Chapter 8

An Influence of Relative Income on the Marginal Propensity to Consume: Evidence from Shanghai

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Additional information is available at the end of the chapter

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Abstract

This chapter deals with the question whether there is a relationship between the marginal propensity to consume and the status of the household in income distribution represented by a relative income. If so, then the current assumption of mainstream theory of consumption about the constant marginal propensity to consume could no longer be considered realistic and it will be necessary to take the element of relative income as a new key determinant of general consumption function. The aim of this work is to identify, describe, and prove an influence of relative income on the marginal propensity to consume using data for urban residents of Shanghai and to prove the correctness of Duesenberry's relative income hypothesis. To achieve this goal, we use a panel regression, through which the results clearly confirm the validity of the initial hypothesis about the existence of functional dependence of the marginal propensity to consume on the relative income and so it fully supports the idea of interdependent concept of utility and consumption.

Keywords: relative income, marginal propensity to consume, Duesenberry's hypothesis, interdependent utility, consumption function

JEL: D11, D12

1. Introduction

Consumption represents a key determinant of economic thought in many ways, not so much for its immense practical significance, but rather because it *de facto* represents the essence of economics itself, the essence of the issue of infinite needs and finite resources. Both in terms of microeconomics, that consumption hypotheses are always necessarily based on, and within a macroeconomic approach the widely accepted theory of consumption of mainstream economics seems to be very well formulated and developed and as such it has remained virtually unaltered for nearly 60 years. But is this theoretical concept entirely accurate and complete? Could not even here be one of the major determinants of the general consumption function omitted? Now these questions are a starting point of this chapter.

Since the 1950s of the twentieth century, the approach of permanent income theory and lifecycle hypothesis has prevailed in professional circles of economic theory. This mainstream view of the basic economic laws determining household consumption is in professional economic texts established to such an extent that the different approaches are practically not visible. However, this does not mean that there are not any alternative hypotheses of consumer behavior. We can find many critical perspectives on the standard theory of consumption, but often it is only a solution of narrowly focused issues, the pieces of a mosaic of complex alternative theory, that as a whole remains fragmented across countless of professional studies as poited out by Ackerman (1997). And if this comprehensive theory arose after all, still it was ignored for various reasons. And that is exactly also the case of Duesenberry's relative income hypothesis—consumer concept, based on the idea of interdependent utility, which has the potential with theoretical way to challenge a complete validity of the consumption theory of mainstream economics, and ultimately and primarily to significantly enrich the basic pattern of generally accepted consumption function of life cycle-permanent income hypothesis (LC-PIH)[1] (Mason, 2000).

Income and price are the key determinants of consumer choice as for mainstream economics. Relative income hypothesis, however, points out the fact that if the consumer is also affected by consumption habits of his surroundings, then the income itself must be seen in two ways: in absolute and in relative terms. From these two concepts of the basic economic determinant of general consumption function, it stems also two channels of influence on the total amount of consumption. An absolute concept of income implies a direct effect, already well known from the Keynesian consumption function. Higher disposable income will lead to a proportionately greater amount of consumer spending. A variable of disposable income then figures in the functional form of consumer equation simply as the independent variable directly explaining the level of consumption. While the relative concept of income, at least according to the principles of Duesenberry's hypothesis, implies an indirect effect. Higher disposable income will lead to higher position of household across income distribution and according to interdependent concept of utility and consumption also to a lower value of the marginal propensity to consume (MPC). The decline of MPC then, as an element transforming disposable income into consumption, negatively affects the ultimate level of consumption. The position of household in income distribution is then represented in the consumption pattern as an independent variable, which indirectly through MPC affects the level of consumption.

The problem is that while the absolute (direct) income effect is a well-known matter and the virtually undisputed, relative (indirect) income effect remains often completely ignored by professional economic communities, whether in the form of Keynesian consumption function or access of LC-PIH. It is true that every relevant and really applicable model must be extracted of elements that have not a major impact on it. However, is also

[1]A theoretical approach to consumption, based on original works: Modigliani and Brumberg (1954) and Friedman (1957). In the case of adding an element of rational expectations, then it can be primarily referred to the so-called random walk model, as defined by Hall (1978).

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the relative income effect the insignificant element, which should be completely removed out of the consumption function without a trace? Is the interdependent concept of utility from the consumption a matter totally irrelevant? If so, then this whole work is a pointless effort.

To explore this matter, we use data from China, which has been undergoing significant structural changes recently. The shift from investment and export-oriented economy into consumption-oriented economy is one of the biggest changes. Although the consumption contribution to the country's GDP is still lower than in all developed countries, the change of government's policy (hence the whole economy) is significant. Such development turns the attention of researchers to the consumption and its determinants.

Unfortunately, only few research studies have been carried out in this field earlier. There are several studies analyzing the factors influencing very low consumption rates in China (see for example Horioka and Wan, 2007; Yang et al., 2011) or studies generally describing the consumption determinants on the macro level as Guo and Papa (2010). Many studies also focus on inequality of income distribution as a factor affecting the consumption (see Lou and Li, 2011). However, none of these studies mention the relative income as one of the possible consumption determinants. The interdependence of consumers seems to be analyzed much more by marketing specialists, see for example the studies of Zhang and Kim (2013); Yu (2014). These studies can provide useful insight into the relations among the consumers, but they cannot provide any evidence of the influence of "keeping up with the Joneses" effect on the final general consumption function.

The aim of this work is to identify, describe, and prove an influence of relative income on the marginal propensity to consume using data of urban residents of Shanghai and thus to prove the correctness of Duesenberry's hypothesis.

2. Relative income hypothesis

"Professor Duesenberry's study of the impact of budgetary and aggregative empirical consumption data on the received theory of consumer behavior is one of the most significant contributions of the postwar period to our understanding of economic behavior" written in his review by Arrow (1950, p. 906), his time respected neoclassical economist and later Nobel prize laureate in economics.

The relative income hypothesis is fundamentally built on criticism of established neoclassical preconditions for the creation of demand and Keynesian theory of consumption based on them. The main and fundamental idea with which Duesenberry (1949) comes to the field of knowledge in order to confront these established relationships of mainstream economics is a complex social concept of consumer and revision of Veblen's demonstration effect (Veblen, 1899), which the author gives a particular dimension through income distribution of households.

We can find two fundamental propositions in the work of James Duesenberry, let's say postulates, on which the theory of relative income stands and which are the basis for its further implications (Palley, 2010, p. 6):

1. "The strength of any individual's desire to increase his consumption expenditure is a function of the ratio of his expenditure to some weighted average of the expenditures of others with whom he comes into contact."
2. "The fundamental psychological postulate underlying our argument is that it is harder for a family to reduce its expenditure from a higher level than for a family to refrain from making high expenditures in the first place."

The real foundation of the new model is, however, the first claim. The author himself called this effect as *keeping up with the Joneses* or the effect of relative income. The principle is mainly simple. The consumer is not isolated from others, he lives in a world where he every day meets his friends, colleagues, family, his neighbors, and so on. And not only he meets them, especially he is confronted with their consumption. He sees what they buy, what they spend for, by what they form their standard of living, and their position in society. He sees what Veblen saw in his theory, the so-called pompous ("pointless") consumption. Unlike Veblen (1899), for the majority of the population, these consumer expenditures are not pointless, because it allows them to reach the intangible social values—a status. And that is what this is about. Our consumer shall see how people around him buy goods for their ceremonial value, before his eyes they increase the value of their status, strengthen their social position and even he does not want to be left behind. Therefore, if the consumer belongs to low-income households (his disposable income (Y_D) is under the society-wide weighted average ($\bar{Y}_D$)), then he spends more of his disposable income just to demonstrate that he can afford it, just to catch up with social status of others. His MPC is then relatively high. Conversely, high-income households[2] (whose Y_D is above the society-wide weighted average) usually already have valuable status, therefore they have not such a motivation to "catch up with someone", they do not have to spend so much of their income and vice versa they save more, simply because they can afford it. So we come to the first simple implication:

$$\mathrm{MPC}_1 > \mathrm{MPC}_2 > \ldots > \mathrm{MPC}_n \tag{1}$$

where the higher value of the index n stands for a household with a higher value of relative disposable income (Y_{RD}), most simply expressed as:

$$Y_{\mathrm{RD}} = \frac{Y_D}{\bar{Y}_D} \tag{2}$$

Put simply marginal propensity to consume can be written as a negative functional dependence of relative (disposable) income, as similarly shows (Palley, 2010):

$$\mathrm{MPC} = c\left(Y_{\mathrm{RD}}\right)\ 0 < c < 1;\ \grave{c} < 0 \tag{3}$$

[2]As you can see, for simplicity, there is described a mechanism of functioning at only two types of households: high income and low income. This is however only a demonstration of the principle, which otherwise could be applied to any number of categories (social classes), as shown in Eq.(1).

The total amount of household consumption C is then given by the product of disposable income and the marginal propensity to consume, which is not constant now (as naively assumes the mainstream theory of consumption), but it depends on the position of the entity in the curve of income distribution:

$$C = c(Y_{\mathrm{RD}}) \cdot Y_D \tag{4}$$

Plain view on the derivation of the final rule of general consumption function, especially on the relationship between MPC and Y_{RD} (Eq.(3)), can logically evoke questions like: Is not such a general notation too trivial? Would it be possible at this point to express the dependence of marginal propensity to consume on relative disposable income in particular functional form? We find in the later part of this work that the real version of this relationship is not such a trivial matter, it depends on the number of other factors and it simply cannot be expressed in the general shape like this. There are only a number of methods by which this relationship can be approximated into particular form. One of these ways is, as we could see, the central theme of this work.

3. Methods and data

The first thing we need to realize at this point is that the marginal propensity to consume of households does not change due to the amount of disposable income, but depending on the relative disposable income, as shown in Eq. (3). This is essentially a central idea of discussed hypothesis, a key contribution to the debate on the form of consumption function. As literally written by Alvarez-Cuadrado and Long (2011, p. 1489): "For any given relative income distribution, the percentage of income saved by a family will tend to be unique, invariant, and increasing function of its percentile position in the income distribution. The percentage saved will be independent of the absolute level of income. It follows that the aggregate saving ratio will be independent of the absolute level of income." An important factor is that although the MPC and therefore also APC of households differ substantially across the Lorenz curve of distribution of disposable income (which we can figure out even with simplest common sense, but no longer with the standard theory of consumption), it is this way only because of the effect of relative income, which does not exist at the aggregate level.[3] Average propensity to consume for the whole economy is then constant in the long term, thus the relative income hypothesis is entirely consistent with the observation presented by Kuznets et al. (1946)[4] 70 years ago.

[3]The indicator may only be relative compared with another value. But an aggregate scale only shows one type of household—the "aggregate" one. Therefore, disposable income has nothing to be compare with, respectively, is equal to the average disposable income. After substituting into Eq. (2), YRD is always equal to one and whether the MPC inferred form it takes any value, it will be constant throughout the progress of consumption function. And because it is linear and based on the origin of coordinates, the average propensity to consume is also constant taking equality MPC = APC.

[4]Widely appreciated and respected study that using macroeconomic data from the US for nearly 70 years proves that even during rapid long-term growth of real income, the average propensity to consume had not virtually changed, just as the autonomous component of consumption would not exist. This discovery thus de facto entirely denies a validity of Keynesian consumer theory in the long run.

Whatever is the strength of the effect of relative income throughout income distribution in the society, the MPC for every household, more precisely a category to which the household belongs, is always given by a functional relationship due to its relative disposable income. And as it is well known that the function generates for any given situation only one result, therefore, each type of household also has only one marginal propensity to consume. Maybe the above sounds trivial and like a commonplace, but it is important to realize that the MPC of different groups of households does not change over time ceteris paribus,[5] it is independent on the absolute amount of income and so it has for each Y_D a constant value. But first and foremost, as the previous lines try to imply and how sadly Palley (2010) himself, whose model we use as a basis, forgot to mention, the above applies to types of households, to the categories to which they belong, not to individual households themselves and their individual consumption functions. This is a fundamental difference!

The biggest shortcoming of the standard model of consumption in the form of LC-PIH can therefore be seen in a constant characteristic of value of marginal propensity to consume for all kinds of income categories. To refute this erroneous assumption is then precisely the goal of the following analysis.

3.1. Methods

Let us recall at this point that the main motive of this work is to prove an influence of relative income on the value of its marginal propensity to consume, particularly by formulation of a specific form of its possible functional form. The term of relative income thus still remains the key concept for us. From the principle point of view it is *de facto* quantification and therefore the possibility of mathematical-economic interpretation of the issue of household's position in the distribution of disposable income. From the definitional point of view, it is a ratio of disposable income to the society-wide weighted average, as shown in Eq. (2). Now we have only left to specify precisely the variable of $\bar{Y}_D$. From the perspective of the principles of relative income hypothesis, it seems to be the best solution to set the weights as the average numbers of household members in the given income category, which would epitomize the best a frequency of individual income cases in society. However, due to limited data source we have to settle for determining variable $\bar{Y}_D$ as the simple arithmetic average of disposable incomes for considered income categories. Therefore, this point can be considered as a necessary simplification given by the availability of empirical data and potentially a weaker place of the following analysis, but not weak enough to make it impossible to achieve the stated objective.

For actual try of expressing a specific form of assumed functional dependence, we use a regression analysis by estimation of regression coefficients using the least squares method. Due to the nature of the input data, in particular the limited number of statistically measured income categories (small number of observations), the classical regression could lead to distorted results, therefore, will use panel regression.

[5]Changing values of MPC in time could in our case characterize only one thing, a change in the distribution of disposable income, thus de facto enlargement or reduction of income inequality.

The general formula of the required univariate linear regression model depends on whether we use a panel regression method for fixed or random effects. Which of these panel regression methods is more suitable for expression of wanted dependency will be shown up by Hausman's test at a later stage of the analysis, so it is necessary now to still consider both the options. In the case of using fixed effects the regression equation is given by:

$$\mathrm{MPC}_{i,t} = \alpha_i + \beta \cdot Y_{\mathrm{RD}_{i,t}} + u_{i,t} \tag{5}$$

where $\mathrm{MPC}_{i,t}$ is the marginal propensity to consume for the category i at time t, α_i is the level constant (an intercept) for the ith income category, the product of $Y_{\mathrm{RD}_{i,t}}$ is relative disposable income for the ith category at the time t and the regression coefficient β expressing the sensitivity of the marginal propensity to consume to the relative disposable income. Variable $u_{i,t}$ symbolizes the random component. In a more detailed breakdown, the level constant α_i for each category is divided into two subfolders, where:

$$\alpha_i = \beta_0 + \gamma_i \tag{6}$$

where β_0 is the basic level constant to which it applies $\beta_0 = \alpha_1$. A constant γ_i is then an added fixed impact for given income category for $i \in \{2; \ldots; I\}$, where I is the number of categories. By simply rewriting α_i according to Eq. (6) we get new more detailed form of the general expression of wanted regression equation using fixed effects:

$$\mathrm{MPC}_{i,t} = \beta_0 + \gamma_i + \beta \cdot Y_{\mathrm{RD}_{i,t}} + u_{i,t} \tag{7}$$

Since in the case of using the fixed effects method (for a given entity) we subsequently need also to verify the appropriateness using time fixed effects, it is necessary to consider other, 1 order of magnitude more detailed breakdown of level constants α_i, which could now be broken down to the given shape:

$$\alpha_i = \beta_0 + \gamma_i + \tau_t \tag{8}$$

where for newly level constant it applies the condition $\beta_0 = \alpha_1$ only for $t = 1$ and where τ_t is an added fixed impact due to the time period for $t \in \{2; \ldots; T\}$, where T stands for the number of such time periods. Moreover, by a new rewriting α_i in Eq.(5) we can write down a general expression of wanted regression equation using fixed effects for given categories and time:

$$\mathrm{MPC}_{i,t} = \beta_0 + \gamma_i + \tau_t + \beta \cdot Y_{\mathrm{RD}_{i,t}} + u_{i,t} \tag{9}$$

For regression estimation based on random effects the wanted relationship is characterized more simply and clearly in the form:

$$\mathrm{MPC}_{i,t} = \alpha + \beta \cdot Y_{\mathrm{RD}_{i,t}} + u_{i,t} + \varepsilon_{i,t} \tag{10}$$

Where newly α represents a level constant for all categories, $u_{i,t}$ is a random component between categories and $\varepsilon_{i,t}$ is a random component within an income category.

Either way, an important prerequisite of any possible resulting variations of panel regression is a negative value of the coefficient β, because according the principles of Duesenberry's hypothesis with increasing relative disposable income the marginal propensity to consume must necessarily decline, as demonstrated by Eq. (3).

3.2. Data

The prerequisite of negative linear dependency of MPC on Y_{RD} is tested here using the example of data for the budgetary situation of urban households in China's Shanghai; therefore, all the input data for the aforementioned analysis were taken from the database of the Shanghai Municipal Statistics Bureau (2016). The original input data are annual statistics between the years 2000 and 2014, which resulted in essentially two time series, which are further divided into five another subfolders. Followed 15 observations are then basically written in two variables:

Y_D = average nominal disposable income of household per capita in CNY,

C = average nominal consumption of household per capita in CNY.

As can be seen, we work with the mean values per person. For better demonstration of the validity of Duesenberry's hypothesis, this procedure is certainly preferable. An important finding is also mentioned in the secondary division of basic variables. Indicators Y_D and C are both equally divided into five other subfolders reflecting income and consumption situation of different types of households arranged ascendingly by quintiles of disposable income. Finally, we register 10 input time series here, divided into five panels by the types of income categories. Indicators directly entering the subsequent panel regressions are Y_{RD} calculated according to Eq. (2) and APC expressed by formula:

$$\mathrm{APC} = \frac{C}{Y_D} \tag{11}$$

It is then necessary at this point to realize that we work with income categories here (not with individual households), for which the value of APC is independent on Y_D and in the absence of an intercept it is at any point equal to MPC. That is why we could use this simple equivalence, where MPC values are substituted by the average propensity to consume. In conclusion, we note that although the original input data in this study are nominal expression of consumption and disposable income, but due to the relative nature of indicators MPC and Y_{RD} the unwanted effect of changes in the price level is to be fully canceled out anyway.

4. Results

Chart 1 is used for preliminary visual assessment of the expected dependence. Although the linear dependence of both followed quantities is quite obvious at this point, only a graphical

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analysis is obviously not enough for us. The aim here is to mathematically approximate this relationship by the regression equation.

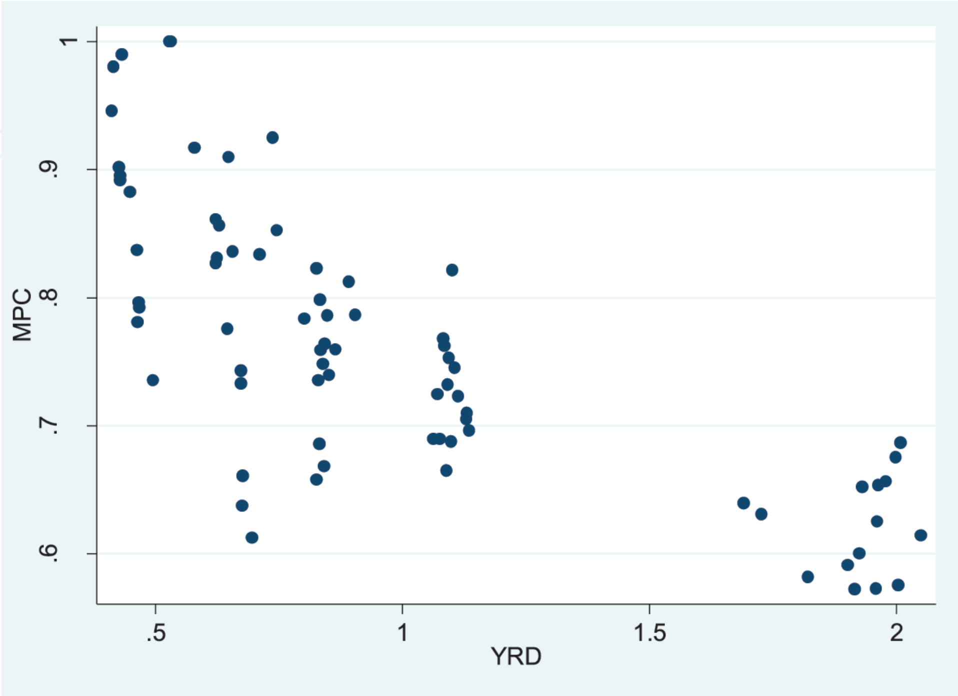

Chart 1. Visual assessment of linear dependence of MPC and Y_{RD}. *Source*: own calculations and processing in Stata 12.

Before it can be proceeded to the actual final estimate of regression parameters of mentioned dependency, it is necessary for the panel nature of the data to decide whether it should be used as a method of fixed or random effects, in other words, whether there are differences significant enough in the wanted functional relationship between the categories that they must be captured in a separate level constant just for each category. This dilemma is unambiguously solved by executed Hausman's test when its results indicate that a suitable panel regression in this case is in the method of random effects, at least at the 5% significance level, which we also use for further analysis.

The results of the final panel regression using random effects are summarized in **Tables 1** and **2**. In this final estimation of the desired functional form, we use a robust method of estimation of standard error using White's estimator, thereby the model was protected against a possible autocorrelation and heteroskedasticity. An important finding is that considering the inclusion of only one explanatory variable, a relatively high value of the coefficient of determination was achieved, which indicates that approximately 57% of the variability of MPC was explained just by Y_{RD}. This fact then clearly confirms the main initial assumption about the influence of relative disposable income on the marginal propensity to consume.

There is no doubt that the model as a whole is statistically significant, as well as the regression coefficient and level constant. The key element—the wanted regression coefficient β

achieves exactly according to our expectations a negative value, which cannot be influenced nor by potential standard error. The resulting model corresponds to an initial economic theory and predicts that a change in the relative disposable income by 0.1 also changes the value of the marginal propensity to consume of any income category in the opposite direction by 0.0155.

Number of observations	**75**
$F(10, 149)$	36.69
Prob > F	0.000
R^2	0.575
Source: own calculations and processing in Stata 12.	

Table 1. Estimation of Eq. (10) using panel regression with random effects, part 1.

MPC	**Coefficient**	**Robust Std. Err.**	z	$P>\|z\|$	**[95% Conf. Interval]**
β	−0.155	0.026	−6.06	0.000	−.206, −.105
α	0.912	0.037	24.75	0.000	.84, .984
Source: own calculations and processing in Stata 12.					

Table 2. Estimation of Eq. (10) using panel regression with random effects, part 2.

In conclusion, let us emphasize that the result of Hausman's test significantly influenced (and positively) the very predictive ability of the resulting model. The final use of the random effects method means that the regression relationship between the MPC and Y_{RD} can be expressed in a fully general way and elegantly by only one equation (which could not be possible using fixed effects) and therefore it does not depend on what income category we are situated. The final functional dependence of the marginal propensity to consume on relative disposable income has then a following form:

$$\mathrm{MPC}_{i,t} = 0.912 - 0.155 \cdot Y_{\mathrm{RD}_{i,t}} + u_{i,t} + \varepsilon_{i,t} \tag{12}$$

5. Conclusion

The primary goal of this work was to find and prove an influence of relative (disposable) income on the value of marginal propensity to consume. To achieve this goal, we have used primarily a panel regression for data from the Chinese province of Shanghai. There is no doubt that relative income affects the marginal propensity to consume, which concurrently means that validity of "keeping up with the Joneses" effect ("keeping up with the Wangs" as we say in the context of China) is finally proved. And as indicated by the relatively high value

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of the coefficient of determination (relative to one explanatory variable), this dependence must become a new key factor of the general consumption function.

The mainstream theory of consumption, mainly represented by the concept of LC-PIH, assumes a constant value of MPC for all types of income categories. However, as it is shown by the results of our study, this assumption can no longer be considered realistic. Marginal propensity to consume remains unchanged in relation to disposable income only for a given income category, not for individual households. If the income situation of household changes, it will shift to the new income category and at the same time it will fix the new value of MPC. Household consumption function then does not have a constant slope (opposed to the consumption function of income categories) as mistakenly assumed by the mainstream theory of consumption, but it is under a concave characteristic. This is occurring due to the effect of relative income, it is appropriate at this point to emphasize again that the mainstream microeconomics distinguishes only between the income and substitution effect. Duesenberry's theory, as well as the conclusions of this study, requires to add further subdivision and so to distinguish between the income effect of absolute (direct) and relative (indirect).

Although the impact of relative income on the marginal propensity to consume was unequivocally confirmed, the issue of its precise nature still remains open. Approximation of followed dependency, of course, depends on a functional form, which is used for it, and here utilized linear function is certainly not the only option. Moreover, it may not even be the most appropriate. It is important to realize that, at least in terms of statistics, there is not only one correct and objective functional form, this is only just what we define it. And the definition of a new, elegant and more convenient functional relationship of MPC and Y_{RD} better and more accurately describing consumer behavior of households so remains the motive for further scientific research.

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