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Household Personal Inflation:
How Does Residential Area Affect It?

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אינפלציה אישית למשק הבית - כיצד משפיע איזור המגורים ?

סיגל ריבון

תקציר

מדד המחירים לצרכן משקף את השינוי במחיר סל צריכה ממוצע של משקי הבית, אולם קיימת שונות גדולה בהרכב הסלים של משקי בית שונים, ולכן ניתן לצפות לשונות באינפלציה אותה הם חווים. הנייר הנוכחי מציג חישוב של שיעור אינפלציה אישי לכל משק בית על פי מבנה ההוצאות שלו והשינוי במחירי המוצרים כפי שהם נמדדים במדד המחירים לצרכן. בשונה ממחקרים רבים אחרים, לכל משק בית מותאם השינוי בהוצאות על דיור (שכר דירה) על פי האיזור בו הוא מתגורר. נמצא כי קיימת שונות גדולה בקצב השינוי של מחיר סל הצריכה של משקי בית שונים, אולם לא קיימת התמדה משמעותית על פני זמן באינפלציה היחסית של קבוצות אוכלוסיה שונות. נמצא כי בשנים 2008-2010, היה שיעור עליית המחירים גבוה יותר עבור משקי בית בחמישון התחתון עד האמצעי, משקי בית בקבוצת הגיל שמעל 65 ומשקי בית של יחידים. בשל העלייה המהירה בשכר הדירה בשנים אלו היה שיעור עליית המחירים גבוה יותר למשקי בית המתגוררים בתל אביב, גוש דן או המרכז. במשך התקופה הנבחנת – בין 2003-2012 – יש פער של כ-4 נקודות אחוז באינפלציה המצטברת בין איזורים שונים ובין משקי בית מעל גיל 65 ואחרים.

Household Personal Inflation: How Does Residential Area Affect It?

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Abstract

The Consumer Price Index reflects the change in the price of an average household's consumption basket. However, there is considerable variance in the composition of the actual basket among different households, so it can be expected that they experience different rates of inflation. This paper presents a calculation of a personal inflation rate for each household, based on the structure of its expenditures and on the changes in prices as they are measured in the CPI. Here, in contrast to many other studies, the change in housing (rent) expenses is adjusted for the area in which the household resides. It was found that there is wide variance in the rate of price changes of consumption baskets among different households, but there is no strong persistence over time in the relative inflation for various population groups. It was found that in 2008–10, the rate of price increases was greater for households in the bottom to middle income quintiles, for households in the 65+ age group, and for single-individual households. Due to the rapid increase in rent prices in those years, the rate of price increase was higher for those residing in Tel Aviv, the Tel Aviv suburbs (Gush Dan), or the Center. Over the course of the period studied (2003–12), there was a difference of approximately 4 percentage points in cumulative inflation between different regions and between 65+ households and others.

1. Introduction and Literature Review

The tracking of prices over time is an important element in managing monetary policy, particularly in keeping the inflation rate within its target. Although different aggregates in an economy (GDP, industrial goods, etc.) have many different prices, the price stability that policy seeks to maintain is measured foremost based on the Consumer Price Index (CPI).

Apart from its role in macroeconomic description of the development of the aggregate price level, the CPI is used to compute and analyze the real purchasing power of household income, examine the real value of household assets, index the government's liabilities, and so on. Therefore, its importance transcends its role in guiding monetary policy.

The CPI tracks changes in the price level of an aggregate household consumption basket. The weights within this basket are set on the basis of a household expenditure survey and are adjusted once every two years.[1] Month-on-month price changes are measured in detail by monitoring the prices of a very large number of goods and services that are included in the index.[2] The prices thus collected reflect the average price of a good and the change that it underwent, without the prices being attributed to the consumption of any particular household. Namely, each good has one price at a given time. Thus the CPI, built on the basis of average consumption weights and average prices, reflects the "average" change in the price level but may not capture change in the price of each household's consumption basket. The more variance one finds in the composition of households' consumption basket and in the development of the prices of components of the basket, the more variance one would expect to find in the price development of different households' consumption baskets.

The purpose of this study, like other studies abroad and several in Israel as well, is to construct and test a price index that reflects the change in the price of the consumption basket of households that have different characteristics. Using individual-level data on households, we identify the weights of expenditure on different goods within the consumption basket of households that have different characteristics. In regard to prices that households actually face, those that may be attributed to every household are usually uniform due to lack of information about specific prices that households pay in view of where and when they pay them. What sets this study apart from others—and what it contributes to the literature—is its use of regional differentiation in determining housing rent prices, which account for a large share of household expenditure. This method reflects the heterogeneity that exists in the development of housing rent that households in different regions pay.

Many studies around the world compare the development of prices among different population groups with an overall average index published by a central statistical authority. All such studies combine the prices of goods and services in the CPI—at one level of detail

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[1] Until 2003, the weights were adjusted once every five years.

[2] Where the term "good" is used below, it refers to a good or service included in the CPI.

or another—with expenditure-survey data that assign weights to various goods that are included in typical households' expenditure baskets. The general approach in all these studies is to construct household-level price indices by calculating a weighted average of the prices using weights appropriate for the group of households being investigated. Various studies raise questions about a bias in the total index relative to a more specific index, discuss different ways of calculating the index (presented briefly below), characterize the development of prices for different population groups at specific points in time and over time, and test for persistence in the position of different population groups relative to the average rate of price change.

In an early work, Michaels (1979) investigates price development in the 1970s for different groups of US households that have different consumption baskets, according to sampling in the early 1960s, and finds variability both among groups differentiated by wage, age, and education, and within the groups themselves. Hagemann (1982), using an approach similar to that of Michaels (1979) and expenditure data to analyze price development in the United States between the early 1970s and the early 1980s, finds that while price changes among households headed by senior citizens and/or retirees exceeded the average, these effects did not persist across the decade reviewed. The reason for this is the larger share in this group of expenditure on food, housing, and healthcare, the prices of which rose more vigorously than other prices the during the review period.

Hobijn and Lagakos (2005), investigating inequality in US inflation between 1987 and 2001, detect large variance over time and among groups along with meaningful changes in the general inflation rate across the period reviewed. They find that price changes were greater among the elderly, chiefly due to a rapid increase in healthcare expenditure, whereas the poor suffered from the volatility and marked increase in fuel prices at the beginning of the review period. Colavecchio, Fritsche, and Graff (2011) examine typical inflation rates among households from different population groups in fifteen European countries in 1997–2008. They find persistence in different groups' tendencies, and significant but small differences in inflation rates among households differentiated by income level and education.

Johannsen (2014) uses US expenditure-survey data to demonstrate the existence of a positive relation between variance in the inflation rates of households in different groups of expenditure, age, and education and the extent of disagreement within these population groups about inflation expectations. Variance of intra-group inflation, Johannsen reports, is greater among groups at lower levels of expenditure or education than among those that spend more and have more schooling; this, he concludes, traces to variance in the groups' consumption baskets and not to variance in the prices that the households face—for which there are no data.[3]

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[3] Further studies that ask similar questions are Chiru (2005) for Canada; Crawford and Smith (2002) and O'Donoghue, Powell, and Fenwick (2007) for the UK; Eithne and Garvey (2004) for Ireland, Hait and Jansky (2014) for the Czech Republic, and Jacobs, Perera, and Williams (2014) for Australia.

Studies of this type usually use variance analysis—a method that explains variance among and within groups of households of different types—and simple regressions that explain the rate of price change for a household or group of households, chiefly through the prism of demographic variables that characterize them. Most such studies find no persistence in the ranking of groups in terms of the inflation rate that they experience over time. Instead, they discover that the groups' ranking varies in accordance with relative change in the rate of price increase that is typical of different consumption groups, particularly the most salient ones—food, energy, and housing.

It has also been found that the within-group variance is greater than between-group variance. This attests to the acute heterogeneity of consumption weights among households, including those that belong to one population group, in terms of income, age, size, and structure.

In Israel, to the best of my knowledge, two studies of this type have been performed: Finkel (2006) and Finkel and Oren (2011) of the Israel Central Bureau of Statistics (hereinafter: CBS). Finkel (2006) calculates an experimental CPI for the older population (men aged 65+, women aged 60+) using 1998–99 data and a wide breakdown of the CPI for some 1,300 goods. Finkel notes several limitations of such an index, which are also typical of the analyses performed in other studies. First, it is assumed that the price change is the same for all consumers irrespective of their shopping habits. In addition, the sampling of goods for the total CPI underweights goods that are typically consumed by the older population; therefore, it does not accurately reflect the makeup of this group's consumption basket. Overlooked in particular are changes in prices that affect the elderly only, such as subsidies earmarked for this age group. Finkel and Oren (2011) construct a CPI for Israel households in 1999–2005, based on constant weights in the 2002 expenditure survey. They find a narrow distribution of price changes among households that broadens when the inflation rate is higher. They also calculate inflation for income quintiles (resembling the official CBS index) and age groups. Much as in other studies abroad, they find that the elderly—those in the 65+ age group—spend a larger share of total expenditure on housing. Like others, they find no persistence in the relative inflation rates of different groups over time.

As noted above, most studies, including those in Israel, treat prices as homogeneous and cannot, due to data limitations, detect the prices that different households actually face. As a result, they cannot distinguish among changes in the price of one good for different consumers. Several examples of analyses that do refer to different prices are Hait and Jansky (2014) for the Czech Republic, Chiru (2005) for Canada, and Jacobs, Perera, and Williams (2014) for Australia. In the Czech study, based on price data gathered separately for households in the Prague area, a difference in price development between Prague and the rest of the country—indicating a bias in measuring prices at the national level—is found. The authors also find that retirees and low-income households experienced higher inflation than others did during the review period (1995–2010). The paper relating to Canada parses

home prices by provinces to calculate housing-loan expenditure—a component of the Canadian price index—in each province. In Australia, new-home prices (excluding land) are incorporated into the price index and Jacobs et al. (2014) relate to regional prices of homes to calculate this part of household expenditure. Crawford and Smith (2002) differentiate among UK households that rent their homes on the free market, those that occupy public rental housing (for which rent is not included in expenditure), households that own their dwellings and are paying down housing loans (for which expenditure is imputed), and those that own their homes free and clear (for which no imputation is performed). They do not, however, differentiate between rent and home prices in different regions. Keinan (2004), examining detailed data on food prices in Israel as gathered by CBS in 2000–03, finds that the rate of change in food prices is highest in the center of the country, followed by the north, and is slowest in the south.

The current paper examines price development for different population groups with reference to changes in rent in different parts of the country—in contrast to many of the other studies, particularly those concerning Israel, which use a single homogeneous price of housing rent. This distinction is important when rent prices in different parts of the country vary widely, as was the case in the past decade, the review period of this study.

The results of the analysis that follows reveal the existence of relatively wide variance in the rate of inflation that different households face even if they belong to the same group in terms of age, region of residence, or income quintile. Persistence in the households' relative ranking, however, is not strong. Change in rent levels accounts for much of the variance in the development of different households' consumption prices. In 2008–10, households in three regions—Tel Aviv, Center, and Gush Dan (Tel Aviv suburbs)—experienced faster price increases by about 1 percentage point per year than households in two other regions, North and Haifa. In other years during the full review period, bounded by 2003 and 2012, the differences were smaller. Households headed by persons aged 65+ faced a slightly above-average inflation rate (by 0.1–0.2 percentage points) than did the other age groups in 2008–10, for the additional reason that housing accounts for a large share of expenditure among members of this group. Single-person households also faced a higher inflation rate due to a larger share of housing in their expenditure. The uppermost income quintile had a 0.9 percentage-point slower pace of annual price increase than the lowest quintile between 2008 and 2010. At the end of the review period, the rate of CPI change was slower for households with young children than among others because preschool charges declined sharply due to implementation of the Trajtenberg Committee recommendations. During the full review period, 2003–12, there is a gap of 4–5 percentage points in cumulative inflation among different regions and between age 65+ households and others. Variance in consumption weights among households and differential effects of monetary policy on prices of different consumption items are reflected in variance in the impact of monetary policy on changes in the prices that households face.

The study proceeds as follows: Section 2 presents the data used. In Section 3, the development of households' consumption prices in accordance with different metrics is described. In Section 4, the rate of CPI increase differentiated by household characteristics—income quintile, region of residence, age, and size—is analyzed. Section 5 presents the estimation and its results, Section 6 briefly analyzes the differential effect of monetary policy on households, and Section 7 concludes.

2. The Data

a. The Expenditure Survey

The CBS annual Household Expenditure Survey is used, among other things, to determine the composition of household consumption for the Consumer Price Index. In this study, the expenditure surveys for 2003–12 are used.

The data on each household include detailed information on the distribution of its monetary expenditure on various goods. The survey encompasses some 6,200 households each year, sampled throughout the year.[4] (In 2012, the sample was expanded to 8,700 households.) Since relative prices of goods change all year long, the data reported by the CBS are corrected to represent the value of the household's consumption in annual average prices. In addition to consumption, the data include information on the income, compulsory payments, transfers, and various demographic indicators of each household.[5] A central indicator of the household is its region of residence. In this study, place of residence is attributed to one of eight statistical regions that CBS uses to calculate home and rent prices. Another indicator is the household's income quintile. Here the calculation is based on equivalized total income (monetary and other), net, and includes imputation of housing services for those who live in dwellings that they own. (This also appears as an imputed expenditure on the expenditure side.) For those who rent their homes, the imputation is nil and the income net of imputation for housing services is identical to total income.

For each household, we calculate the share of each of the components in total private expenditure, in accordance with the CPI breakdown that we chose (see below).

b. Price Indices

Consumer Price Index: It is customary to divide the CPI into ten main components, each parsed into a small number of subcomponents (Level 2), which, in turn, are divided into two sub-subcomponents (Levels 3 and 4). Under the Food component, for example (Level 1), is a subcomponent called Bread, Cereal, and Dough Goods (Level 2), within which a sub-

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[4] We filtered from the data observations for which the head of household was younger than twenty or older than ninety-nine if their income without imputation was negative or if their income was more than ten times greater than the average that year. Also excluded were households for which the rent prices that were needed for the analysis were lacking.

[5] We use only the demographic characteristics of the head of household because the analysis is performed at the level of households, not of individuals.

subcomponent (Level 3) titled Bread appears—the most detailed level for which we have data. For the next level of detail, Level 4, there is a small subcomponent called Pita bread, for which data on some goods exist but are rarely published. In the analysis in this paper, we examine price changes across fifty-six subcomponents, most of which are at levels 2 or 3 of the CPI. This makes it possible to align the components of the index with those of consumption in the Expenditure Survey, which are not identical for all items in the consumption basket. The Clothing and Footwear component is measured at Level 1 due to its relative homogeneity. A full specification of components appears in Appendix Table 1. Since the regional rent prices that are used here (see below) are reported on a quarterly basis, prices measured within the CPI framework are also examined in quarterly average terms.

Rent prices: The Housing Services component of the CPI is comprised of two main subcomponents. One is owner-occupied housing services (hereinafter: OOHS), a metric that reflects the value of housing services for households that occupy dwellings that they own and is measured on the basis of the prices of new (and subject-to-renewal) rental contracts each month. The purpose is to reflect the price at which a household can rent its dwelling anew each month (or lease it to someone else). The second subcomponent is Rent, which reflects the average cost of rent to households that occupy rental housing and is measured by the price of the stock of rental dwellings on the basis of contracts signed at some previous time (usually in the past year) and that are still in effect; the intent here is to mirror the average price that renters actually pay. These two indices are calculated at the national level taking into account the dwelling characteristics (hedonic indices).

Unlike other homogeneous goods, in which one may assume that the change in prices is identical even if the price itself varies in different parts of the country, this assumption cannot be made for rent because rent prices are known to develop quite differently in different areas. Housing services are typified by strong supply inelasticity relative to other goods and services and by demand inelasticity due to the dependency of housing-services consumption on area of residence and the cost of moving. Therefore, different conditions of supply and demand, at least in the short term, are likely to find expression in the evolution of rent prices in different regions, even if it were possible to fully correct for differences in quality among dwellings. To take this into account, one may use CBS quarterly data on average rent prices in each region. These prices relate to new rent contracts and are not adjusted to change in dwelling quality. Regional disaggregation[6], however, makes it possible to relate to the difference in price that is explained by the region. For the purpose of the analysis, a series of quality-adjusted rent prices is used.[7] The correlation between rates of change in the regional price series and rates of change in the adjusted price series is 85–95 percent.

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[6] The data are also differentiated by number of rooms; we do not, however, make use of this.

[7] I thank Doron Sayag of the CBS for making the data available to me. The data were calculated on the basis of an accepted methodology in the professional literature, as described in Sayag (2010), and are not part of the official statistics that CBS publishes regularly.

Tables 1a and 1b present the rent prices measured by CBS, with an adjustment to quality for each region and in the aggregate. The interregional variance in the development of prices is perceptibly reflected in the cumulative change between 2003 and 2012. Whereas rent prices in the Center and Tel Aviv regions rose cumulatively by more than 36 percent during these years (in nominal terms, with no quality adjustment), the change in Haifa was less than 10 percent, and that in Jerusalem was around 20 percent. After the index is adjusted to quality, the spreads among the regions are smaller but still considerable. If so, the change in rent expenditure for a household that rents its dwelling depends strongly on its region of residence. Since rent accounts for roughly one-fourth of total household expenditure, this difference is manifested in the average price increase of the household's actual consumption basket.

Table 1a
Rate of Change during Year in Nominal Rent, by Regions (2003–12)

	Jerusalem	Tel Aviv	Haifa	Gush Dan	Center	South	Sharon	North	Total*
2003	-7.8	-12.2	-10.7	-8.6	-6.0	-6.8	-5.8	-9.1	**-9.4**
2004	-3.4	-5.4	-3.8	-0.9	-1.0	-2.3	-2.7	1.8	**-3.3**
2005	5.6	8.3	4.3	5.7	6.4	5.7	7.1	1.6	**6.8**
2006	-5.3	-0.3	-7.6	-6.1	-6.1	-6.9	-5.5	-3.8	**-4.7**
2007	1.4	8.2	-5.5	1.5	0.7	-3.9	4.9	-3.3	**1.3**
2008	8.1	3.7	6.1	12.8	16.4	9.4	9.0	9.5	**8.2**
2009	13.7	13.2	6.2	10.2	10.6	11.5	10.3	7.2	**11.5**
2010	5.3	8.7	8.4	5.8	6.7	3.8	7.3	7.4	**7.5**
2011	-1.0	7.5	8.2	6.9	4.7	6.1	8.9	4.2	**4.9**
2012	4.6	5.6	2.7	3.9	4.1	6.8	3.5	5.0	**4.5**
Cum.	**21.3**	**37.3**	**8.4**	**31.2**	**36.4**	**23.5**	**37.1**	**20.4**	**27.3**

* The total includes the Krayot (Haifa suburbs) region, which is omitted from this study.

Table 1b
Rate of Change during Year in Quality-Adjusted Nominal Rent, by Regions (2003–12)

	Jerusalem	Tel Aviv	Haifa	Gush Dan	Center	South	Sharon	North	Total*
2003	-6.6	-6.6	-6.4	-6.5	-6.4	-5.9	-6.2	-5.9	**-6.5**
2004	-0.2	0.1	-1.0	-0.8	-0.2	-0.2	-0.0	-0.5	**-0.1**
2005	4.7	4.9	2.7	3.6	3.7	2.7	4.4	2.4	**4.0**
2006	-5.5	-4.4	-6.0	-6.1	-6.2	-5.3	-5.3	-5.3	**-5.5**
2007	-0.7	4.7	-1.1	0.4	0.5	0.6	2.3	1.0	**-2.6**
2008	5.1	6.0	-0.3	6.4	8.9	3.9	6.3	1.2	**5.1**
2009	8.0	6.8	3.6	8.1	9.1	7.8	7.0	5.7	**7.5**
2010	3.3	4.3	3.2	3.5	4.5	4.3	4.2	4.8	**4.0**
2011	3.2	5.4	5.3	4.2	4.0	5.2	3.7	4.9	**4.6**
2012	3.4	2.8	3.7	3.1	2.7	3.7	3.5	3.8	**3.1**
Cum.	**14.7**	**24.0**	**3.7**	**15.9**	**20.7**	**16.8**	**19.8**	**12.0**	**13.6**

* The total includes the Krayot (Haifa suburbs) region, which is omitted from this study.

Plutocratic index vs. democratic index: There are two approaches to calculating a price index that reflects change in the price of an "average" aggregate of households. According to the first approach, the index should reflect the total composition of all households' consumption. Thus, the weights are the total consumption of each good divided by consumption of all households that belong to the aggregate. In other words, one first sums all the households' spending on each individual good and then calculates the share of each good in the aggregate consumption of the total population of households, and on this basis one weights the change in the prices of the various goods. Since this method weights households commensurate with their absolute expenditure on the good, a household that spends more overall (for example, because it has a larger income or more members) will receive greater weight in calculating the share of expenditure on a given good (one dollar—one vote). An index calculated in this manner is called a *plutocratic* index, and this is the method by which CBS calculates the consumption weights in the CPI.

The other method is based on the wish to reflect the average weight of expenditure on a certain good by each household. Here, the purpose is to express the average composition of each household's expenditure irrespective of the absolute size of its total expenditure. In this case, the weights reflect average weights across households and not the weight of each good in total consumption, and each household is weighted identically. This method is called a *democratic* index (one household—one vote). For this purpose, the share of expenditure on each good by each household is first calculated, and then this proportion is averaged across the households to obtain the average share of expenditure. Using these weights, a democratic price index is constructed.

Generally speaking, the aggregate price index in a given period may be expressed as follows:

(1) $P = \sum_h w_h \sum_i \frac{E_{ih}}{E_h} p_i = \sum_h w_h \sum_i w_{ih} \, p_i$

where h denotes the household, i denotes the good, E denotes expenditure, w_{ih} denotes the weight of expenditure by household h on good i, and w_h denotes the weight assigned to household h in the aggregate index.

Using the *plutocratic* approach, the following equation may be written:

(2) $P = \sum_h \frac{E_h}{E} \sum_i \frac{E_{ih}}{E_h} p_i = \frac{1}{E} \sum_h \sum_i E_{ih} \, p_i = \frac{1}{E} \sum_i p_i \sum_h E_{ih} = \frac{1}{E} \sum_i p_i E_i = \sum_i p_i \frac{E_i}{E}$

where E_i is consumption of good i by all households and E denotes total consumption by all households. In view of this formulation, the index is calculated as the weighted average of the prices of goods in view of the aggregate weights of consumption by the household of this good within total expenditure.

When the calculation invokes the *democratic* method, each household is weighted identically at *1/H*, with *H* denoting the number of households. Thus, Equation (1) may be written as follows:

$$(3) \quad P = \sum_h w_h \sum_i w_{ih} p_i = \frac{1}{H}\sum_i \sum_h w_{ih} p_i = \frac{1}{H}\sum_i p_i \sum_h w_{ih} = \sum_i p_i \left(\frac{1}{H}\sum_h w_{ih}\right)$$

Thus, the simple average of each household's individual-level price index, based on the weights that typify it (the second expression), is equivalent to a price index constructed on the basis of the average weights of consumption of each good across the households (the second expression).

This study, predicated on individual-level information for each household, uses the democratic approach. That is, the CPI and its annual change are calculated for each household separately, using the weights relevant for it, and then the average rate of change for various groups of households is calculated.

Figure 1 presents the weights of the CPI components as calculated both ways, the plutocratic (weight in aggregate consumption) and the democratic (average weight per household). One would expect the plutocratic weight to be larger than the democratic one for goods with higher weights in the consumption of households that spend more (and earn more), and vice versa.

Figure 1: Weights of Aggregate Components, Democratic (Solid Line) and Plutocratic (Broken Line) Calculation
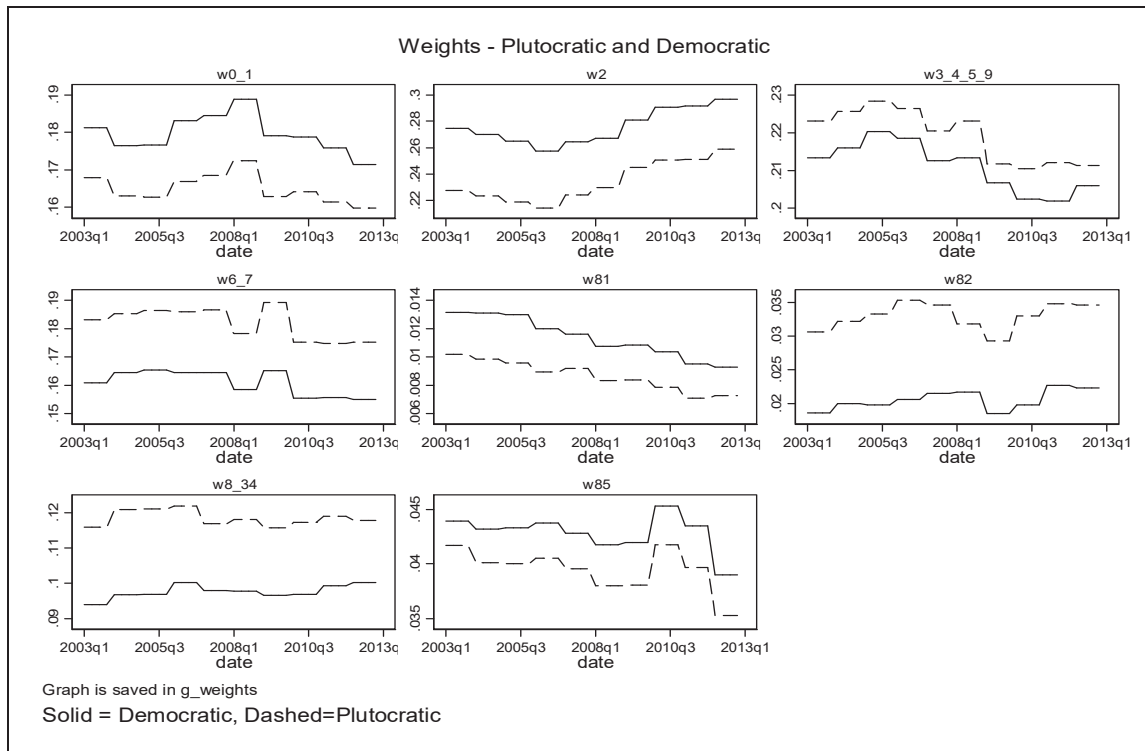
* w0_1 – Food and vegetables, w2 – Housing, w3_4_5_9 – Dweling maintenance, Furniture and household equipment, Clothing and footwear, Miscellaneous, w6_7 – Health and Education and Culture, w81 – Public transportation, w82 – travel abroad, w8_34 – Cars and driving lessons , w85 – Communication.

Thus, the share of expenditure on public transport (w81) is greater in the democratic calculation, whereas that of expenditure on travel abroad (w82) is greater when the plutocratic method is used.

The information on each household's consumption allows us to calculate average weights of consumption of various goods for the entire population and for selected subgroups. This makes it possible to parse the average weight by age groups such as the elderly (see, for example, Finkel and Oren, 2011, mentioned in the Literature Review), by income quintiles (Chiru, 2005, among others) or for different parts of the country that are affected by different rent levels or for any other classification.

3.   Development of Household Consumption Prices

By combining the Expenditure Survey data with the CPI data, we generate an individual price index for each household. We assign to each household sampled in a given year the price level of each good, parsed in the manner that we have chosen, in the last quarter of the survey year and the last quarter of the previous year, and construct a weighted price index commensurate with each household's consumption weights in both periods. The change in the average price level during the year is the rate of change in the household's price index. Since different households are sampled in each survey, meaning that they do not constitute a true longitudinal panel, we know the weights of a given household's expenditure for a given year only. The weight assigned to consumption is the one prevailing at the point of time in the year when the household was sampled, adjusted to the average prices of the survey year.

The CPI data relate to prices adjusted to the average consumption of the good in question, irrespective of the prices that different households pay depending on where they buy it. This is the case even though households with different characteristics presumably purchase goods (and services) at points of sale that have different price *levels*—a neighborhood grocery store, a discount chain, or online, for example. Even so, we assume that prices of the same goods change at *the same rate* at different points of sale across a year or longer.[8,9] One can use the measured change in prices to calculate the change in the price of each household's consumption. For our analysis, we assume that the rate of change in the price of a good is independent of the point of sale.

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[8] Attempts to test price behavior for different population groups have been made. See, for example, for the Czech Republic, a test of price development in Prague and elsewhere in Hait and Jansky (2014) and documentation of a preliminary study using scanner data for the UK in O'Donoghue, Powell, and Fenwick (2007).

[9] Sayag and Ribon (2013) find that different types of points of sale adjust their prices at different frequencies. Thus, retail chain stores adjust food prices once every five months whereas grocery stores do so once every ten months on average. Since grocery store adjustments are only half as large as those of retail chain outlets, the average price change over a lengthy period is similar in both types of points of sale
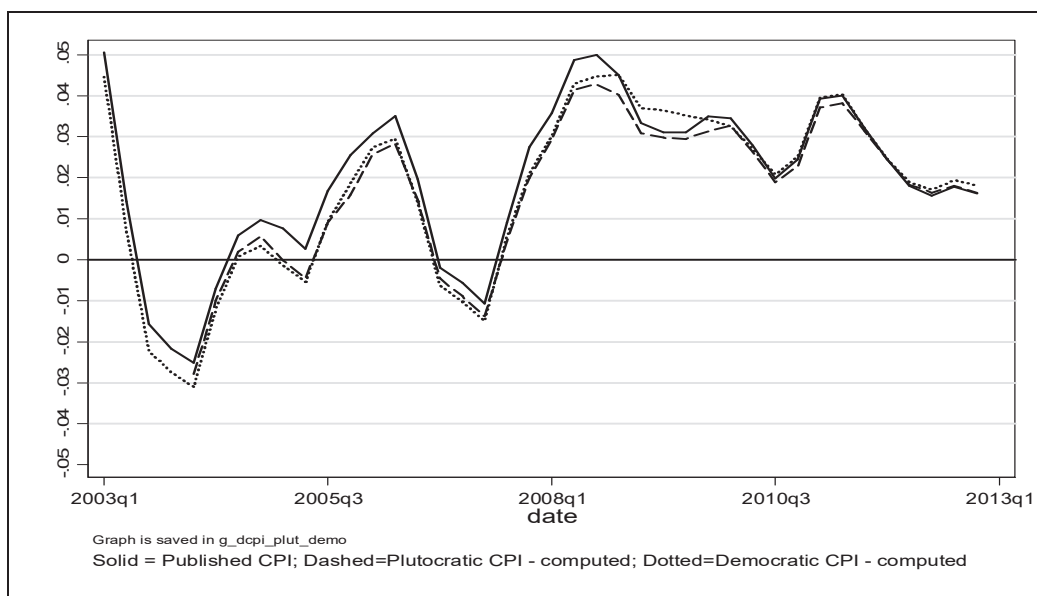
To calculate the change in the price of a household's consumption basket, several formulas differentiated by their treatment of the housing component are used:

1. The price of the housing component is measured using a series obtained from the Consumer Price Index. For OOHS households, we include rent in new or renewed contracts; for renting households, we include rent in current contracts.

2. The housing component price is measured by tracking quality-adjusted rent in the region.[10] Since this series does not distinguish between new and existing contracts, we cannot assign one price to OOHS households and another to those that rent.[11]

3. The CPI excluding the housing component. We also use this index to examine the actual expenditure basket of OOHS households, which do not pay rent. (Their housing-services expenditure is imputed to them in the expenditure basket.)

Calculating in this manner, we obtain for each sampled household the CPI change that fits its consumption weights based on its actual consumption, resembling the calculation in other studies.[12] The calculation here, however, also allows for heterogeneity in the change in the rent prices that households face—a reference that, to my best knowledge, other similar studies lack.

Figure 2 presents three alternative calculations of the annual rate of CPI change. The first (solid line) is the one published by CBS. The broken line plots a plutocratic index calculated on the basis of the data in our research; the dotted line tracks a calculated democratic index (both of which with the housing component measured as in the CPI).

Figure 2: Consumer Price Index, Various Definitions, Four Prior Quarters, 2003–12

Graph is saved in g_dcpi_plut_demo
Solid = Published CPI; Dashed=Plutocratic CPI - computed; Dotted=Democratic CPI - computed

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[10] See Note 7.

[11] We also performed the analyses for the regional rent index that CBS publishes (with no adjustment for quality). The results are qualitatively similar and are not presented here.

[12] The indices are calculated for the various groups using the democratic approach. In some studies, the plutocratic approach is used. The more homogeneous the group for which the index is calculated is, the smaller we would expect the spread between the calculation methods to be.

Overall, the differences among the three calculations are small and usually negligible. The official index and the plutocratic one should be identical but are not, for several possible reasons: our subcomponents are less detailed than those used by CBS; our sample of households is slightly different because we deleted households for which we lacked regional rent data; and we used consumption weights for the year in which we present the index, whereas CBS uses those of the previous year.

Most of the difference between the democratic and the plutocratic indices, as calculated here, is evident between 2008 and 2010; this is due to the rapid increase in rent during those years.

The extent of difference between the plutocratic and the democratic indices depends on the variance of consumption weights among households and price development among different consumption components. Different weights for an identical rate of change of all goods, or different rates of price change for different goods that have the same weights among households, create identity in the indices calculated via both methods. Table 2 shows the considerable variance that exists between different households in their consumption weights.

Table 2
Means and Standard Deviations of Weight of Consumption of Index Components, Households, 2003–12

	Weight according to CBS (2013) (plutocratic)	*Average* weight in household expenditure (democratic)	*S.D.* of average weight
Food	13.6	14.4	7.6
Vegetables and fruit	2.9	3.6	2.7
Housing	25.2	27.6	13.7
Dwelling maintenance	7.9	10.4	6.0
Furniture and household equipment	3.7	3.1	6.0
Clothing and footwear	3.1	3.1	4.4
Education, culture, and entertainment	5.2	5.2	6.1
Transport and communication	11.7	10.9	9.6
Miscellaneous	20.6	17.2	11.9
Health	4.3	4.4	5.6

Figure 3
Standard Deviation of Annual Rate of Price Change, Ten Main Components (Weighted)
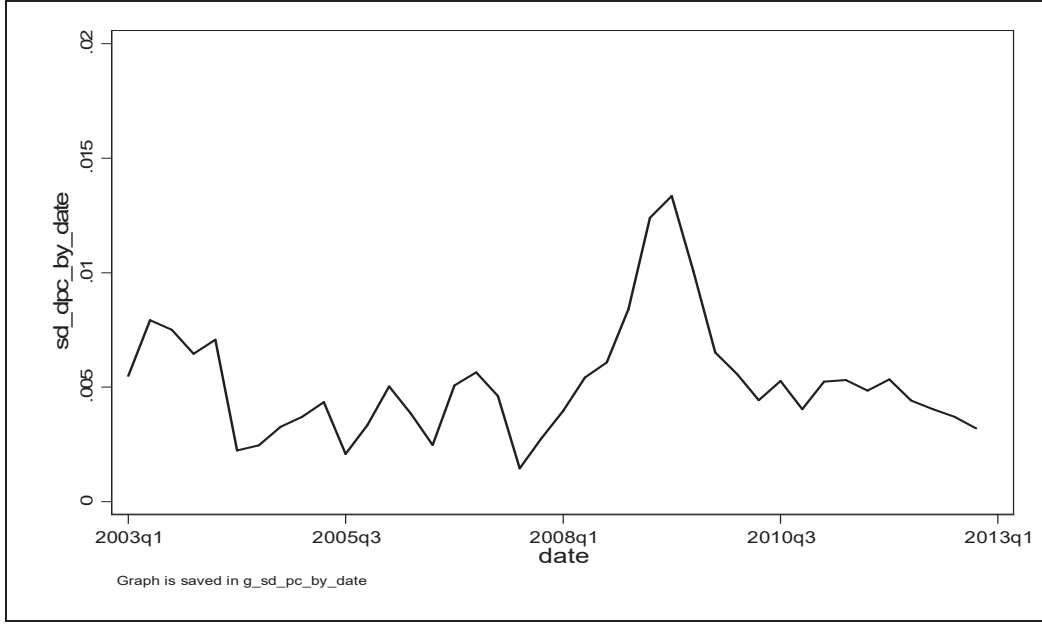

Graph is saved in g_sd_pc_by_date

Figure 3 shows that the variance among rates of change in the ten main components of the CPI is usually small but varies over time and was large in 2009 due to a relatively rapid upturn—more than 10 percent—in rent prices, which are included in the CPI and constitute about one-fourth of the total index. This explains the large disparity between the plutocratic and the democratic indices at that time.[13,14]

It may be demonstrated that the gap between the average index (democratic calculation) and the specific-household index is the sum, across the goods that make up the index, of the product of the gap between the price of the good and the average price and the difference between the weight of this good in the household's spending basket and its average weight among the households.

$$(4) \quad P_h - P = \sum_i w_{ih} p_i - \sum_i p_i \left(\frac{1}{H}\sum_h w_{ih}\right) = \sum_i p_i \left(w_{ih} - \frac{1}{H}\sum_h w_{ih}\right) =$$
$$\sum_i p_i (w_{ih} - \overline{\overline{w_i}}) = \sum_i (p_i - P)(w_{ih} - \overline{\overline{w_i}})$$

where i denotes the good, h the household, w the weight, and p the price. H is the sum of the households and P is the total index.

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[13] Hobijn and Lagakos (2005), studying the US, find minor disparities between the two methods, particularly within income quintiles.

[14] The relation between the official index and the indices used in this study is also shown in Appendix 2 of this article.

Distribution of Inflation across Households

To appreciate the importance of tracking individualized price indices for different households as against the average index, it is worth examining the distribution of changes in consumption-basket prices among households.

Figure 4a
Change in Households' CPI (by CBS Components): Mean, Median, 10th and 90th Percentiles, and Standard Deviation
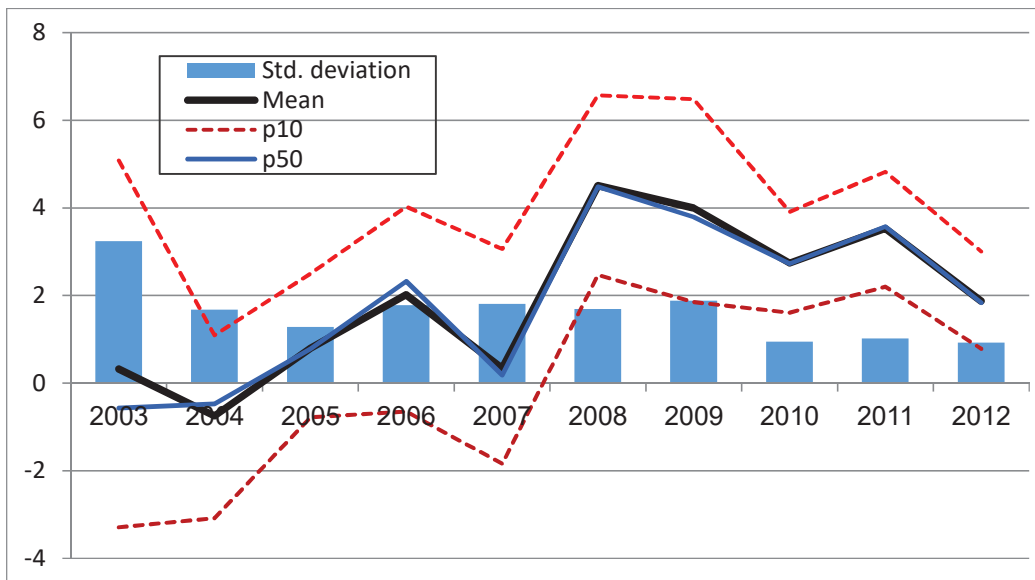
Figure 4b
Change in Households' CPI (Including Quality-Adjusted Regional Rent Prices): Mean, Median, 10th and 90th Percentiles, and Standard Deviation
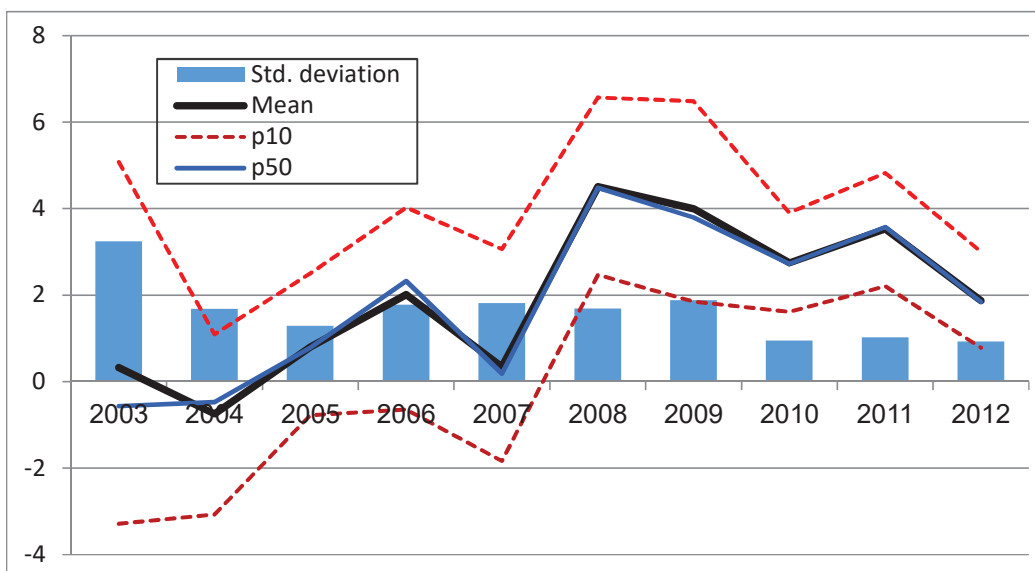

Figures 4a and 4b show the basic statistics of the annual rate of households' CPI change according to the CBS and according to a calculation that includes quality-adjusted regional rent prices for each year. The figures reveal considerable variance in the annual rate of price

change among different households, a rate that has been slow in recent years. The distribution is rather symmetrical, as may be seen in the distance of the tenth and the ninetieth percentiles from the median and the resemblance between the median and the mean.

Another indication of the dispersion is the proportion of households for which the measured inflation rate is close (within one standard deviation) to the mean rate—65–75 percent (Figure 5a).[15] This rate has been trending upward mildly over the years, meaning that the diversity has been contracting. Examining the proportion of households that are within 1 percentage point from the mean, we obtain a similar picture (Figure 5b).[16]
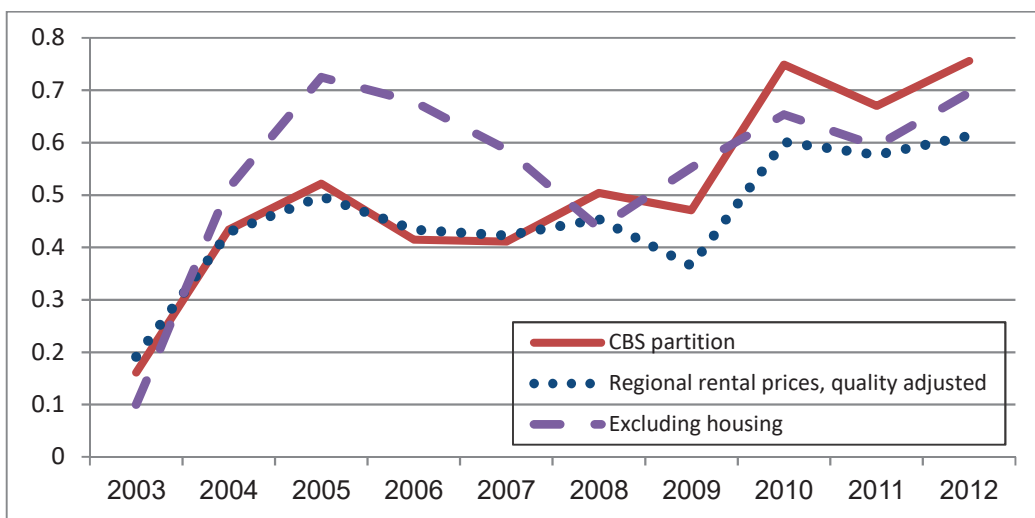
Figure 5a
Share of Households within One Standard Deviation of Mean Change
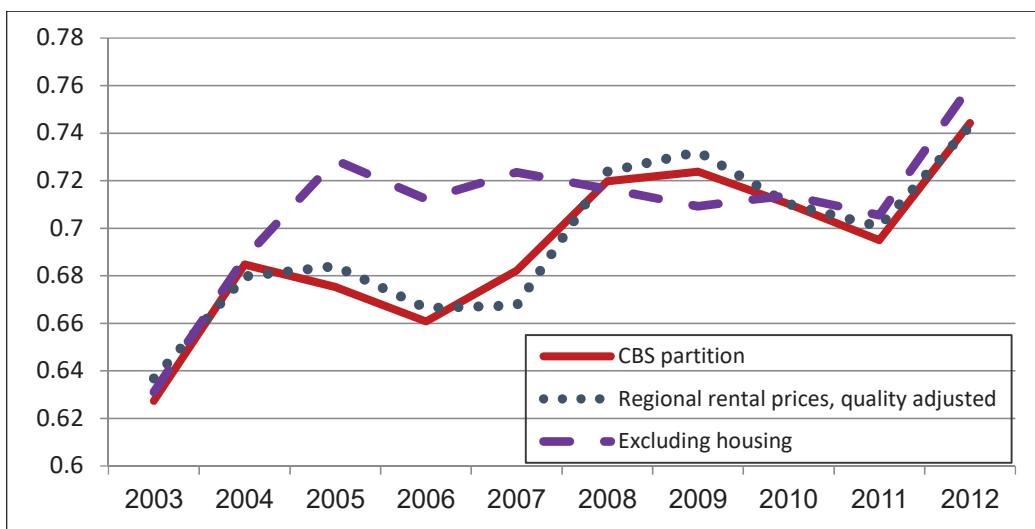
Figure 5b
Share of Households within One Percentage Point of Mean Change

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[15] Such a rate corresponds to normal distribution.

[16] For a similar analysis, see Finkel and Oren (2011).

Yet another indication of the distribution of the change in prices across households may be obtained by estimating kernel density—an a-parametric method based on the empirical distribution of the data in order to fit a theoretical distribution.

Figure 6
Distribution of Change in Household Price Index Data and Kernel Density Estimation, 2004–12
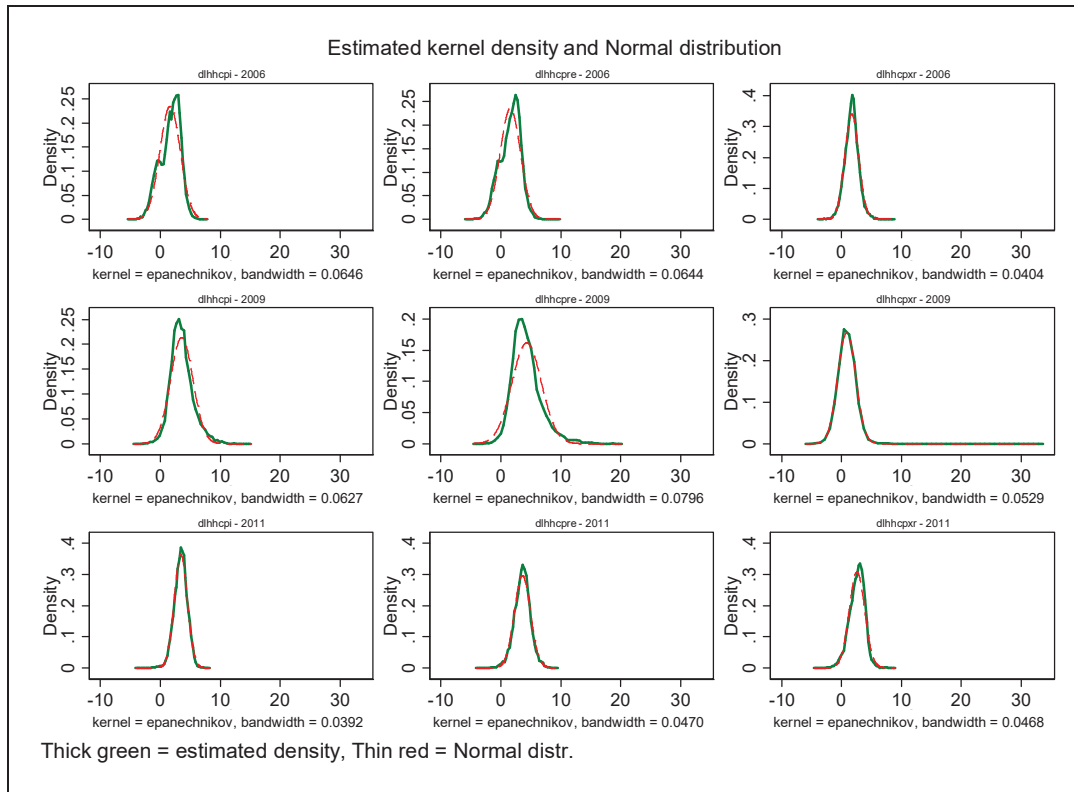
Figure 6 shows that the distribution of the annual CPI change among households, each year separately, is a close fit to a normal distribution and an almost perfect fit in some years. In 2004 and 2005, the distribution is slightly skewed to the right relative to a normal distribution; in 2007 and 2008, it tilts somewhat to the other side.

4. Analysis Based on Household Characteristics

a. CPI Differentiated by Income Quintiles

Here we examine the change in the Consumer Price Index by income quintiles and present the data for three quintiles—bottom, middle, and top. The index calculated here is slightly different from that published by the CBS (Figure 7), which also calculates price indices for income quintiles, for several reasons. First, the CBS uses the plutocratic method whereas the calculation here is democratic (averaging the weights of households' expenditure). Second, the index calculated here is based on a less detailed classification of components than the one produced by the CBS. Finally, our sample of households is not identical to that of the CBS because we deleted anomalous observations among others (see Note 4).

Figure 7
CPI by Income Quintiles—according to the CBS and according to Calculations in This Study

Graph is saved in g_dpc_q_cbs
Solid = CBS, Dashed=Calculation

Table 3 presents the average consumption weights of the CPI components for the bottom, middle, and top quintiles. It may be seen that the share of food in total expenditure is much lower in the uppermost q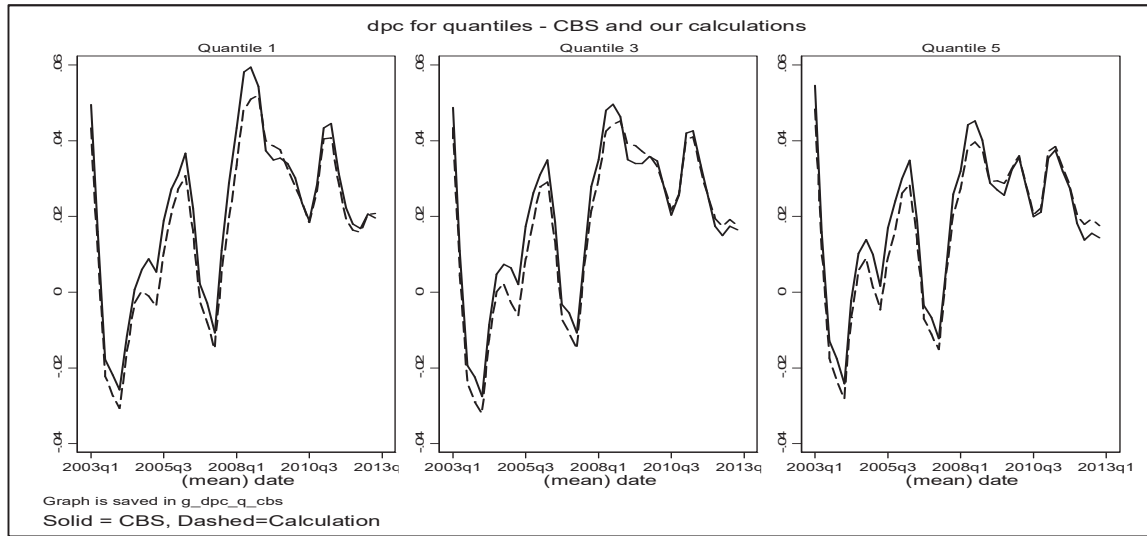uintile than in the bottom quintile and that, in contrast, expenditure on foreign travel and private vehicles and maintenance is much greater among uppermost-quintile households than among those in the other quintiles.

Figure 8 shows the annual rate of change in the prices of food, private vehicles, and private-vehicle maintenance. In late 2007 and in 2008 and 2009, the prices of food, which is weighted relatively high in the lower quintile, climbed more rapidly, whereas the prices of private vehicles and their maintenance, which account for a rather large share of expenditure in the top quintile, rose slightly or edged downward due to rapidly declining energy prices.

Table 3
Consumption Weights of CPI Components, by Quintiles* (%)

	Bottom quintile	Middle quintile	Top quintile
Vegetables, fruit, and food	23.9	17.0	14.1
Housing	27.0	28.8	24.7
Dwelling maintenance, furniture and household equipment, clothing and footwear, and miscellaneous	22.7	20.5	20.8
Health	4.7	5.2	5.7
Education and culture	9.4	11.2	12.0
Public transport	1.8	1.1	0.5
Travel abroad	0.8	1.6	4.3
Private vehicles and their maintenance	4.7	9.9	14.8
Communication	4.8	4.6	3.2

* The quintile distribution is based on total net income. Weights—average weight in each household (democratic calculation).

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Figure 8

Annual Rate of Change in Prices of Food, Private Vehicles, and Private-Vehicle Maintenance
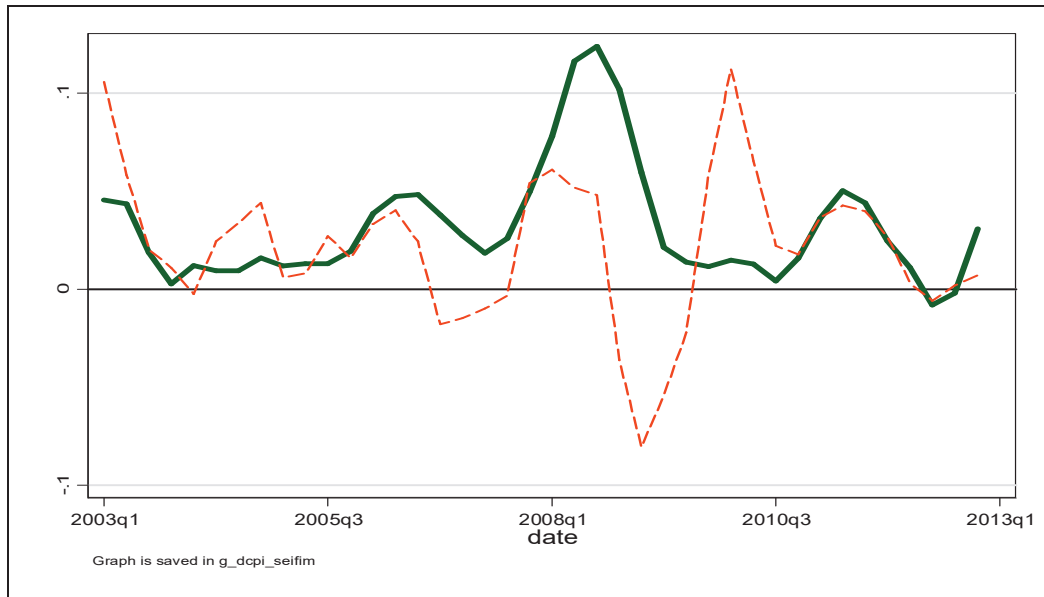
Green=Food, Dashed red = Private vehicles and Private vehicle maintanance

Figure 9 shows that for most years there is no meaningful difference among rates of change in the CPI parsed by quintiles. A noticeable disparity, however, does appear in 2008–10. In all indices, the bottom quintile faces a larger change in price in 2008 and the distance between its change and that of the other quintiles narrows farther on. Price changes in the index excluding housing remain the fastest for the bottom quintile until early 2010, but when the index including regional rent prices is calculated, it is the middle quintile that experiences the greatest price increase in 2009. A rapid upturn in prices of energy, the share of which is greater in the upper quintile's spending (due to private-vehicle expenditure), is reflected in a faster price change for this quintile in 2010 in the index excluding housing. From 2010 onward, the changes in the various indices are very similar for all three quintiles and those pertaining to the lowest quintile are only (very) slightly smaller.

Figure 9

Price Indices by Income Quintiles

   a.   According to CBS
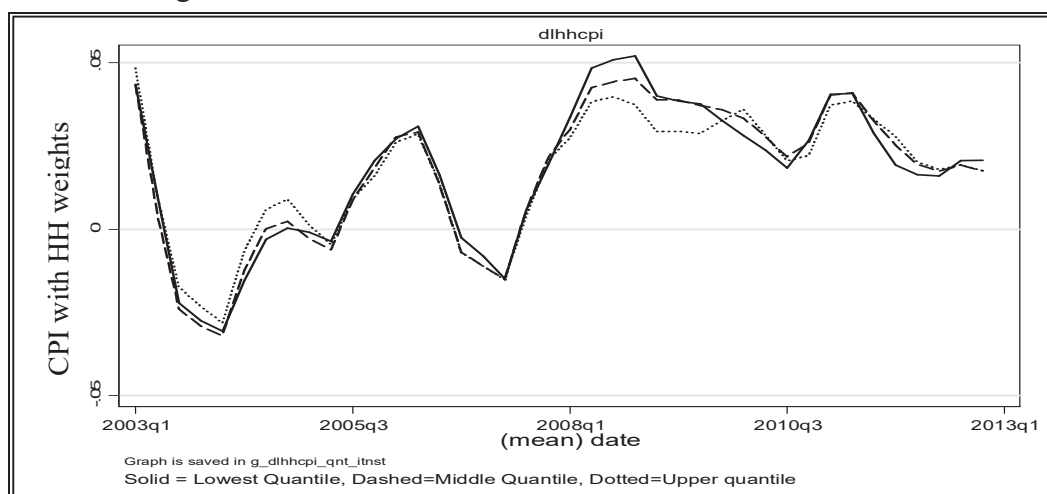
   b.   Including quality-adjusted regional rent prices
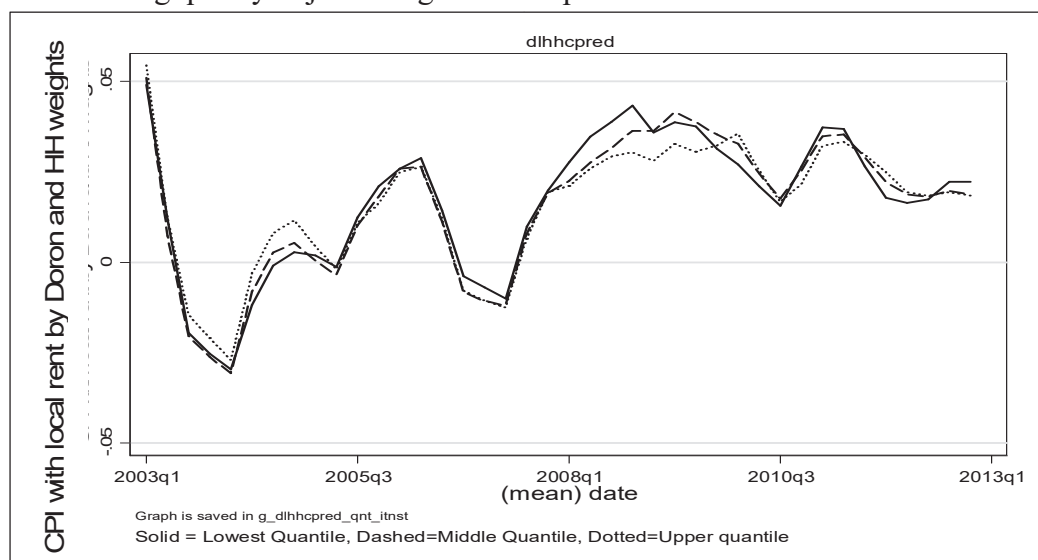
   c.   Net of housing component
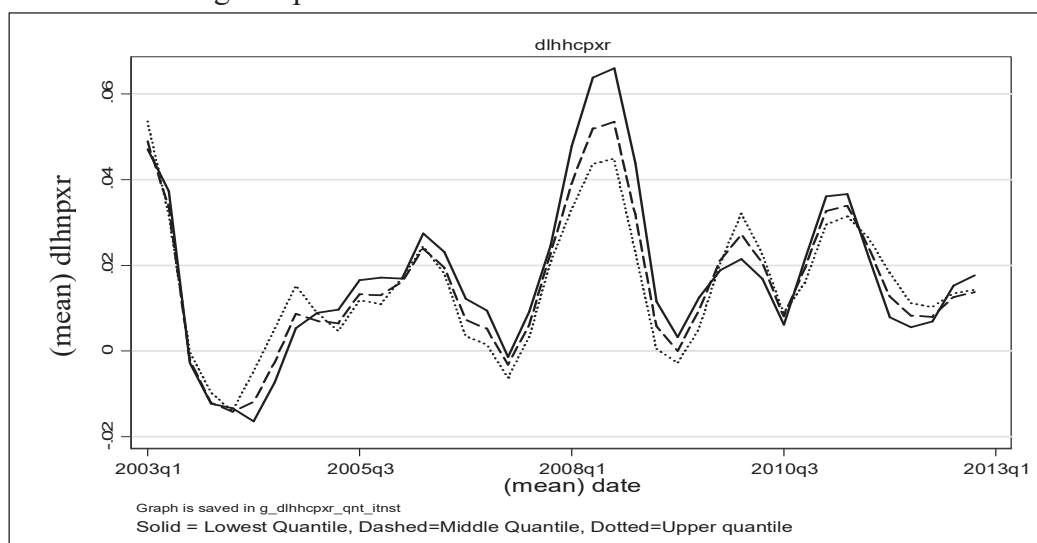
Examining the dispersion of price changes among households within each quintile, we find it greater in the lowest quintile than in the upper quintile for the index that includes quality-adjusted regional rent prices (Figure 10).[17] This outcome is largely a reflection of greater variance in the weights of food and housing consumption among households in the lowest quintile than among upper-quintile households. Johannsen (2014) obtains a similar result for US households, owing mainly to variance among households in expenditure on food and energy, the prices of which are quite volatile. Johannsen also finds a relation between greater variance in price changes that the household faces and greater variance in households' inflation expectations.

Figure 10
Standard Deviation of Rate of Price Change among Households, by Income Quintiles
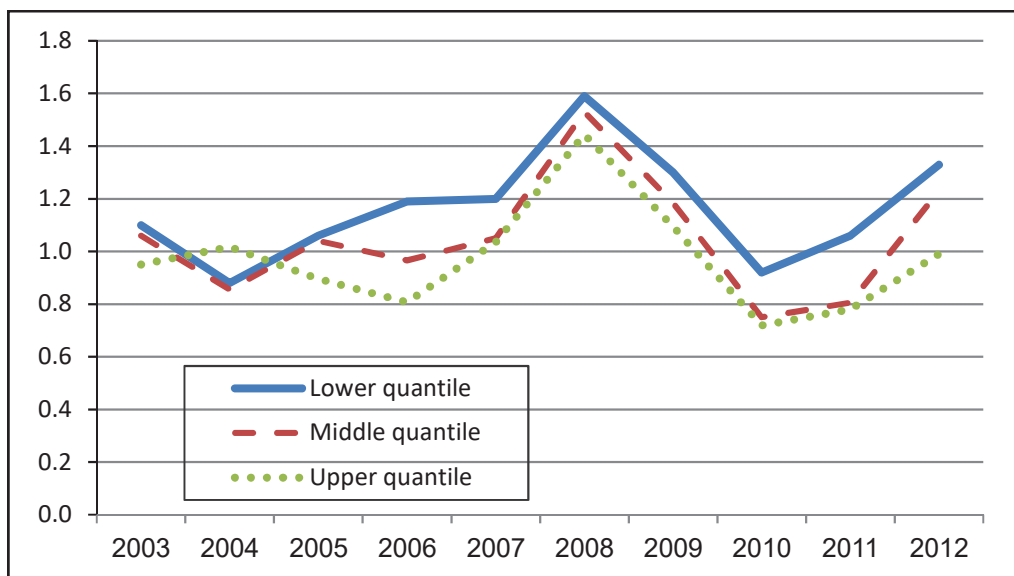
b. CPI Differentiated by Regions of Residence

In the foregoing analysis, rent prices were found to have developed differently in different parts of the country in the past decade (Tables 1a and 1b). That is, the nominal cumulative increase in rent prices (quality-adjusted) in 2003–12 was 4 percent in Haifa as against around 15 percent in Jerusalem, South, Gush Dan (Tel Aviv suburbs) and North and 20 percent or more in Tel Aviv and Center. Since rent accounts for around one-quarter of total household expenditure, regional variance on this account should be expected to affect the development of price indices adjusted to the expenditure of households in different regions based on quality-adjusted regional rent prices. Figure 11 presents the annual rate of change (over the last four quarters) in the regionally differentiated and household-differentiated CPI—for households that rent and for OOHS households (the CPI excluding housing). The indices are presented for three representative regions: Haifa, Jerusalem, and Center. The

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[17] The results for the index including the housing component as calculated by CBS are very similar and are not presented here.

development of the index excluding housing—the index relevant for households that occupy a dwelling that they own—is very similar in the different regions; since the rest of the prices in the consumption basket are regionally homogeneous; the difference in interregional consumption weights of various CPI components is negligible. For households that rent their housing, regional differences were relatively small between 2003 and 2008 and widened afterwards. The annual rate of price increase in 2008–09 was nearly 6 percent for households in the Center but closer to 4 percent for households in Haifa. At the end of 2011, the price increase for a household that rented in Jerusalem was about 1 percent whereas in Haifa it was about 3 percent. A year later, a convergence to 2 percent was evident in all three regions.

Figure 11
CPI Change for Renting and OOH Households, Different Regions, Regional Rent Price Index (Quality-Adjusted)

Graph is saved in g_hhcpi-act_ezor
Solid = Home owners, Dashed = Renters
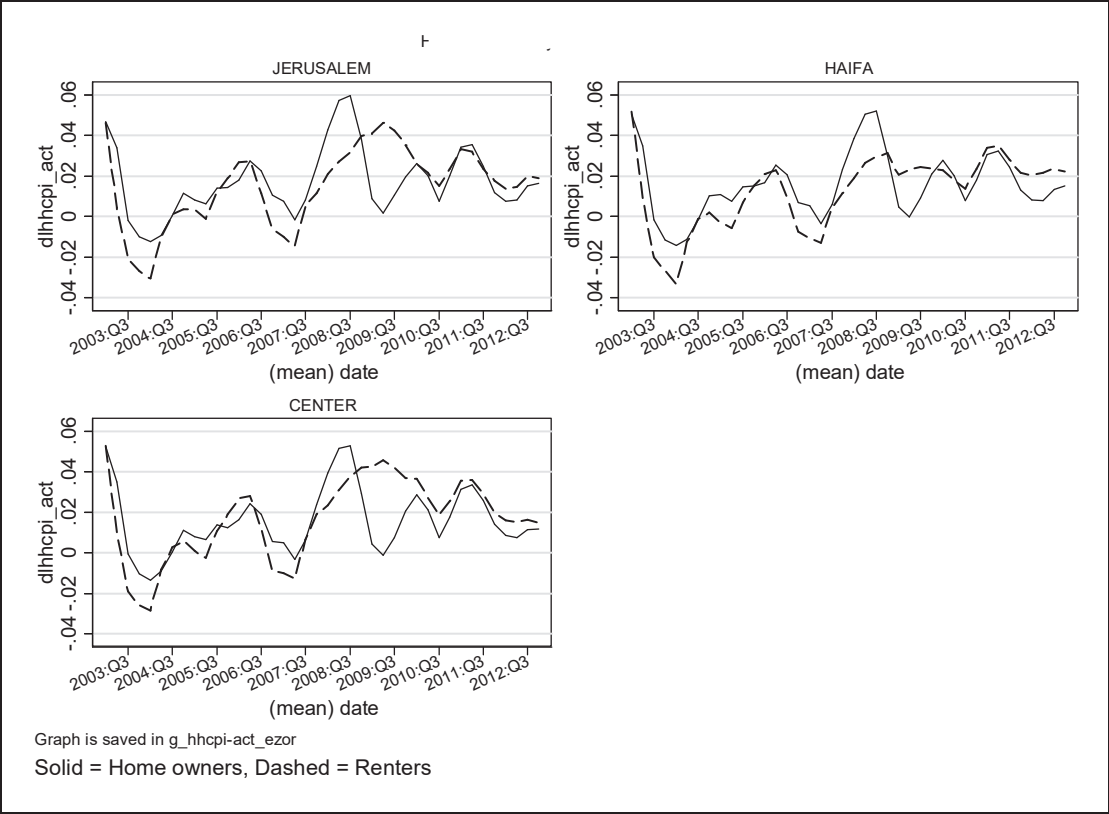
In 2007 and early 2008, as rent prices climbed more slowly than the rest of the index, the consumption basket of renting households, including rent expenditure, changed more slowly than that of OOHS households, which had no rent expenditure and therefore did not benefit from the decrease or the slowing of increase in rent prices. In 2009, conversely, home renters, particularly in Jerusalem and regions where rent increased swiftly, saw a faster increase in the price of their consumption basket.

c. CPI Differentiated by Age

Table 5 presents the weights of the expenditure components in consumption by age group. The most noticeable difference among the age groups is the share of housing in total expenditure. Where housing accounts for about a quarter of their total expenditure among young people, its share rises to 28 percent among older age groups and to more than 35 percent on average among the oldest (65+). Conversely, the eldest allocate about half the rate of expenditure to private vehicles (including fuel) relative to the other age groups. In addition, the share of health in expenditure rises perceptibly with age and that on education and culture falls.

Table 5
Consumption Weights, Aggregated Components, by Age Groups* (%)

	25–34	35–44	45–54	55–64	65+
Vegetables, fruit, and food	16.6	18.2	18.3	17.8	18.7
Housing	25.7	24.3	24.5	27.9	35.3
Dwelling maintenance, furniture and household equipment, clothing and footwear, and miscellaneous	21.9	22.0	21.1	20.5	19.8
Health	3.3	3.9	4.6	6.0	8.2
Education and culture	13.7	13.6	11.4	9.0	6.6
Public transport	1.5	1.0	1.2	1.0	1.0
Travel abroad	1.9	1.7	2.4	2.6	1.8
Private vehicles	11.0	11.0	11.3	10.7	5.3
Communication	4.5	4.2	5.2	4.4	5.2

* Weights—average weight in each household (democratic calculation).

Against this background, it may be seen that a faster increase in rent prices than in other components of the index has a stronger effect on the price index that is typical of elder households. Figure 12 shows the annual price change across three age groups for CPIs including regional rent indices.

As the analysis of the consumption weights among the age groups shows, there is no meaningful difference in the development of the CPI between those aged 25–34 and those aged 45–54.[18] Older persons' (65+) consumption prices resembled those of the other age groups until 2008 but increased at a much faster pace in 2008–09—the years when rent prices spurted ahead. While the CPI change for the younger age groups was 3.5 percent in 2008–09, for the 65+ population it came to 5 percent.

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[18] Brender and Strawczynski (2014) analyze household expenditure by children's age. Figure 12 in their paper shows that, based on their calculations, there has been no meaningful difference in the development of the price index for families with and without children in recent years.

Figure 12
Change in CPI including Regional Housing Prices (Quality-Adjusted) for Households of Different Ages

Graph is saved in g_dhhcpred_agec
Solid = 25-34; Dashed=45-54; Dotted=65+
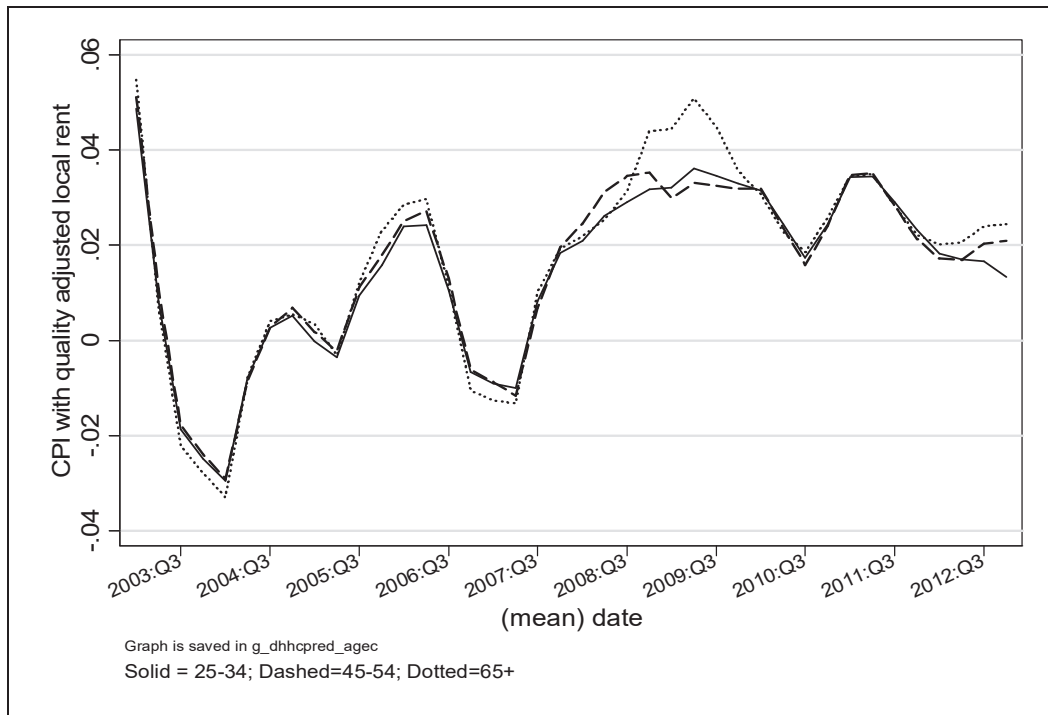
Although though the change in housing prices is the most meaningful, even when we examine the development of the CPI without this component (Figure 13)—the relevant index for OOHS households because their expenditure does not include rent—a disparity among the age groups comes into sight in certain years. Thus, in early 2008 and in 2012, the rate of nonhousing CPI change among households headed by persons aged 65+ was more than 1 percentage point higher than that of a young household. The difference in 2008 is explained by a decrease in the prices of the Private Vehicles and Maintenance component (mainly on account of fuel), the share of which in consumption is smaller among older households than among younger ones. In 2012, the rate of CPI change for young households was restrained by a decrease in preschool charges, which account for 5 percent of total nonhousing consumption among young households, due to the implementation of the Trajtenberg Committee recommendations.

Figure 13
Change in CPI Excluding Housing for Households of Different Ages

Graph is saved in g_dhhcpxr_agec
Solid = 25-34; Dashed=45-54; Dotted=65+
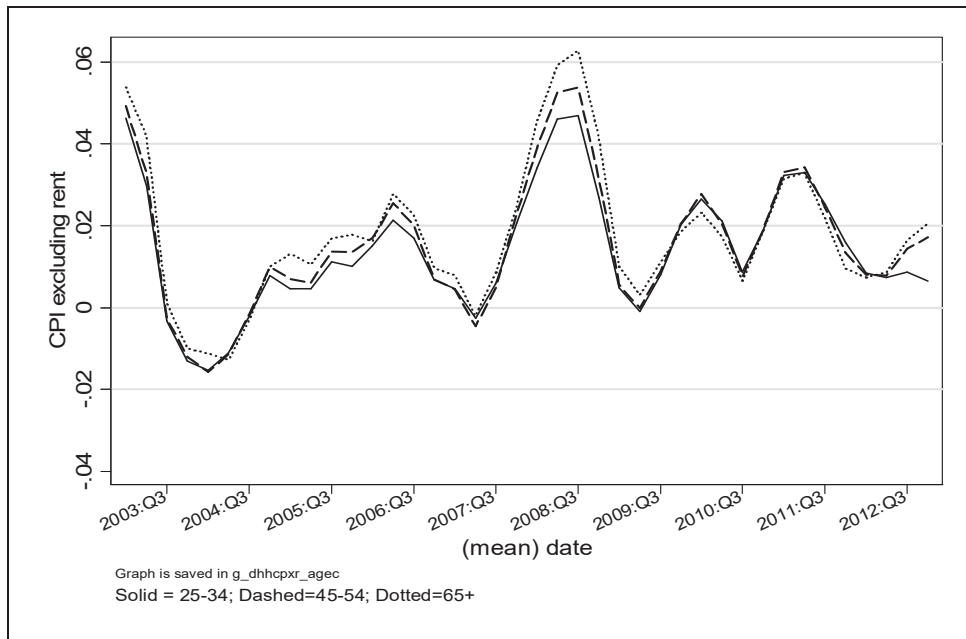
d.   CPI Differentiated by Household Size

Table 6 presents consumption weights in accordance with household size. In single-person or couple households, around one-third of expenditure goes for housing, whereas for large households (six persons or more) the share of housing in expenditure resembles that on food, each accounting for around 20 percent of the total.

Table 6
Consumption Weights, Aggregated Components, by Household Size* (%)

	1	2	3–5	6+
Vegetables, fruit, and food	16.3	17.7	17.7	22.0
Housing	37.1	30.0	24.1	22.7
Dwelling maintenance, furniture and household equipment, clothing and footwear, and miscellaneous	19.1	20.1	21.8	23.2
Health	6.1	6.4	4.4	3.9
Education and culture	8.2	8.9	12.6	12.2
Public transport	1.4	1.2	1.0	1.1
Travel abroad	1.9	2.7	2.0	1.1
Private vehicles	6.1	9.2	11.7	9.1
Communication	3.7	3.8	4.7	4.6
Share of group among households (%)	17.6	23.9	46.5	12.0

* Weights—average weight in each household (democratic calculation).

The different compositions of consumption of differently sized households find expression in the development of the prices of their consumption baskets. The large share of expenditure on housing among single-person households is reflected in an increase of

more than 5 percent in basket price in the middle of 2009, as against 4 percent among couple households and smaller fractions in larger households.

Figure 14
CPI Change among Differently Sized Households

CPI excluding housing	Including quality-adjusted regional housing prices

Graph is saved in g_dhhcpxr_pernum
Solid = 1 person; Dashed=2; Dotted=3-5; Thin Solid=6+

Graph is saved in g_dhhcpred_pernum
Solid = 1 person; Dashed=2; Dotted=3-5; Thin Solid=6+
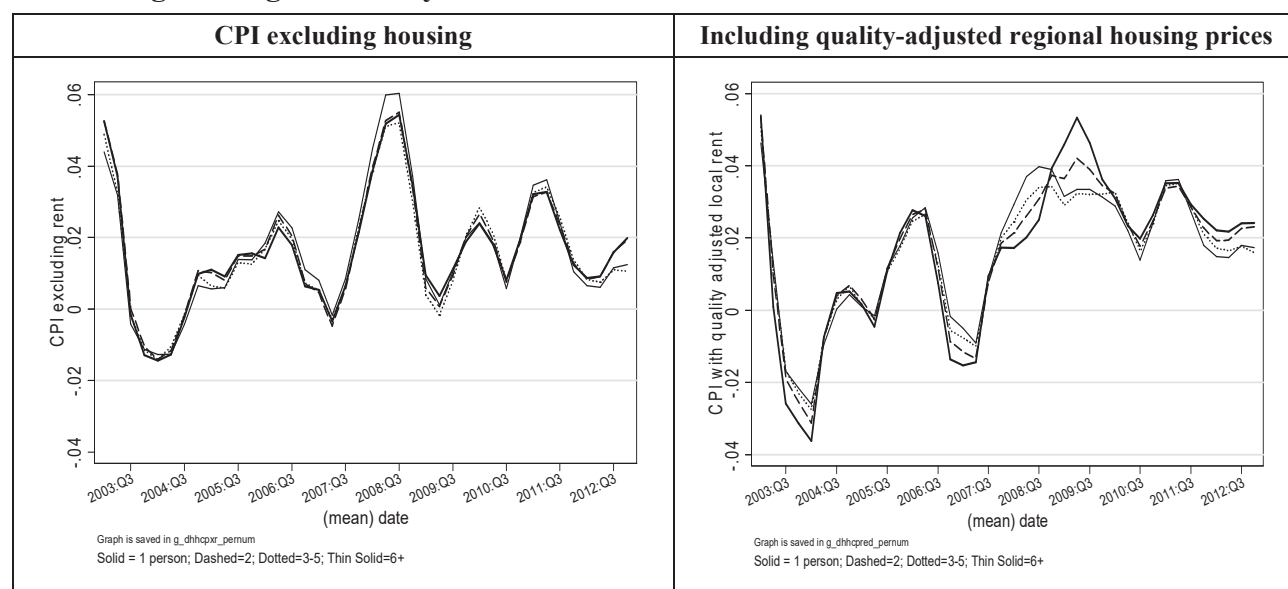
In early 2008, in contrast, larger households—for which food accounts for a larger share of consumption—faced relatively vigorous 4 percent inflation because food prices spurted ahead at that time, whereas the consumption basket of small households increased by only 2 percent. Examining the development of the CPI excluding housing, the metric of relevance for OOHS households (Figure 14, left-hand side), we find smaller disparities among households of different sizes during most of the review period.

Table 7
Consumption Weights, Aggregated Components, by Number of Children up to Age 3 in Household* (%)

	0	**1**	**2+**
Vegetables, fruit, and food	17.9	17.8	18.9
Housing	28.6	23.5	24.1
Dwelling maintenance, furniture and household equipment, clothing and footwear, and miscellaneous	20.5	23.1	24.2
Health	5.6	3.6	3.4
Education and culture	10.0	14.6	14.4
Public transport	1.2	0.8	1.1
Travel abroad	2.3	1.3	0.8
Private vehicles	9.5	11.4	9.5
Communication	4.4	3.9	3.7
Share of group among households (%)	**80.0**	**14.8**	**5.2**

* Weights—average weight in each household (democratic calculation).

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The development of prices was also examined for groups typified by the number of children up to age three in the household. The share of expenditure on education and culture among households with young children is 4 percentage points greater than that in households that have no young children. Households with young children also spend more than other households on furniture and household equipment, clothing and footwear, and miscellaneous, and less than other households on transport and communication. No meaningful differences were found in the development of the CPI among the different households at any time in the review period except the end of the sample period, after the adoption of the Trajtenberg Committee, the recommendations lowered preschool charges fees considerably. This was reflected in a 16 percent decrease in the average price of the preschools component in the last quarter of 2012 as against the year-earlier quarter and in a 1-percentage-point difference in 2012 in change in prices for households with young children as against other households (Figure 15).[19]

Figure 15
CPI Change for Households with Children Up to Age 3

CPI excluding housing	Including quality-adjusted regional housing prices

Graph is saved in g_dhhcpxr_per0_3
Solid = no 0-3 kids; Dashed=1; Dotted=2+

Graph is saved in g_dhhcpred_per0_3
Solid = no 0-3 kids; Dashed=1; Dotted=2+
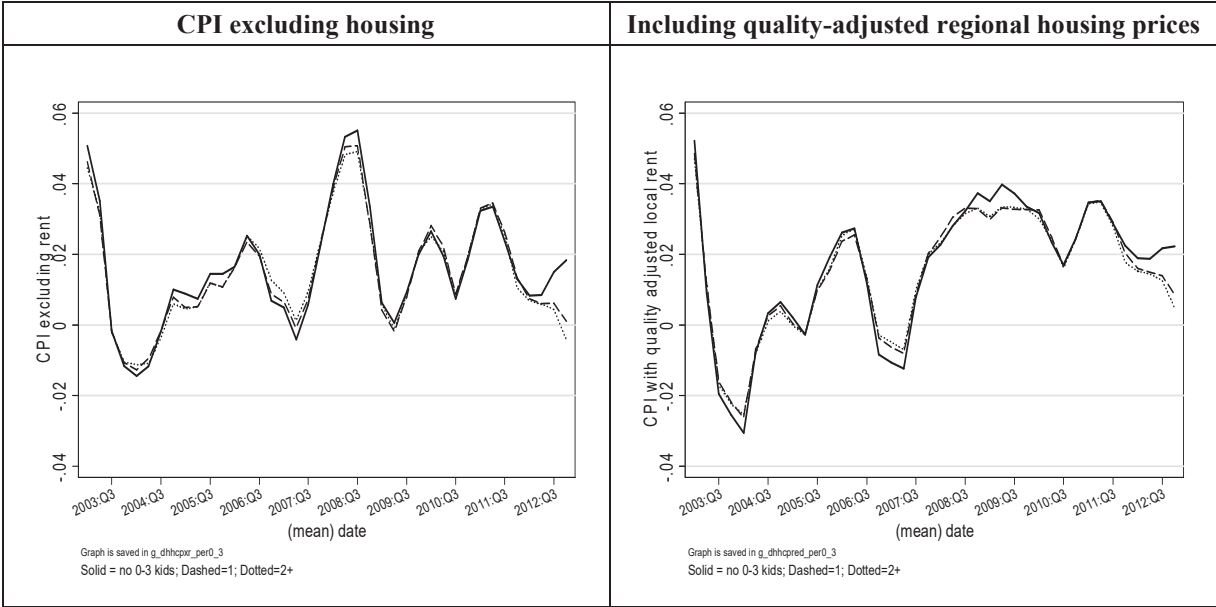
e.   Cumulative Inflation, 2003–12, and Persistence over Time

It is of interest to examine the cumulative rate of price increase between 2003 and 2012 for different groups of households. Do the price increases that different households face over time accumulate, or are they offset over time? Insofar as the cumulative rate of change in different CPI components over a period of years is different among household types, and insofar as different types of households have different typical consumption weights, it would stand to reason that disparities in CPI change over several years would indeed accumulate.

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[19] See Brender and Strawczynski (2014) for reference to the consumption basket of households with children up to age nine.

In the past decade, different CPI components developed much differently; therefore, relative prices also changed considerably. There was a salient upturn in the prices of non-tradable goods such as health and housing, as well as energy prices in the dwelling maintenance component, as against various decreases, particularly in clothing and footwear and furniture and household equipment. Food prices rose by 30 percent during the review period pursuant to rising commodity prices abroad and imperfect competition in the industry. Rent prices also developed differently in different regions (Table 1).

Table 8: Cumulative Price Change and Standard Deviation, by CPI Components, 2003–2012

	Cumulative price change*	Standard Deviation over years
Food	31.0	2.8
Vegetables and fruit	29.2	7.4
Housing	20.0	5.4
Dwelling maintenance	30.1	2.9
Furniture and household equipment	-13.5	1.0
Clothing and footwear	-20.4	3.5
Health	18.6	1.1
Education, culture, and entertainment	3.6	1.4
Transport and communication	16.9	1.8
Miscellaneous	23.0	1.9
Total CPI	**18.4**	**1.9**

* Last quarter of 2012 vs. last quarter of 2002.

Table 9: Cumulative Inflation, Democratic CPI, Various Definitions, Different Age Groups, 2003–2012

	CPI per CBS	CPI incl. regional rent prices	CPI excl. housing
Up to 34	13.2	13.4	12.1
35–44	14.6	14.0	13.0
45–54	15.8	14.8	14.3
55–64	17.1	15.8	15.4
65+	17.7	16.1	16.1

When the cumulative price change during the review period is parsed by age groups, inter-group differences can be seen. Table 9 shows that the cumulative change is 4 percentage points lower for young households (based on age of head of household) than for elder households, when a democratic index for households and CBS components are used—when regional rent prices are included and when housing prices are excluded. In other words, among both renting households, for which the total CPI has to be examined, and OOHS households, for which actual expenditure does not include housing, older households faced a much larger cumulative price increase than did younger ones.

Examining the cumulative CPI change for households in different regions (Table 10), we found, as expected, no meaningful inter-regional differences in the index according to the CBS components and the CPI excluding housing. The index that includes quality-adjusted regional rent prices, in contrast, has perceptible inter-regional differences, particularly between Haifa and the other regions. Thus, the cumulative price increase was only 12 percent for households in Haifa as against 16 percent for households in the Tel Aviv and Center regions. Households that incur no de facto rent expenses (that is, OOHS households) faced smaller cumulative inflation than did renting households if they lived in Tel Aviv or Center. In all other regions, there was no major difference between the index including rent and that excluding this component. In Haifa, renters even enjoyed lower cumulative inflation in their consumption basket.

Table 10: Cumulative Inflation, Different Definitions of CPI, Differentiated by Region of Residence, 2003–12

	CPI per CBS	**CPI incl. regional rent prices (quality-adjusted)**	**CPI excl. Housing**	**Share of households in region (%)**
Jerusalem	16.1	14.8	15.0	**9.9**
Tel Aviv	14.7	16.6	13.6	**9.0**
Haifa	14.9	11.5	14.2	**9.5**
Gush Dan	16.4	15.1	14.7	**11.7**
Center	15.5	15.5	13.6	**17.9**
South	15.1	14.4	13.7	**14.2**
Sharon	16.0	15.7	14.1	**13.3**
North	16.2	14.1	14.5	**14.7**

Examining the cumulative price increase by the income quintiles specified above, we found an upturn of around 15 percent with no meaningful differences among definitions of the index. In the cumulative change of the index excluding housing, a small difference among quintiles was found—increases of 15.6 percent for the bottom quintile and 13.3 percent for the uppermost one between 2003 and 2012.[20]

persistence over time: Another indicator that may be examined when analyzing the difference in inflation that different households experience is the degree of persistence in the relative positioning of differently characterized households regarding the inflation rates of their consumption baskets. To test this, we examined the likelihood of change in a household's relative positioning from one year to the next on the basis of an analysis similar to Michael (1979) and studies in his wake. Lacking true longitudinal panel data for households, we created cells of households that are homogeneous in terms of homeownership, region of residence, income quintile, and age[21]—some 380 cells in each period.[22] For each year, the households are sorted by their corresponding inflation rates—

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[20] The table is not shown.

[21] See below for a detailed description of the aggregation.

[22] See Note 24 below.

from low to high—and are assigned to three groups: low, middle, and high, in accordance with their inflation rate. This strategy makes it possible to examine whether, from year to year, each cell of households remains in the same third or moves up or down. The more stable a household's position is, the more one would expect to find a majority of households on the diagonal in a matrix of year-to-year transitions—that is, remaining within the same third.

Figure 16 presents the proportion of households that stay on the diagonal from year to year, in accordance with the base year, in each of the thirds. The maximum value of this indicator is 1, which is obtained when all households remain in their previous-year third. The figure relates to three household price indices: as constructed by CBS, including quality-adjusted regional rent prices, and excluding housing. It is hard to detect a clear trend and any clear change among the metrics. Overall, fewer than half of the groups of households maintain their position in the lower portion, middle portion, or upper portion of CPI change from one year to the next. If so, relative inflation in the prices that different households face is not a longitudinal characteristic of different groups; instead, it varies over time in view of changes in the relative prices of different consumption groups.

Figure 16
Share of Household Groups that Persist in Position from Year to Year
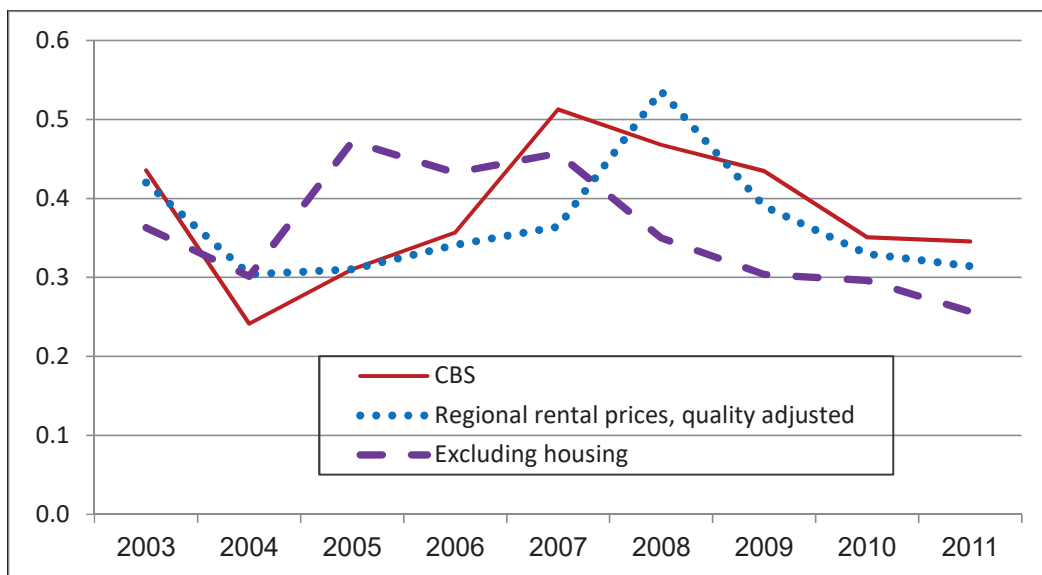
5. Estimation

This section presents the results of the estimation of the factors that explain the variance in CPI development for differently characterized households. The estimation is conducted under two alternative approaches. In the first, the LHS estimated variable is the annual rate of CPI change for an individual household. Since each household in the sample resembles a different number of households in the real population as a function of the weight assigned to it in the CBS sampling, the estimation takes account of household weights. For the annual

2003–12 data,[23] there were some 59,000 observations altogether. Since the sample of households is different each year (that is, it is not a true panel), panel estimation methods cannot be used in this formulation. In the second approach, a pseudo-panel was generated by creating cells of households that are homogeneous in terms of certain characteristics that are constant over time. These observations may be treated as (balanced) panel observations. We chose to aggregate the households by region of residence (eight regions), age (five groups), income quintiles (five quintiles), and OOHS (two groups)—400 groups in each period altogether. Although such an aggregation creates cells that have very small numbers of observations, it allows each main variable—income quintile, region of residence, age, and OOHS—to be included separately as an explanatory variable. In this manner, some 3,800 observations were obtained[24] and were estimated by a panel regression in which each cell is equally weighted. (The aggregation into cells was carried out using the household weights.) The results obtained with both methods are very similar both qualitatively and quantitatively.

For both estimation methods, the equations were estimated for the entire sample from 2003 to 2012 and separately for three groups of years. 2003–07—in which rent prices usually declined or rose moderately in most regions; 2008–12—a time of rapid increase in rent with greater inter-regional variance; and 2011–12—similar moderate increases in most regions. In addition, equations were estimated for a specified cross-section of cells for the average price change during the entire period.

The coefficients obtained by estimating the equations describe the (marginal) effect of a given household characteristic on the rate of change in the CPI relevant to the household, its other characteristics taken as given. This makes it possible to estimate the difference between the total CPI and the index tailored to a given household with a given composition of characteristics. The effect of the household's characteristics is estimated relative to the average of the estimated index. That is, an average across the households of the index in accordance with various definitions, which appears as the estimated LHS variable, is on the right-hand side as an explanatory variable. In the estimations that include only one variable, as may be seen, the coefficient is unitary and the intercept is zero. In the estimations that included additional explanatory variables, a constant was included in the equation to allow appropriate offsetting of the constants in the other variables (the dummy variables in particular).

a.　Estimation for the Entire Period (2003–12)

The results of the estimation for households and cells that are aggregated and presented in Tables 1a–2a show, as expected, that the main variance among observations traces to variance among years and less to variance among households. Thus, the share of variance

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[23] The data included in the estimation are only those pertaining to the last quarter of each year.

[24] There were supposed to be 4,000 observations over ten years but some cells were deleted because they contained one observation or none.

explained by the addition of variables that characterize households, in the estimation that covers the entire period, is negligible. Nevertheless, most explanatory variables that describe the household are significant at a 5 percent level or less.

When the index of rent prices calculated by CBS for renters (inventory) and for owner-occupier households (new contracts and contracts subject to renewal) is used, we find that the change in prices is 0.3–0.4 percentage point lower, on average, for renting households than for OOHS households. Seemingly, over time, the change in prices of the inventory of existing contracts (those used to measure the rent that renters actually pay) should be identical to that measured by means of new contracts and contracts subject to renewal only (a metric used to impute the value of housing services for OOHS households). Therefore, one would expect to find no difference in the prices that both types of households face over time. Observation of the development of both of these components of the index (Figure 17), however, reveals a large difference between the two series measured, reflected in the negative coefficient of the estimation. Different weighting of rent prices for the measurement of actual housing rent, as against the weighting used to estimate the imputation for OOHS households, due to different distribution of the two types of households among regions, may explain at least some of the gap. When the estimation uses regional rent series, which do not distinguish between new contracts and existing ones, the coefficient is much smaller. For the index excluding housing, the effect of this variable is even smaller, as expected.

Figure 17
Development of Rent Prices, December 2002–December 2012 (2012 average=100)
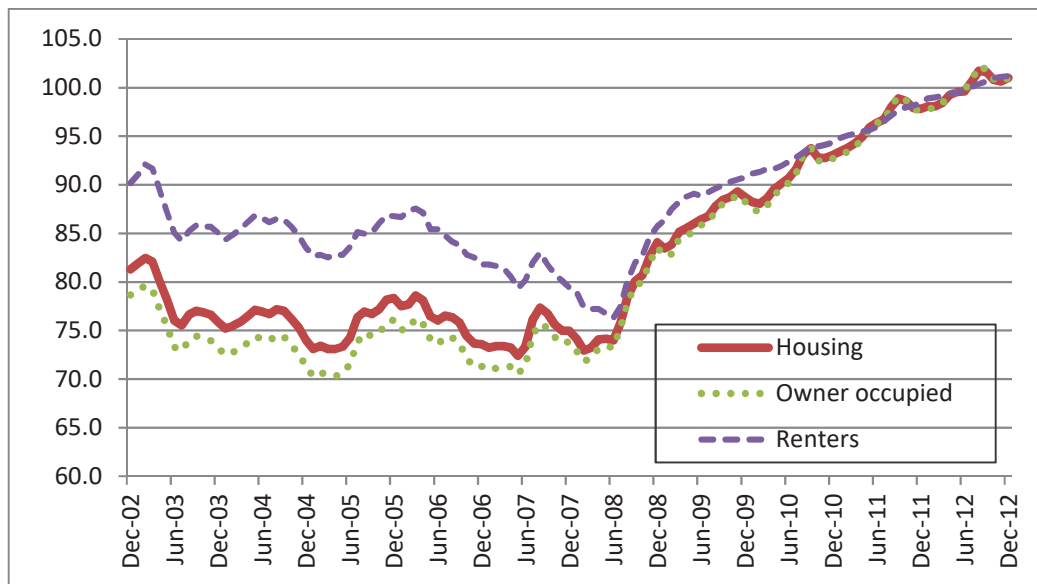
The age of head of household has a very minor effect on the rate of change in the household-adjusted index, due to different consumption weights. However, the effect is greater among households headed by individuals aged 65+. An important variable is region of residence, which affects the rent—actual or imputed—that a household pays. This effect

is revealed only when use is made of regional rent prices, which pair each household with the (quality-adjusted) rent prices on the basis of its region of residence. When these prices are included in the estimation, it is found that, on average, the price index for households in the Tel Aviv, Gush Dan, Center, and Sharon regions increased by 0.2–0.4 percentage point more per year than did the index for those in Jerusalem, South, and North. For households in Haifa, the index increase was 0.2 percentage point per year smaller than for those in Jerusalem, South, and North.

A household's position on the scale of income quintiles affects the change in the index that it faces. Thus, on average, the annual index increase is 0.3–0.4 percentage points higher for the lowest quintile than for the uppermost quintile in measurements that include and exclude the housing component. The higher a household ranks on the quintile scale, the smaller is the increase in its index.

b. Estimation by Subperiods

Tables 3a and 4a present similar estimation equations, including regional rent prices or estimating the index excluding housing, for three separate year brackets: 2003–07, when rent prices usually fell or rose mildly in most regions; 2008–10, a time of rapid increase in rent and larger differences among regions; and 2011–12, years of mild upturns that were similar in most parts of the country.

The effect of age remains negligible but a dummy variable for households headed by individuals aged 65+ is usually positive and significant, particularly in the estimation for cells, in respect to both indices: that including quality-adjusted regional rent prices and that excluding housing.

Considerable disparities emerge in the development of the index including regional rent prices in 2008–10. This index rose by 0.6–1.0 percentage point more, per year, for households in five regions—Jerusalem, Tel Aviv, Gush Dan, Center, and Sharon—than for those in the northern region. The index increase for households in Haifa was 0.3 percentage points smaller than for those in the North.

The household income quintile variable had a different effect in each of the three periods. Between 2003 and 2007, there was no meaningful difference among the quintiles. In 2008–10, in contrast, the CPI of the lowest quintile rose by 0.8–0.9 percentage points beyond the increase among households in the uppermost quintile, including rent prices and excluding housing prices. Even the higher quintiles experienced more vigorous inflation during this time than did the uppermost quintile. The pairing of surging food prices and falling energy prices (Figure 10) explains this phenomenon. In 2011–12, the gap among the quintiles narrowed again.

Between 2011 and 2012, the price increase experienced by households with more young children (up to age three), couple households, and immigrant households was smaller than that of other households.

c. Cross-Section Estimation

Table 5a presents an estimate for aggregated cells in cross-section—that is, an estimation lacking the time dimension—of the average price change in each cell across the entire 2003–12 period, 399 observations in all. On average, households headed by individuals aged 65+ experienced much higher inflation than did younger households. The household-adjusted inflation rate was 0.3–0.4 percentage point higher on average in the low quintiles than in the uppermost quintile. Households with young children, which are also younger than others, experienced 0.3 percentage point lower inflation, mainly due to the lowering of preschool charges in 2012. In the estimation including (quality-adjusted) regional rent prices, it was found that households in Tel Aviv experienced the highest inflation rate, on average, followed by those in Jerusalem, Gush Dan, Center, and Sharon. Those in Haifa had 0.2 percentage point less inflation than those in the North.

6. Differential Effect of Monetary Policy

Ribon (2011) investigates the differential effect of shocks to monetary policy—nominal interest rate and exchange rate—on various components of the CPI, using the Factor Augmented VAR method, which makes it possible to detect the response function of each component of the index to interest and exchange-rate shocks. Using the outcomes of Ribon (2011), a specific CPI response function that corresponds to each household's basket can be constructed by aggregating the response of the components of the CPI basket with appropriate weights for each household.[25]

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[25] We assume that rent in all regions responds to interest-rate and exchange-rate shocks with the same intensity. Therefore, differential measurement of rent is meaningless here because the discussion relates only to the response to the shock irrespective of price variability.

Table 10
Cumulative Response of Price to Interest-Rate Shock, Different Horizons, by Groups*

	Component/s	After 3m	After 6m	After 12m	After 18m	After 24m
0	Vegetables and fruit	-0.52	-0.48	-0.40	-0.37	-0.96
1	Food	-0.31	-0.56	-0.67	-0.74	-0.35
2	Housing	-1.09	-1.17	-1.17	-1.20	-0.79
3	Dwelling maintenance	-0.64	-0.96	-1.11	-1.20	-1.22
4	Furniture and household equipment	-0.28	-0.61	-0.77	-0.86	-1.27
5	Clothing and footwear	0.43	-0.40	-0.77	-0.96	-0.93
6	Education, culture, and entertainment	-0.59	-0.66	-0.65	-0.66	-1.10
7	Health	-0.33	-0.52	-0.63	-0.69	-0.66
8	Transport and communication	-0.96	-1.00	-0.96	-0.96	-0.74
9	Other	-0.20	-0.53	-0.70	-0.79	-0.96
	Total CPI	-0.67	-0.84	-0.89	-0.93	-0.86

* Ribon (2011), Table 2a. The calculation is based on thirty-eight CPI groups.

Table 11
Cumulative Response of Price to Exchange-Rate Shock, Different Horizons, by Groups*

	Component/s	After 3m	After 6m	After 12m	After 18m	After 24m
0	Vegetables and fruit	0.022	-0.026	-0.017	-0.008	-0.001
1	Food	0.098	0.084	0.047	0.024	0.006
2	Housing	0.106	0.038	0.023	0.014	0.007
3	Dwelling maintenance	0.145	0.115	0.066	0.034	0.010
4	Furniture and household equipment	0.119	0.111	0.062	0.031	0.008
5	Clothing and footwear	0.207	0.237	0.122	0.058	0.009
6	Education, culture, and entertainment	0.061	0.019	0.010	0.006	0.003
7	Health	0.086	0.075	0.044	0.023	0.007
8	Transport and communication	0.080	0.010	0.004	0.004	0.004
9	Other	0.115	0.112	0.062	0.031	0.008
	Total CPI	0.099	0.057	0.032	0.017	0.006

* Ribon (2011), Table 3a. The calculation is based on thirty-eight CPI groups.

Tables 10 and 11 show the response of each of the main components of the CPI to interest-rate and exchange-rate shocks, as estimated by Ribon (2011).

All prices fall in response to a positive interest-rate shock, the responses usually increasing with time. Although differences in the responses of different components are not large, they do exist. The response of the components to a positive exchange-rate shock is positive, with some variance among the components, largely in the short term.

When the response function of the price indices parsed by different groups—age, region of residence, and income quintile—is examined, no meaningful variance in the effect of monetary policy between the groups is found. This is because, on average, the differences among consumption weights are small and as shown above, the various components respond to the shock similarly.

Figure 18
Distribution of Households' Response to Interest-Rate Shock after Three Months and after Two Years
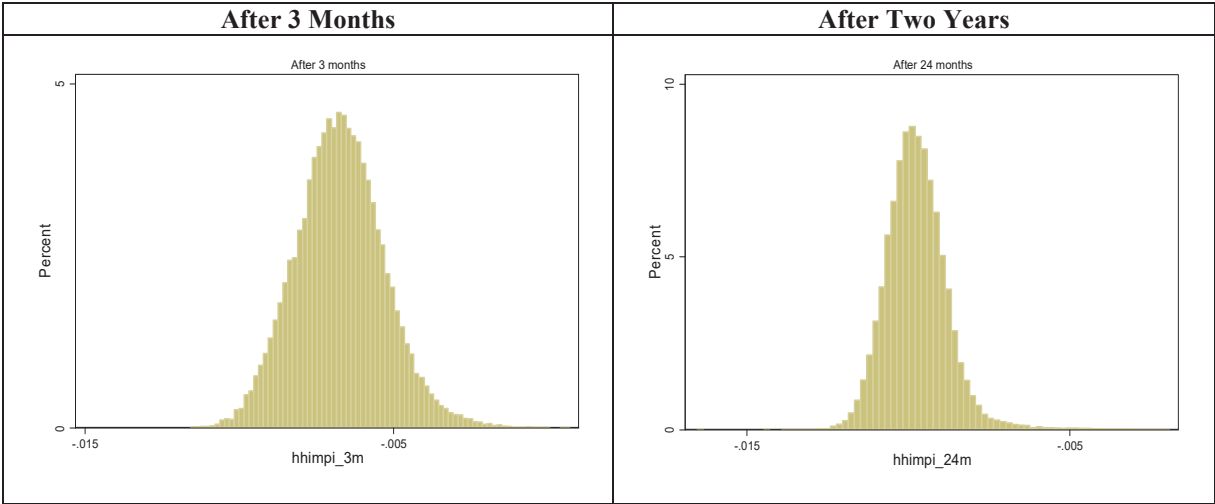
Figure 19
Distribution of Households' Response to Exchange-Rate Shock after Three Months and after Two Years
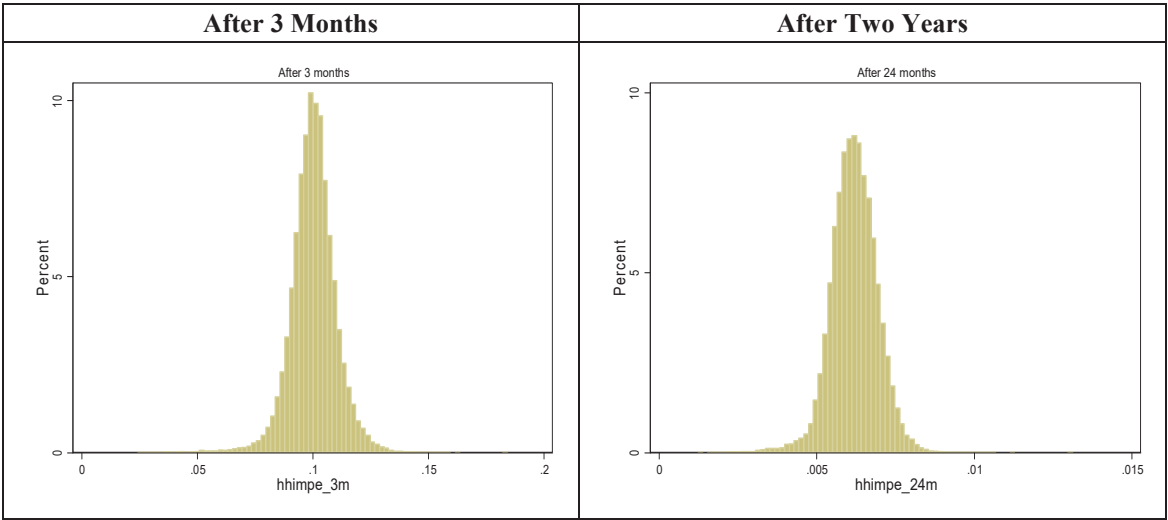
Some difference may be detected in the response to a monetary-policy shock when its distribution across individual households is examined. Figures 18 and 19 present the distribution of households' responses to an interest-rate shock and an exchange-rate shock after periods of three months and two years.

7. Conclusion

The Consumer Price Index reflects the change in the price of an average household consumption basket. There is, however, considerable variance in the composition of different households' baskets; therefore, variance in the inflation rates that they experience should also be expected. This paper presents the calculation of a personal inflation rate for each household on the basis of the structure of its spending and changes in the prices of the goods that make up the Consumer Price Index.

The contribution of this paper is that, unlike many other studies, particularly those pertaining to Israel, it matches every household to the change in its housing expenditure (rent) on the basis of its region of residence. For the other prices, the data include only the average price of a certain good or service, with no information about variance in its price in accordance with point of purchase. We assume that even if the level of prices vary at different points of sale, their rate of change is similar, particularly in cumulative terms.

The study adopts the democratic index approach, which calculates the distribution of expenditure for each household and only afterwards averages them across households, so that the index reflects the average consumption weights of households, as opposed to an average weight based on the aggregate consumption by all households. In other words, the approach is one household, one vote, compared to that taken by the Israel Central Bureau of Statistics in calculating the CPI—the plutocratic approach, which reflects a one dollar, one vote stance. Calculation using the democratic approach reveals an average price increase of about half a percentage point greater than that obtained when the plutocratic approach is used. Such is the case for the year 2009; the differences are smaller in the other years.

In 2008–10, prices rose more for households that were outside the uppermost quintile, belonged to the 65+ age group, lived in Tel Aviv, Gush Dan (the Tel Aviv suburbs), or the Center, and that were composed of one person. During the rest of the period between 2003 and 2012, the differences between the groups were smaller. Households in Tel Aviv, Center, and Gush Dan experienced 0.9 percentage points higher inflation per year between 2008 and 2010 than did households in the North. The CPI faced by households in Jerusalem and the Sharon region increased by 0.7 percentage points more on average, in these years, than did that of households in the North. In other years in the review period (2003–12), the differences were smaller. Households headed by persons aged 65+ faced 0.1 percentage points higher inflation between 2008 and 2010 and in subsequent years. The uppermost quintile faced a rate of price change lower by about 1 percentage point per year between 2008 and 2010 than did households in the lowest quintile. Throughout the review period (2003–12), there was a disparity of 4–5 percentage points in the cumulative inflation among different regions and between households headed by persons aged 65+ and others. The persistence in a household's positioning relative to other households, however, was not strong. Variance in the development of rent prices did much to explain the differential development of different households' consumption prices. Variance in consumption

weights among households and the differential effect of monetary policy on the prices of various components of consumption were reflected in variance in the effect of monetary policy on change in the prices that households actually face.

Table A1: Equations for Household, 2003–2012*

Dependent variable: YoY annual change in household CPI	With CPI rent prices	With CPI rent prices	With quality-adjusted regional rent prices	With quality-adjusted regional rent prices	Excl. housing	Excl. housing
Constant	0.00	-0.31	0.00	-0.42	0.00	-0.60
Avg. change in explained CPI	1.00	1.00	1.00	1.00	1.00	1.00
Dummy for renter		-0.43		-0.08		-0.08
Age		0.005		0.004		0.006
Dummy for age 65+		0.091		0.073		0.070
Dummy for region:						
Jerusalem		0.10		0.12		0.11
Tel Aviv		0.09		0.38		0.07
Haifa		(-0.05)		-0.23		(0.01)
Gush Dan		0.12		0.16		0.09
Center		0.04		0.22		(0.01)
South		(-0.03)		0.07		(-0.03)
Sharon **		0.06		0.22		(0.03)
Dummy for income quintile:						
Lowest		0.35		0.30		0.38
2nd		0.20		0.15		0.22
3rd		0.13		0.09		0.12
4th		0.04		0.03		0.03
Persons aged 0–3		-0.11		-0.12		-0.14
Dummy for married		(0.01)		0.04		0.06
Dummy for immigrants		-0.04		-0.03		-0.03
Observations (N)	58,479	58,479	58,479	58,479	58,478	58,478
Adjusted R^2	0.73	0.75	0.71	0.72	0.42	0.43
RMSE	1.168	1.139	1.109	1.091	1.26	1.24

* All coefficients are significant at the 5 percent level unless shown in parentheses.

**Northern region is omitted.

Table A2: Equations for Cells Differentiated by Owner-Occupancy, Region of Residence, Age Group, and Income Quintile, 2003–2012*

Dependent variable: YoY annual change in household CPI	With CPI rent prices	With CPI rent prices	With quality-adjusted regional rent prices	With quality-adjusted regional rent prices	Excl. housing	Excl. housing
Constant	-0.05	-0.17	-0.03	-0.36	-0.02	-0.36
Avg. change in explained CPI	0.97	0.97	1.01	1.00	1.00	1.00
Dummy for renter		-0.33		(-0.03)		-0.08
Age		0.002		0.002		0.003
Dummy for age 65+		0.10		0.09		0.10
Dummy for region:						
Jerusalem		0.09		0.08		0.107
Tel Aviv		(0.07)		0.32		(0.03)
Haifa		(-0.02)		-0.22		(0.05)
Gush Dan		0.06		0.10		0.09
Center		(0.04)		0.19		(0.04)
South		(-0.02)		(0.05)		(-0.00)
Sharon **		0.06		0.22		0.07
Dummy for income quintile:						
Lowest		0.28		0.25		0.38
2nd		0.17		0.14		0.21
3rd		0.09		0.07		0.10
4th		(0.03)		(20.04		(0.01)
Persons aged 0–3		-0.21		-0.18		-0.22
Dummy for married		0.12		0.13		(0.06)
Dummy for immigrants		-0.10		-0.09		(-0.02)
Observations (N)	3,830	3,830	3,830	3,830	3,830	3,830

* All coefficients are significant at the 5 percent level unless shown in parentheses.
**Northern region is omitted.

Table A3: Equations for Households—Separate Estimation for Year Brackets*

Period:	With quality-adjusted regional rent prices			CPI excl. housing		
	2003–07	**2008–10**	**2011–12**	**2003–07**	**2008–10**	**2011–12**
Constant	-0.10	-1.47	0.21	-0.57	-1.07	0.52
Avg. change in explained CPI	1.00	1.00	1.01	1.00	1.00	0.99
Dummy for renter	0.04	-0.14	-0.22	-0.14	(0.01)	-0.07
Age	0.002	0.01	-0.00	0.01	0.01	-0.00
Dummy for age 65+	(-0.01)	0.12	0.15	0.04	(0.06)	0.13
Dummy for region:						
Jerusalem	-0.18	0.70	(0.00)	(0.05)	0.26	(0.07)
Tel Aviv	0.07	0.87	0.41	(-0.04)	0.19	0.15
Haifa	-0.33	-0.28	0.13	(-0.02)	0.09	(-0.07)
Gush Dan	-0.26	0.92	0.06	0.07	0.23	(-0.05)
Center	-0.11	1.04	-0.13	(0.03)	0.08	-0.09
South	-0.04	0.30	(-0.00)	(-0.03)	(0.03)	(-0.08)
Sharon **	0.05	0.64	(0.03)	(0.03)	(0.05)	(0.04)
Dummy for income quintile:						
Lowest	-0.07	0.94	0.16	0.24	0.89	(-0.07)
2nd	-0.19	0.77	0.08	0.12	0.65	-0.18
3rd	-0.18	0.58	(0.01)	(0.03)	0.46	-0.19
4th	-0.11	0.30	(-0.05)	(0.01)	0.19	-0.16
Persons aged 0–3	(0.02)	-0.07	-0.49	0.03	-0.07	-0.60
Dummy for married	0.27	-0.12	-0.22	0.11	0.08	-0.10
Dummy for immigrants	-0.09	0.09	(0.21)	(-0.02)	0.10	-0.21
Observations (N)	28,631	16,824	13,023	28,630	16,824	13,023
R^2	0.73	0.29	0.15	0.51	0.22	0.09

* All coefficients are significant at the 5 percent level unless shown in parentheses.
**Northern region is omitted.

Table A4: Equations for Cells Divided/ by Owner-Occupancy, Region of Residence, Age Group, and Income Quintile—Separate Estimation for Year Brackets*

	With quality-adjusted regional rent prices			CPI excl. housing		
Period:	**2003–07**	**2008–10**	**2011–12**	**2003–07**	**2008–10**	**2011–12**
Constant	(0.01)	-1.76	0.33	-0.37	-1.06	0.79
Avg. change in explained CPI	0.99	0.99	1.02	0.99	0.97	0.88
Dummy for renter	(-0.02)	-0.04	-0.15	-0.17	0.03	-0.01
Age	-0.002	0.01	-0.001	0.00	0.00	-0.00
Dummy for age 65+	0.09	0.09	0.12	0.12	0.22	0.03
Dummy for region:						
Jerusalem	-0.13	0.67	-0.00	0.07	0.32	0.06
Tel Aviv	(0.03)	1.02	0.24	-0.13	0.37	-0.02
Haifa	-0.32	-0.16	0.19	(-0.02)	0.17	0.03
Gush Dan	-0.23	1.00	0.03	0.10	0.25	-0.09
Center	-0.11	1.08	-0.10	0.07	0.07	-0.07
South	(-0.03)	0.36	0.09	(-0.04)	0.08	0.03
Sharon **	0.11	0.73	0.00	0.13	0.13	-0.03
Dummy for income quintile:						
Lowest	-0.07	0.82	0.20	0.19	0.86	0.04
2nd	-0.16	0.69	0.13	(0.03)	0.61	-0.01
3rd	-0.11	0.51	0.04	(-0.03)	0.44	-0.10
4th	-0.10	0.22	-0.02	-0.05	0.15	-0.09
Persons aged 0–3	-0.10	(-0.01)	-0.64	(-0.05)	-0.16	-0.83
Dummy for married	0.34	0.16	-0.28	0.16	0.34	-0.25
Dummy for immigrants	(0.02)	0.07	-0.43	0.12	0.28	-0.55
Observations (N)	1904	1140	758	1904	1140	758

* All coefficients are significant at the 5 percent level unless shown in parentheses.
**Northern region is omitted.

Table A5: Equations for Cells Differentiated by Owner-Occupancy, Region of Residence, Age Group, and Income Quintile—Average Cross-Section 2003–12*

Dependent variable: YoY change in household CPI	With CPI rent prices	With quality-adjusted regional rent prices	Excl. housing
Constant	1.22	1.10	1.07
Avg. change in explained CPI	-0.34	-0.08	-0.11
Age	(0.00)	(0.00)	0.001
Dummy for age 65+	0.20	0.18	0.17
Dummy for region:			
Jerusalem	0.10	0.15	0.13
Tel Aviv	0.12	0.38	0.09
Haifa	(0.01)	-0.19	0.04
Gush Dan	0.12	0.19	0.12
Center	0.03	0.23	0.03
South	-0.02	0.07	-0.01
Sharon **	0.04	0.24	0.07
Dummy for income quintile:			
Lowest	0.37	0.32	0.42
2nd	0.20	0.15	0.21
3rd	0.09	0.06	0.08
4th	(0.01)	-0.02	-0.02
Persons aged 0–3	-0.31	-0.31	-0.35
Dummy for married	0.37	0.26	0.21
Dummy for immigrants	-0.08	0.07	0.10
Observations (N)	399	399	399

* All coefficients are significant at the 5 percent level unless shown in parentheses.

**Northern region is omitted.

Appendix 1: CPI Components Used in the Analysis and Their Weights (from January 2013)

Main component	Subcomponent	Weight (out of 1000)
Food	Bread, cereals and dough goods	24.30
	Meat, poultry, fish and their products	35.96
	Fats and margarine	3.67
	Milk and dairy products	21.00
	Eggs	2.83
	Sugar, marmalade and sweets	4.00
	Beverages	10.19
	Miscellaneous food products	7.89
	Meals away from home	26.46
Vegetables and fruit	Fresh vegetables	13.04
	Fresh fruit	7.36
	Frozen, pickled and canned vegetables	5.77
	Canned and dried fruit	2.99
Housing	Owner occupied housing services	194.47
	Rent	49.22
	Other housing expenses	8.51
Household maintenance	Water	10.07
	Electricity	26.97
	Gas	4.13
	Kerosene, Diesel fuel, and other heating	0.55
	Maintenance and repairs	13.75
	Miscellaneous household utensils	6.83
	Municipal taxes	23.25
	Domestic help	11.12
Furniture and household equipment	Furniture	13.88
	Electrical equipment	13.65
	Home and kitchen equipment (non-electric)	4.33
	Bedding and home decorations	5.53
Clothing and footwear		30.54
Health	Medical services	24.08
	Dental fees	13.10
	Medicines and medical equipment	15.04

Main component	Subcomponent	Weight (out of 1000)
Education, culture and entertainment	Preschool education	16.11
	Primary education	5.84
	Post-primary education	5.98
	Higher / academic education	10.69
	Vocational training, courses, and summer camps	13.26
	Books and study equipment	2.51
	Newspapers, weeklies, and monthlies	2.04
	Fictional literature	1.42
	Religions needs	0.56
	Plays, concerts and performances	8.44
	Vacation, recreation and outings	7.34
	Electrical products for entertainment	16.64
	Hobbies (incl. computer)	7.85
	Toys and games	2.29
	Parties and events	15.79
Transport and communication	Public transport	7.66
	Foreign travel	36.91
	Private vehicles and maintenance	119.22
	Driving lessons, etc.	3.02
	Communication services	39.41
Miscellaneous	Cigarettes and tobacco	10.11
	Personal services and cosmetics	25.12
	Jewelry and watches	3.58
	Handbags, etc.	3.73
Total		1000

Appendix 2: Relation between CPI Published by CBS and Calculated Indices

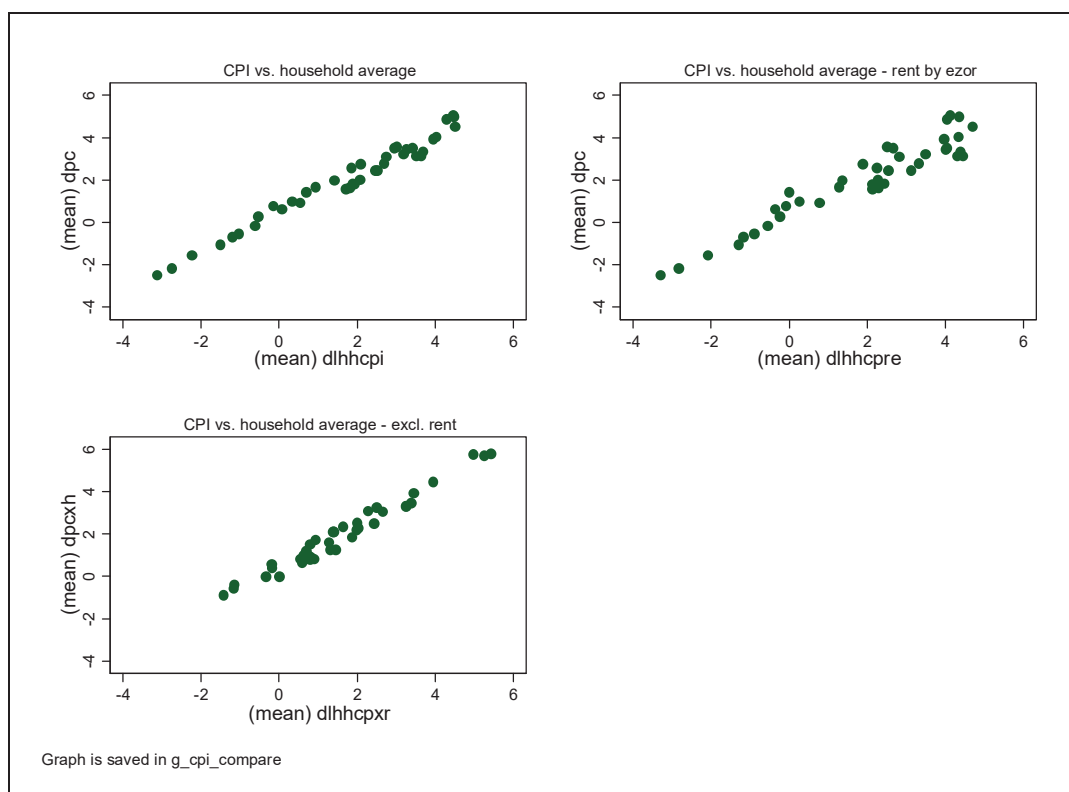Figure A1: Relation between Official CPI and Household-Differentiated Indices

Graph is saved in g_cpi_compare

Table A1: Estimated Relation between Official CPI and Household-Differentiated Indices

	Total CPI	**CPI with quality-adjusted regional rent prices**	**CPI excl. housing**
Constant	-0.42	(-0.29)	(-0.32)
CPI published by CBS	1.08	0.96	
CPI published by CBS excl. housing			0.99
R^2	0.97	0.96	0.90

* Coefficients in parentheses are not significant at 5 percent level.

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