

The Income-Expenditure Gap and Household Debt: Econometric Appendix

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The main purpose of this appendix is to present in detail the estimation results, and the way in which the estimation method was chosen.

The estimation was carried out separately for married and unmarried households, due to differences in the two groups' characteristics, including how they manage their budgets, their types of expenditures, and the distribution of expenses within the household budget. Noteworthy results of the model with reference to both household types will be discussed later on.

The following is a detailed discussion of the econometric estimation stages that were carried out in different parts of the study. The order in which the findings are presented is identical to the order in which the econometric findings appear in the study itself. Displayed first are the estimation results based on the household expenditure surveys: the correlations between household characteristics and size of income-expenditure gap (current gap), and the correlations between this gap and household consumption attributes, expressed as the share of different spending categories out of total financial expenditures. This will be followed by a presentation of the estimation results for the probability of being a Paamonim client.

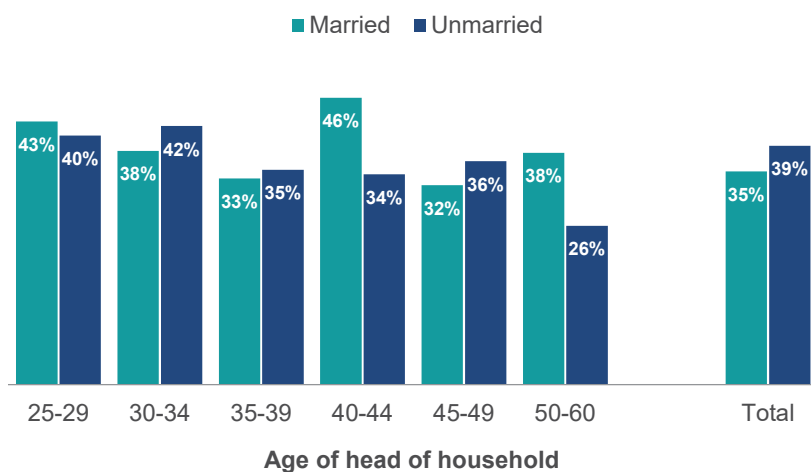
Current gap was defined as the gap between household disposable income and monetary expenditures on consumption, plus mortgage expenditures. Mortgage payments are included in the gap calculation for the purpose of analyzing the correlation between housing expense types and negative current gap, i.e., the chance of sinking into financial difficulty, as indicated in the study. For purposes of clarity, the current gap was multiplied by minus 1. Thus, the higher the value of the explained variable, the more negative the current gap.

* Kyrill Shraberman, Taub Center researcher. I would like to thank the Paamonim organization for the data used in this study. My gratitude and appreciation are also due to Professor Avi Weiss, Professor Claude Berrebi, Dr. Dmitri Romanov, and Hadas Fuchs for their helpful comments.

As noted in the study, because no information is available on the assets of households included in the study, negative current gap does not necessarily attest to financial difficulty if a household can finance it through past savings or by assuming debt at the expense of future income. Thus, reducing assets necessarily increases the chance of future financial trouble.

In the expenditure survey data representing the study population,¹ there are households with both positive and negative current gap (Figure 1). There is, therefore, no reason to assume that households with a current surplus behave differently from households with a current deficit. Thus, it was decided in the first stage of the estimation to perform an estimation of an unrestricted model via least squares, i.e., an estimation based on data for all of the households, those with a positive or negative gap.

Figure 1. Share of households with negative current gap, 2015



Source: Kyrill Shraberman, Taub Center | Data: CBS, *Household Expenditure Survey*

The results of the unrestricted model estimated for unmarried households are displayed in Column A of Table 1 (the results for married households appear in Column A, Table 2). One of the model's most striking findings is that there are no significant differences between the various age groups, relative to the 50-60 age group. This finding is also true of married households.

¹ The study focuses on households of Jews and others (by religion of head of household) headed (economically) by people ages 25-60.

By contrast, type of housing expenditure and socioeconomic status are correlated to a statistically significant degree with size of current gap. The type of expenditure for which the correlation is highest is “rent + mortgage,” followed by “rent,” while the lowest correlation is between “mortgage” and current gap (true for married households as well). It is interesting to note the correlation between current gap and socioeconomic status, represented by the income quintile to which the household belongs.² The correlations of the income quintile dummy variables are positive, and they become smaller as socioeconomic status rises.

As noted, the main purpose is to analyze the relationship between household characteristics and size of per person negative current gap; it is therefore appropriate to ask whether there are household-characteristic differences between households with positive and negative gap. To answer this question, a restricted model was estimated (Column B in Tables 1 and 2), in which a dummy variable signifying that a household has a negative current gap, and its interaction with explanatory variables, were added to the unrestricted model. To test the hypothesis that there is a difference between households with positive gap and households with negative gap, a unified t-test was performed on the interaction coefficients and the “negative gap” dummy. The hypothesis that the coefficients equal 0 was refuted at a very high degree of significance;³ thus we can say that households with negative gap have different correlations from households with positive gap. To assess this argument in greater depth, correlations for households with negative gap only were estimated.

Column C in Table 1 (unmarried households) and Table 2 (married households) display the estimation results based on data for negative-gap households only. The most striking finding in the unrestricted model results is the reversal of the coefficient sign for socioeconomic status: the lower the status, the smaller the negative current gap. In fact, the data indicate that the per person negative current gap for households in Quintile 1 is smaller than that of households belonging to Quintile 5, which have the largest negative current gap (most negative). Higher current income is correlated with many more assets, about which, as noted, no data are available; thus, economically stronger households have an easier time covering larger current deficits. This finding is also valid for the married households model.

2 Income-per-capital quintiles of households of Jews and others whose economic heads fall into the 25-60 age range.

3 Test results for the unmarried model: $F(17, 1318) = 36.04$, with a significance level: $\text{Prob} > F = 0.0000$. Married model test: $F(17, 3253) = 80.16$, with significance level of $\text{Prob} > F = 0.0000$.

Having established that the estimation results for negative-gap households only differ from the results for all households, it becomes necessary to determine which model is the most appropriate for estimating the correlations between household characteristics and size of per person negative current gap. Since the restricted model estimation showed that the question of whether a household has negative current gap is statistically significant, it would appear to be necessary to choose separate estimation for households with negative current gap. On the other hand, it should be noted that the socioeconomic correlations, and their interactions with the control for negative current gap, remain statistically significant.

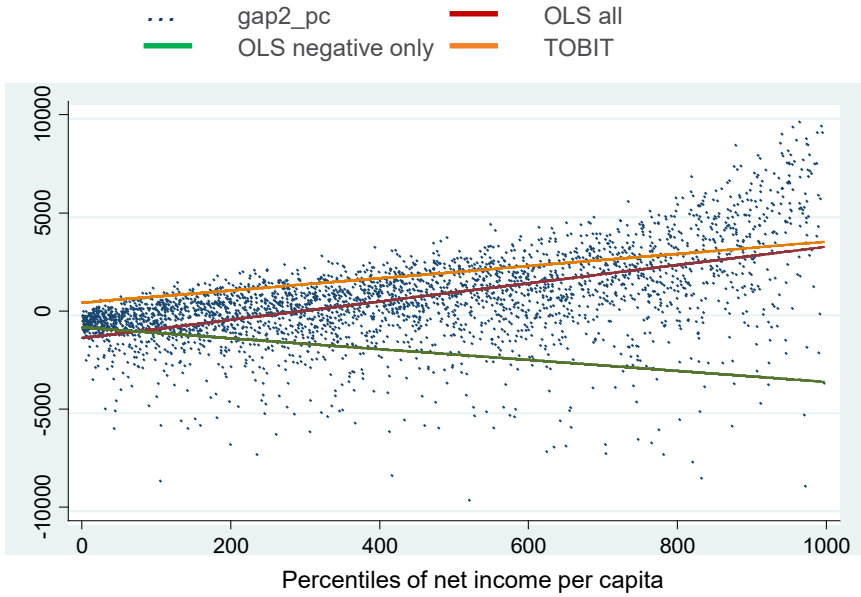
If the above is taken into account, then estimating the correlation between socioeconomic status and per person negative current gap size requires adjusting the estimation for the effects of households with positive current gap. However, this should be done not by including these data in the estimation, but rather through conditional estimation (estimating data for negative-gap households, given the probability of negative gap). The appropriate estimation method for this purpose is Tobit – estimation based on censored data, subject to the probability of their presence in the non-censored data (data included in the estimation).

Figure 2 shows the computed values estimate for negative gap in married households, obtained by estimating the unrestricted model (all observations), the model including negative current gap only, and the Tobit model, as a function of per person income percentile. As we can see, the correlation between income percentile and current gap in the unrestricted model is positive, while in the restricted model it is negative. The difference in the findings can be likened to a situation where we look at the same problem only from different angles. The correlation obtained in the unrestricted model indicates that current gap variance is similar to income variance: the weakest subjects are those with negative gap, and the strongest are those with positive gap.

If we examine only households with negative gap, we find that the negative gap of the stronger households is larger than that of the weaker households. This finding would seem to contradict the results of the unrestricted model. One method to overcome this contradiction is to estimate censored data via Tobit, which estimates the correlation while correcting for the probability of presence in the uncensored data.

Figure 2. The correlation between the negative current gap per person and socioeconomic status

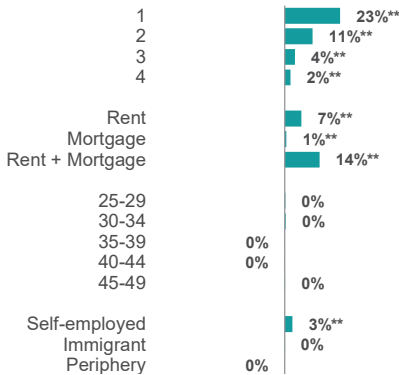
By net income percentiles per person, households of Jews and Others, head of household ages 25-60



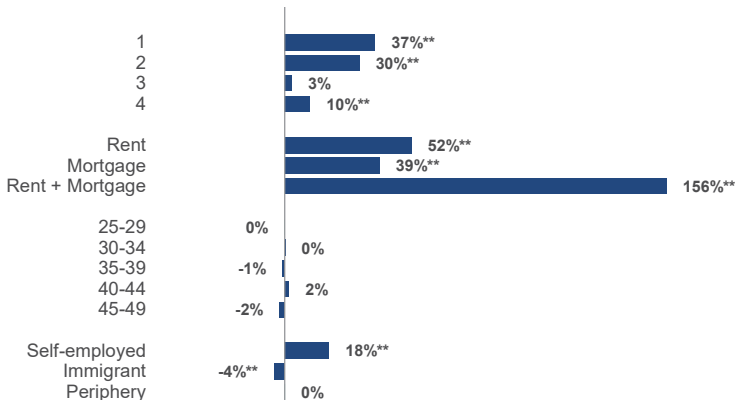
Source: Kyrill Shraberman, Taub Center

Figure 3. The correlation between the negative current gap per person and household characteristics, 2015

Married



Unmarried



Note: * p-value = 0.05-0.10; ** p-value < 0.05; No asterisk = not significant.

Source: Kyrill Shraberman, Taub Center | Data: CBS, *Household Expenditure Survey*

Column D in Tables 1 and 2 display the Tobit estimation results. For purposes of comparison with the results obtained in the earlier stages — estimated via least squares, with the coefficients constituting a product of the marginal correlations and marginal probabilities of being present in the sample at the means points — the sign of the coefficients [was] reversed, in contrast to the Column C coefficients, and are smaller in absolute value. As

we can see, the age of the (economic) head of household has no statistically significant correlation with per person negative current gap (relative to households headed by people in the 50-60 age range), and the lower the socioeconomic status, the larger the per person negative current gap.

Table 1. Estimation stages — Unmarried

	(A) OLS All	(B) OLS restricted	(C) OLS negative only	(D) Tobit (marginal effects)
Age of head of household				
25-29	-453.30	6.85	-602.88	-0.19
30-34	521.40	551.30	855.50	1.40
35-39	-151.13	235.67	162.47	-5.08
40-44	628.21	347.31	-189.87	9.69
45-49	-2192.53	-2800.01	369.24	-10.90
Housing expenditure category				
Rent	2385.06	1451.25	487.40	262.34
Mortgage	1595.48	203.18	647.83	196.34
Rent + Mortgage	5167.87	2184.10	2838.86	789.90
Socioeconomic status				
Lowest quintile	4760.09	5642.37	-2458.10	187.16
2 nd quintile	4448.92	5459.70	-2574.05	154.49
3 rd quintile	3781.52	4793.92	-2178.00	14.89*
4 th quintile	3594.74	3938.26	-969.00	52.57
Self-employed	1045.10	-586.00	478.59	91.88
Immigrant	-785.29	-889.57	-113.05	-21.06
Periphery	377.30	254.13	608.23	0.91
Negative gap (Dummy)		9903.34		
Interaction (with negative dummy variable)				
		Age of head of household		
25-29		-609.73		

Table 1 (continued). Estimation stages — Unmarried

	(A)	(B)	(C)	(D)
	OLS All	OLS restricted	OLS negative only	Tobit (marginal effects)
30-34		304.20		
35-39		-73.20		
40-44		-537.19		
45-49		3169.25		
Household expenditure category				
Rent		-963.85		
Mortgage		444.65		
Rent + Mortgage	654.76			
Socioeconomic status				
Lowest quintile		-8100.47		
2 nd quintile		-8033.75		
3 rd quintile		-6971.92		
4 th quintile		-4907.26		
Self-employed		1064.59		
Immigrants		776.52		
Periphery		354.10		
Constant	-5110.79	-632.31	3582.03	
N	1,299	1,299	519	1,299
R ²	0.1713	0.3854	0.0849	0.0105***

Note: Significance: Bold - $\alpha < 0.05$; * $\alpha = 0.077$; ** pseudo R².

Source: Kyrill Shraberman, Taub Center

Table 2. Estimation stages —Married

	(A) OLS All	(B) OLS restricted	(C) OLS negative only	(D) Tobit (marginal effects)
Age of head of household				
25-29	29.86	-123.12	-91.34	2.66
30-34	352.85	434.56	-322.86	4.13
35-39	56.87	220.73	-575.82	-0.10
40-44	4.06	191.26	-481.63	-0.83
45-49	423.99	441.49	-437.95	1.83
Housing expenditure category				
Rent	1107.46	735.16	22.13	60.21
Mortgage	553.21	611.74	-560.98	5.98
Rent + Mortgage	1430.32	989.92	-504.78	124.70
Socioeconomic status				
Lowest quintile	4319.95	4485.43	-2762.17	198.66
2 nd quintile	3937.21	4008.30	-2196.52	100.18
3 rd quintile	3306.71	3412.11	-1842.91	36.41
4 th quintile	2668.96	2666.20	-939.83	20.28
Self-employed	160.40	-403.77	282.05	27.50
Immigrant	120.03	46.66	234.44	0.16
Periphery	-184.69	-170.00	-72.17	-0.66
Negative gap (Dummy)		9809.45		
Interaction (with negative dummy variable)				
Age of head of household				
25-29		31.79		
30-34		-757.42		
35-39		-796.55		

Table 2 (continued). Estimation stages — Married

	(A) OLS All	(B) OLS restricted	(C) OLS negative only	(D) Tobit (marginal effects)
40-44		-672.89		
45-49		-879.44		
Household expenditure category				
Rent		-713.03		
Mortgage		01172.72		
Rent + Mortgage		01494.70		
Socioeconomic status				
Lowest quintile		-7247.60		
2 nd quintile		-6204.82		
3 rd quintile		-5255.02		
4 th quintile		-3606.03		
Self-employed		785.82		
Immigrants		187.77		
Periphery		97.84		
Constant	-4617.08	-5559.74	4249.71	
N	3,221	3,221	1,180	3,221
R ²	0.2049	0.467	0.0897	0.0084**

Note: Significance: Bold - $\alpha < 0.05$; * $\alpha = 0.077$; ** pseudo R².

Source: Kyrill Shraberman, Taub Center

Another issue that arose when analyzing the income-expenditure gaps was that of mortgage inclusion. As noted, economic theory views the purchase of a dwelling as an investment with two components. One is the “flow of housing services” that serves the buyer, while the other is a capital component that can be regarded as a kind of security against the rising cost

of housing services (rent), and also as an investment good for all intents and purposes (Henderson and Ioannides, 1983). Due to the capital component, home purchase expenditures are not normally included in current gap calculations, even though mortgage payments reduce the disposable income that could be used for consumption.

To determine whether differences exist between the results of the negative gap estimations with and without mortgage expenditure, the equation of the characteristics of negative gap without mortgage expenditure was estimated. Table 3 displays the estimation results for both versions of the characteristics equation. We can see that the income quintile coefficients remained almost unchanged (increase of up to 10 shekels), with the dummy variables for type of housing payment and links to mortgage declined. Thus, including mortgage payments when calculating the income-expenditure gap has no significant impact on the estimation results.

Table 3. Estimate of characteristic equations

	With no mortgage	With a mortgage
Age of head of household		
25-29	1.291	2.659
30-34	1.127	4.130
35-39	-0.402	-0.104
40-44	-5.645	-0.830
45-49	2.322	1.826
Housing expenditure category		
Rent	54.175	60.211
Mortgage	-22.537	5.929
Rent + Mortgage	*14.513	124.702
Socioeconomic status		
Lowest quintile	213.662	198.664
2 nd quintile	110.297	100.177
3 rd quintile	46.992	36.407
4 th quintile	27.580	20.276
Self-employed	25.137	27.496
Immigrant	-0.061	0.158
Periphery	-1.927	-0.662

Note: Significance: Bold - $\alpha < 0.05$; * $\alpha = 0.09$.

Source: Kyrill Shraberman, Taub Center

The next section will address the estimation of correlations between the relative share of expense categories out of total expenditures and the size of per person negative current gap. These equations were also estimated via the Tobit method, and Table 4 displays the estimation results for unmarried households (Column A) and for married households (Column B). As found in the estimation of correlations between household characteristics and size of per person negative current gap, we must also take into consideration the probability that a household will display negative current gap.

The guiding principle behind the equation characterization is that increasing expenditures, i.e., increasing the share of a specific category out of total spending, should widen the negative current gap. In other words, if we only increase the expenditure without changing any other variable, then the expenditure's share of total spending will necessarily increase. It is therefore impossible that the correlation between per person negative current gap size and expenditure share would be negative. Thus, we can see that in Column A of Table 4 the correlations are positive, i.e., increasing the share of the expenditure categories would entail widening the per person negative current gap. The correlation between the gap and home maintenance expenditures (electricity, water, gas, heating, locality taxes, *arnona* and security levies)/education expenditures is not statistically significant.

Column B1 in Table 4 displays the correlations for married households. We see that all of the correlations are significant, and the correlation of home maintenance expenditure share is negative. It was therefore decided to formulate the correlation between home maintenance expenditure share as a quadratic polynomial (Column B2). This formulation somewhat improves the quality of correspondence for married households, with no change in the correlations of the other explanatory variables. Figure 4 displays the marginal correlations between the shares of the various expenditure types and the size of per person negative current gap.

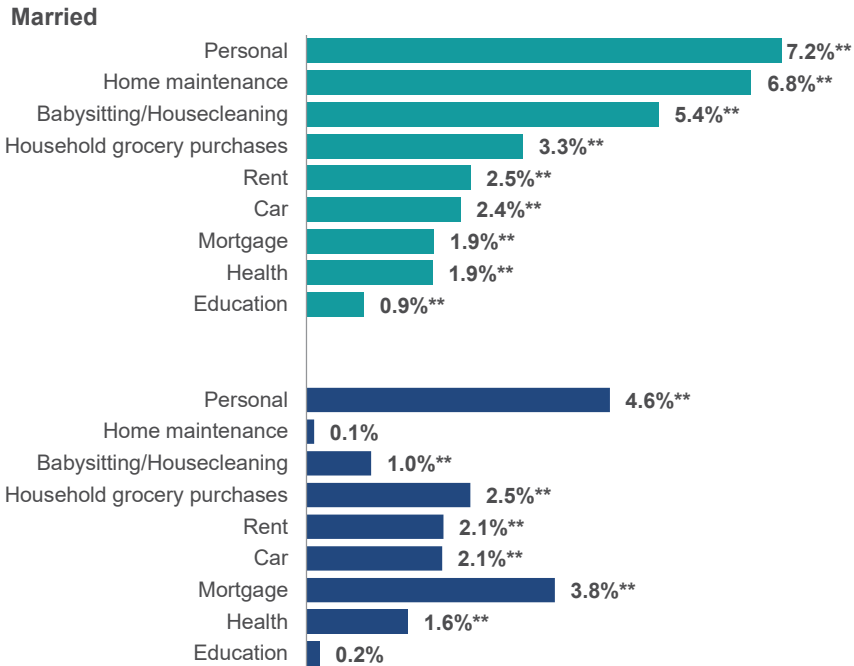
Table 4. Correlations between negative current gap per person and the expenditure category share in the budget

	(A)	(B1)	(B2)
	Unmarried		Married
Household grocery purchases	2638.24	2120.27	1847.17
Personal items	4888.22	4266.58	4052.99
Health	1638.13	902.16	1075.51
Rent	2207.64	1390.95	1400.93
Mortgage	4001.09	1039.46	1088.80
Home maintenance	121.48	*-370.22	3805.83
Home maintenance ^{^ 2}			-71067.10
Car	2184.96	1324.67	1316.05
Education	212.82	421.51	490.82
Babysitting/House cleaning	1042.08	3072.99	3006.66
N	519	1,180	1,180
Pesudo R ²	0.0465	0.0446	0.0454

Note: Significance: Bold - $\alpha < 0.05$; * $\alpha = 0.09$.

Source: Kyrill Shraberman, Taub Center

Figure 4. The correlation between the negative current gap per person and the share of the expense category out of the budget



Note: * p-value = 0.05-0.10; ** p-value < 0.05; No asterisk = not significant.

Source: Kyrill Shraberman, Taub Center | Data: CBS, *Household Expenditure Survey*

The next stage of the analysis will compare household characteristics and the distribution of expenditures between households included in the Household Expenditures Survey that have negative gap and households from the Paamonim database. Due to the great similarity of the data, they can be unified in a single sample; in the first stage we can estimate the probability of receiving assistance from Paamonim given household characteristics, while in the second stage the expenditure distribution can be estimated.

The estimation method chosen is Logit, which assumes that the explained variable is exponential. Before the estimation was performed, weights were calculated for the Paamonim households, to correct deviations resulting from an unrepresentative sample in this database (Manski and Lerman).⁴

Table 5 displays the marginal effects obtained from estimating the probability of being in the Paamonim database, Column A for unmarried households (the data are not displayed in the study) and Column B for married households. We can see that there are differences between the two equations. Head-of-household age has a statistically significant correlation for married households only; the older the head of household, the greater the likelihood of being a Paamonim client. For unmarried households this correlation is not statistically significant, which leads us to conclude that there are no significant differences by age among unmarried households.

For married households, all types of housing expenditure are correlated to a statistically significant degree with current gap, relative to households with no housing expenditures. The probability of applying and being admitted to Paamonim programs for households that pay rent is 31 percent higher than that of the omitted group, the probability for households making mortgage payments is 20 percent higher, and the probability for households paying both rent and mortgage is 23 percent higher.

Figure 5 displays the marginal coefficients [effects] between household attributes and the probability of being in the Paamonim database (i.e., receiving assistance from the organization), for married households.

4 The weights were created in accordance with the distribution by head-of-household age and date of immigration, for married and unmarried households separately. After conversion of the weights, the share of a specific group in the Paamonim data (unrepresentative sample) will be equal to the share of that same group in the expenditures surveys (data representing the Israeli household population). It should be noted that the weights for the Paamonim households were calculated in terms of the distribution of all of the households, both those with negative current gap and those with positive current gap, in order to obtain a more reliable representation of the entire population included in the Paamonim database.

Table 5. Correlation between likelihood of being a Paamonim client and household characteristics

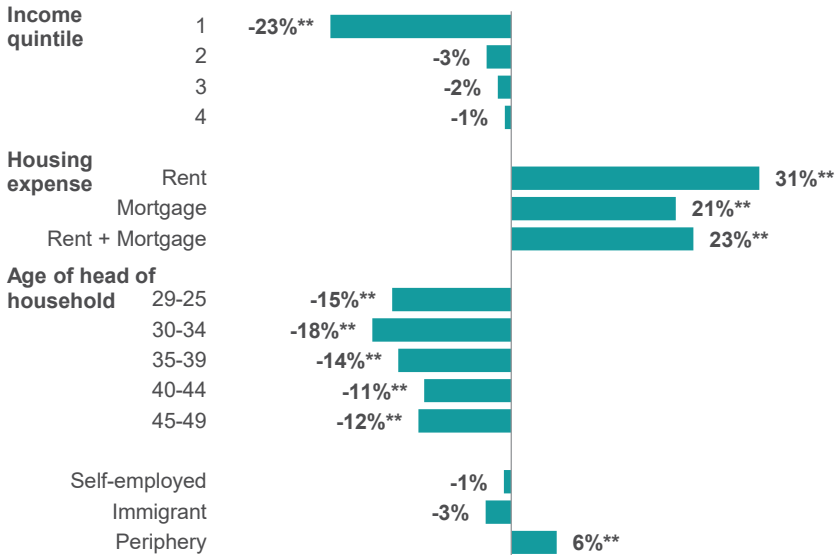
	(A) Unmarried	(B) Married
Age of head of household		
25-29	0.043638	-0.1501
30-34	0.0560	-0.17515
35-39	-0.01939	-0.14249
40-44	-0.00073	-0.10993
45-49	-0.04882	-0.11683
Household expenditure category		
Rent	-0.0147	0.312849
Mortgage	0.17196	0.207598
Rent + Mortgage	0.126736	0.229886
Socioeconomic status		
Lowest quintile	0.151619	-0.22799
2 nd quintile	0.123502	-0.03088
3 rd quintile	0.096481	-0.01704
4 th quintile	0.00333	-0.00819
Self-employed	0.006053	-0.00907
Immigrant	-0.10694	-0.03228
Periphery	-0.04586	0.057269
N	747	2,297
Pseudo R ²	0.0611	0.0593

Note: Significance: Bold - $\alpha < 0.05$; * $\alpha = 0.09$

Source: Kyrill Shraberman, Taub Center

Figure 5. The correlation between the likelihood of being a Paamonim client and household characteristics

Married households



Note: An increase in the gap relative to the reference group. Significance levels: No asterisk - not significant; * p = 0.05-0.10; ** p < 0.05.

Source: Kyrill Shraberman, Taub Center | Data: Paamonim (2016); CBS, Household Expenditure Survey 2015

Based on the estimation performed for negative current gap, the correlations between the budgetary consumption categories and the likelihood of being a Paamonim client household were estimated. Table 6 shows the marginal effects of the estimation for unmarried households (Column A) and for married households (Column B).

Table 6. Correlations between the likelihood of being a Paamonim client and the expenditure category out of total household budget

	(A) Unmarried	(B) Married
Household grocery purchases	0.0012	-0.0025
Personal items	-0.0001	0.0094
Health	-0.0196	-0.0275
Rent	-0.0019	**0.0027
Mortgage	0.0024	0.0007
Home maintenance	0.0053	0.0278
Babysitting/ House cleaning	-0.0151	* -0.0178
Car	-0.0030	-0.0074
Education	0.0071	0.0070

Note: Significance: Bold - $\alpha < 0.05$; * $0.05 < \alpha < 0.10$

Source: Kyrill Shraberman, Taub Center