MEASURING POVERTY IN WEST BANK AND GAZA
Methodology Review using PECS 2016

Technical report

Palestinian Central Bureau of Statistics

and

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This technical report is a joint effort of the Palestinian Central Bureau of Statistics (PCBS) and the World Bank. The report is a product of the World Bank's programmatic work in the Palestinian territories and technical assistance. The PCBS team includes Jawad Al-Saleh and Fida Twam. The World Bank team was led by Aziz Atamanov and Nethra Palaniswamy. The team received guidance and comments from Benu Bidani (Practice Manager, GPVDR) and overall support from PCBS President Ola Awad and country director Marina Wes. The team thanks peer reviewer Dean Jolliffe for excellent comments. We are also grateful to Andrea Germiniasi for a careful cross review of all the Stata code the team prepared.

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1. Introduction

The Palestinian Expenditure and Consumption Survey (PECS) is a multi-purpose survey (on household budget and living standards), based on which official poverty estimates are estimated for the Palestinian Territories. The first PECS survey was implemented by the Palestinian Central Bureau of Statistics (PCBS) in 1995, seven years after the declaration of the state of Palestine. The PECS survey was designed to be implemented on an annual basis, and poverty estimates were first produced in 1998. In 2009, PCBS requested technical assistance from the World Bank to validate its poverty measurement methodology, and to improve it in line with international best practices. This programmatic technical assistance (implemented over the period 2008-2010)- which initiated a long-standing technical partnership between PCBS and the World Bank- successfully implemented critical improvements to the measurement methodology; and suggested improvements in survey design that would be particularly relevant for middle income countries with largely urban populations like Palestine. These recommendations are summarized in Box 1.

Despite a protracted and continued situation of volatility and conflict, PCBS successfully implemented the PECS survey annually until 2011. After 2011, there was a gap in data collection, which, in large part, followed a financing gap. In 2014, the World Bank's Poverty and Equity team secured financing to fill the gap through the Trust Fund for Statistical Capacity Building; and supported a program of technical assistance centered on this survey. Subsequently, the 2016 PECS was implemented for a 12-month period, starting in October 2016. The technical assistance program had two main goals: (i) improving survey design and reducing the time-gap from survey completion to the availability of data for analysis; and (ii) to inform internal discussions and debate on improving the poverty measurement methodology, by taking advantage of newly available data and improved measurement methods.

Box 1: Improvements to Poverty Measurement Methodology adopted in 2009

The current official methodology for poverty estimation was first developed in 1998, and it was subsequently revised in 2009 following a program of technical assistance (TA) implemented by the World Bank (World Bank 2010). The methodological improvements that were adopted included: (i) Calculation of poverty at the individual rather than the household level; (ii) Spatially adjusting to allow for variation in prices; and (iii) an inflation based update of the poverty line to establish a consistent trend. This TA program also made other key recommendations that could not be adopted in 2010 due to limitations in survey design. These recommendations included: (i) Adopting better spatial adjustment methods, that could better account for the differences in the prices of non-food items which are empirically relevant in Palestine's middle income context; (ii) adapting survey design to allow for the estimation of a flow of services from durable goods; and (iii) improving survey data collection on expenditures related to housing(rents) and health (by further investigating the use of public and private health care facilities, and health insurance regimes).

Source: World Bank (2010)

This main objective of this technical review is to consider several different elements of the official poverty estimation methodology with the aim of informing and improving poverty measurement going forward; and to document the availability and identification of new survey and CPI data that can be used to implement the proposed improvements. In particular, this review (i) uses detailed and disaggregated data from the 2016 PECS, to examines several elements of the official methodology, with a focus on key elements in the non-food component of the welfare aggregate that are likely to be important to accurately measure monetary living standard in middle income country contexts; and (ii) examines the implications of using an absolute poverty line following a costs of basic needs approach (Ravallion 1998), and compares these results to the relative poverty line that is currently in use. The note also explores the implications of alternate adjustments to household size (per capita vs adult equivalent) on poverty. The new data and proposed improvements that this review examines are highlighted in Box 2.

Box 2: Improvements in 2016 PECS survey and availability of CPI data

The 2016 PECS is a 12-month survey that covered 3739 households, and was implemented from October 2016 to September 2017. For this survey, PCBS adopted some key improvements recommended by the technical assistance program that was supported the Trust Fund for Statistical Capacity Building.

Improvements in survey data: The PECS is a is a multi-topic survey that collects information on a range of topics that include food and non-food expenditures (based on a 30-day diary for most items and 12 month and 3 year recall for some unregularly purchased items), core data on socio-economic and health characteristics, dwelling conditions, and labor activities and incomes. The 2016 PECS was modified and improved based on the recommendations made by the World Bank in 2010. In particular, it collected for the first time detailed information on the key durable assets including purchase and current values. This new data allows for methodological improvements in how expenditures on durable assets are measured. Additional questions were also added to better measure the quality of access to improved water and sanitation.

Data to improve spatial adjustments: Components of the non-food CPI that were previous not available, were provided to the bank team for the 2016 PECS (rents). This data, along with the use of unit values for food prices, allows for different experiments with spatial adjustment of the welfare aggregate and the construction of spatial deflators.

In summary, our main recommendations focus on key improvements needed for more accurate estimates of welfare and distributional measures. Given the importance of non-food expenditures in the welfare aggregate, and in particular, the importance of housing and durables, the key recommendations for improvement are centered around (i) the adoption of the flow of services approach for consumer durables; (ii) survey design improvements for more accurate estimates of the flow of services from dwellings; and (iii) improvements in and the incorporation of measures of spatial price differences in the costs of housing. The review also highlights additional improvements that can be incorporated and where appropriate, affirms the methodological decisions adopted under current practice.

The rest of this review is organized as follows. Section 2 briefly discusses the main methodological issues in poverty measurement. Section 3 explains the construction of different components of the welfare aggregate. Section 4 discusses the methodology for calculating poverty lines. Section 5 examines the robustness of poverty estimates to different methodological choices made; and Section 6 concludes with recommendations.

2. Methodological issues in poverty measurement[1]

This section outlines some of the key methodological issues in measuring monetary poverty. In general, poverty measurement includes two key choices: (i) the choice and construction of a welfare aggregate, which allows the analyst to rank the population based on this measure of welfare; and (ii) setting the poverty line, or defining the minimum welfare level below which individuals or households are considered poor.

The first step in the process of defining a welfare aggregate is choosing whether to use income or expenditures to measure monetary welfare. The appropriateness of the measure typically depends on country context. Having detailed and quality information based on a well-designed questionnaire, whether on income or consumption, is the critical element in welfare measurement. In rich, developed countries, incomes are typically the basis for measuring welfare, as a high degree of formalization in the economy allows for accurate reporting on all sources of income. For example, poverty in most of the European Union countries is measured by income.[2] In non-developed countries on the other hand, consumption or expenditure is arguably more closely related to well-being than income, because (i) may be better measured in countries with large agrarian (and self-production) and informal sectors, while incomes tend to be under-reported (Azzarri et al. 2010) and (ii) because it reflects not only the goods and services a household can afford based on their current income but also whether the household can access credit markets especially during times of income volatility. Thus, consumption is less subject to seasonal volatility in rural areas compared to income and is more likely to be representative of general welfare (Coudouel, Hentschel and Wodon 2012; Haughton and Khandker 2014).

Once the choice between income and expenditures has been determined, the components of the welfare aggregate need to be defined. On the one hand, the welfare aggregate should be comprehensive enough to capture important dimensions of wellbeing, while on the other, being attentive to concerns about measurement error. The key criterion to guide the selection of components is whether the inclusion of the component improves the ability to correctly rank individuals in terms of their wellbeing, or if the additional information (or the way the information is collected) simply adds noise to the measure. Food consumption, for example, includes expenditures or consumption from own production, transfers and food outside home. Nonfood consumption usually excludes lumpy infrequent expenditures (e.g. funerals, weddings, Hajj), investment and items, which are hard to estimate accurately. In contrast, durables require a particular treatment because they are bought at a particular point in time, but consumed during

[1] This section draws heavily from Atamanov et al (2016).

[2] Nevertheless, Meyers and Sullivan (2009) argue that even for a developed country like the United States, consumption is a better measure especially for those at the lower end of the distribution.

a period of several years. Consumption should include only the annual consumption of a durable rather than purchase value (Amendola and Vecchi 2014). The same principle should apply in measuring the value of housing services (Deaton and Zaidi 2002, Haughton and Khandker 2014).

There is no consensus in literature on whether health expenditures should be included in the welfare aggregate. One argument to exclude health expenditure is because they often imply a regrettable necessity and do not contribute to welfare. Another fundamental issue is the inability to distinguish between health expenditures aimed at improving welfare and health expenditure as a regrettable necessity. The decision on the inclusion is sometimes made based on elasticity of health expenditure with respect to total expenditure. Essentially if one observes individuals with high values of consumption (not including health expenditures) having high expenditures on health, then it is assumed that on average health expenditures are reflecting preventative health expenditures and will help to better sort the population in terms of well-being. So, a higher elasticity implies a stronger case for inclusion. Even though education expenditures can be seen as investment rather than current consumption, this component is often included in welfare aggregates, as recommended by Deaton and Zaidi (2002). Following Deaton and Zaidi (2002), we check the elasticity of education expenses as well.

After the welfare aggregate is constructed, this aggregate needs to be adjusted to allow for valid inter-personal comparisons of welfare. In particular, spatial and inter-temporal deflations are required to account for temporal and spatial differences in prices faced by households. This process makes, for instance, the expenditures incurred by households interviewed in January comparable with those incurred by households interviewed in August; or similarly, across those living in small villages in a desert area to those living in big cities by the sea. Inter-temporal adjustments within the survey period are usually done by using official consumer price index, while spatial adjustments can be done either by using prices from CPI in different locations (if the CPI has an inbuilt spatial deflator[3]) or by calculating unit values from the survey. The advantage of using prices from CPI is that prices on non-food items can be taken into account, as these are generally not collected in household surveys. However, it is important to check the coverage because very often these prices are collected in urban areas only. Sometimes, CPIs do not have any spatial deflators built in and in these cases, they cannot be used for spatial adjustment of the welfare aggregate.

The second important adjustment is related to the adjustment of welfare aggregate for household composition. This is usually done by simply dividing household consumption by total household size; or by taking into account household-economies of scale and adult-equivalence scale adjustments. Using household size is appealing for its simplicity and transparency, and it is very often used to measure poverty at the individual level. Welfare aggregates per adult equivalent are also frequently used to capture differences in consumption requirements by age. For example, young children may have lower food requirements compared to adults. Economy of scale can be introduced as well by adding elasticity ranging from zero to one (Haughton and Khandker 2014). The key challenge in using an adult equivalent is picking

[3] This is only true if the CPI is explicitly set up as a spatial deflator i.e If all regional CPIs are not set to equal 100 in the base year.

an appropriate scale, as there are very few satisfactory ways to estimate economies of scale (Deaton and Zaidi 1998).

Once the welfare aggregate is finalized, the next step is to construct the poverty line, that defines cutoff points to define who is considered poor in a geographic area at a given time. The choice of a poverty line depends on the local context, and it typically varies with across high and low-income countries. In developing countries, where a significant proportion of the population cannot meet its basic needs, an absolute standard is often used to set the poverty line. Wealthier countries, where absolute deprivation is not as significant often use relative poverty lines, where the line is defined in relation to the overall distribution of income (World Bank 2015). At present, Palestine uses a relative poverty line[4].

Several countries use an absolute poverty line, where households whose consumption expenditures or incomes fall below this line are considered poor; and the most common approach in setting an absolute poverty line is the "cost-of-basic-needs approach (CBN). In this review, we examine the implications of using a CBN line for Palestine. The CBN approach involves three main steps. The first step is to identify a minimum nutrition requirement or threshold, which is usually defined in terms of minimum caloric requirements. This nutritional threshold is typically estimated to ensure that it is consistent with local tastes and consumption patterns. Selecting one requirement for all individuals is an approximation given that food needs are heterogeneous across the population in reality, but the advantage of having a single requirement is transparency, simplicity and ease of communication. The second step is to estimate costs of meeting this nutritional requirement, using a diet that reflects the consumption patterns (or a typical food basket) of households near the poverty line. This will give the food component of poverty line, or the food threshold. The third step is to define the total poverty threshold by adding to the food threshold the non-food threshold, which includes the additional income or expenditures required for the sustenance of the minimum non-food basic needs. This estimation can be done in multiple ways (Ravallion 1998).[5]

3. Welfare aggregate and its components[6]

Palestinian households spend close to one-third of the budgets on food items (32% including food away from home), and about two-thirds (68%) on non-food items. This expenditure pattern reflects that of a standard middle-income country, where households spend a large share of their budgets on more expensive calories within food, and on non-food items relative to food.

[4] First, a "deep poverty line" is calculated to reflect a budget for food, clothing and housing. A second "poverty line" then adds necessities including health care, education, transportation, personal care, and housekeeping supplies.

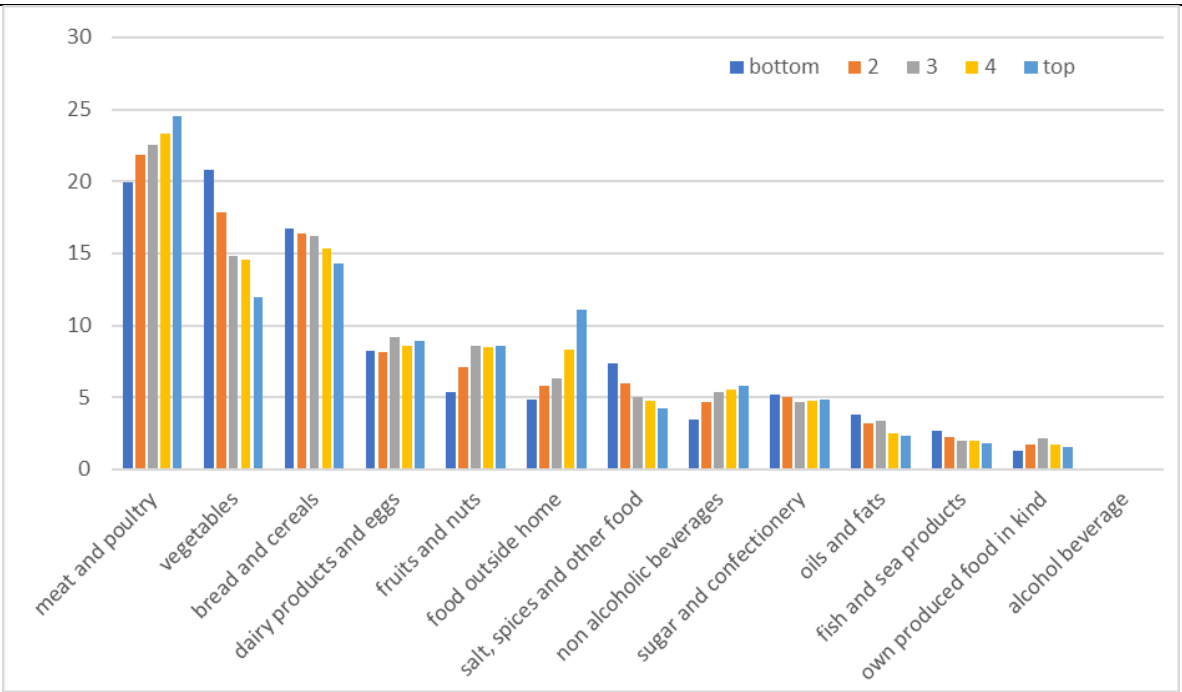
[5] Obtained line is often called upper poverty line, while in many countries lower poverty line constructed as well. For lower poverty line, the reference population for nonfood share is from subsample of households whose total expenditures per capita are close to food poverty line.

[6] Welfare aggregate is usually a mixture of expenditure and consumption (PECS mostly records expenditures and we add consumption from using durables and dwelling), therefore we use both terms interchangeably while talking about welfare aggregate.

3.1 Food items

The 2016 PECS collects information on food purchases over four weeks through a month-long diary.[7] In addition, respondents are asked about their expenditure on food away from home (take away food and food in restaurants) and own production. Both expenditures and quantities purchased are recorded.[8] On average, expenditures on food comprise 32% of total consumption expenditure; and households across the expenditure distribution consume high-calorie cost items. The top three food groups consumed in Palestine are bread and cereals, meat and poultry, and vegetables. **Error! Reference source not found.** b elow shows the shares of different food groups in total food consumption across consumption (per adult equivalent) quintiles. In general, the poorer quintiles rely more on cheaper calories from cereals and vegetables, while the richer quintiles have higher shares of total food consumption coming from more expensive sources of calories - meat, fruits and food away from home. In absolute terms, the richest spend about eight times more on food away from home than the poorest per adult equivalent. Fish and seafood as well as alcohol account for negligible shares of food consumption, as would be expected.

Figure 1: Shares of food products in total food consumption by quintiles, %



Source: PECS-2016, authors' calculation.
Note: Quintiles are based on consumption in per adult equivalent.

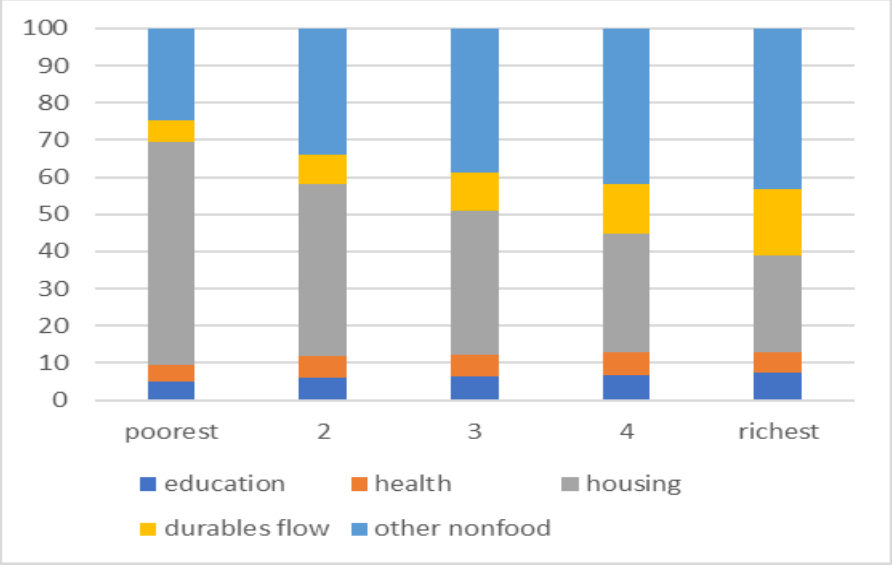
[7] A four-week diary recording period is generally longer than the 2-week diaries that are used in other countries in the region. Some countries are switching from diaries altogether to using recall modes to collect information on food consumption.

[8] Seven households recorded zero food purchases (not dropped). In many countries, consumption is recorded in addition to expenditures.

3.2 Non-food items

As in other middle-income countries, non-food items account for large share of expenditures in Palestine (68%). Within non-food, housing, durable assets, and education and health account for a large share of household's expenses (these four categories together account for 63% on non-food). The composition of non-food expenditures also varies by quintiles, and this is presented in Figure 2. Given the importance of non-food in the household budgets, measuring these items accurately is critical for an accurate measure of welfare aggregates, as well as the welfare ranking of individuals.

Figure 2: Nonfood expenditure structure by quintiles, %



3.2.1 Housing Services

The flow of services from dwellings or housing services alone accounts for 41 percent of total non-food expenditures, or 28 percent of total expenditures. It is single largest non-food component, and accounts for 60 percent of non-food expenditures for the poorest quintile, and 26 percent for the richest. Typically, the flow of services from housing is estimated using rental values. Such an approach works well in economies with large and functioning rental markets as rental values can be imputed to owner-occupied dwellings based on the observable characteristics of these dwellings. In countries with small rental markets, getting an accurate estimate of this important component of welfare can be more difficult.

Information on actual and reported rents is collected in the dwelling section of the survey. While services from dwellings are an important component, the prevalence of a rental market is small and geographically concentrated (the West Bank is largest in terms of numbers, East Jerusalem is the largest in terms of shares). From 3,739 sampled households, 292 households rented apartments. Most of the remaining households (n=3447 households) owned dwellings and reported estimated rents by answering the question "If you were to reside in a similar dwelling, what would be the estimated rental monthly value".

Table 1 presents the spatial distribution of home ownership and rental dwellings across areas: West Bank, East Jerusalem and Gaza. Overall, about eight percent of households are renters. This share varies being the highest in East Jerusalem (around 21 percent of households are renters).

The current methodology used by PCBS relies on including actual rents reported by renters and estimated rents from owners. This is a simple and transparent method, but it may be problematic due to the existence of rent controls in some of the dwellings that are older/located in the historical areas of old cities. Tenants from these dwellings pay rents lower than the market values, and they therefore have artificially lower "use-values" and thus appear to be poorer than they are. Renters living in rent-controlled dwellings cannot be distinguished in the data from those who rent non-controlled dwellings. In addition, owners may also tend to report inflated values when asked for a rental value of housing that would be equivalent to their home. Figure 3 and Table 2 demonstrate this difference between owners and renters. Across all areas, renters tend to have lower rents than self-reported rental values from owners. Due to these measurement issues, the inclusion of rent-controlled dwellings in the hedonic rent model or simply using reported rents will contaminate the imputation for the "use-value" of the dwelling.

Table 1: Regional distribution of renters and owners

	West Bank	East Jerusalem	Gaza	Total
		Shares, %		
owners	93	79	93	92
renters	7	21	7	8
		N		
owners	2041	171	1235	3447
renters	152	46	93	292

Source: PECS-2016, authors' calculation.
Note: Shares are calculated for households.

Figure 3: Reported rent values among owners and renters

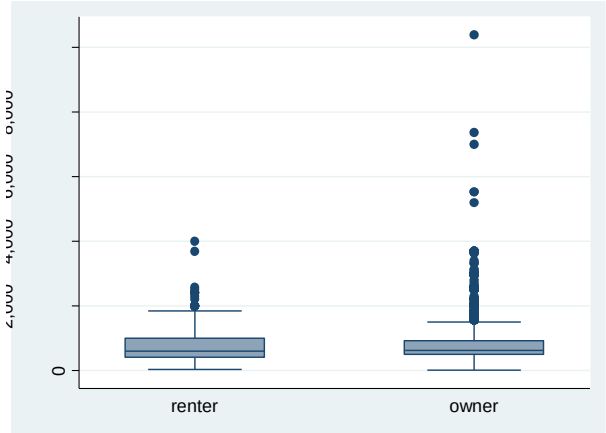


Table 2: Monthly rent by renters and owners across regions in New Israeli Shekel (NIS)

	West Bank	East Jerusalem	Gaza
renter	674	1980	488
owner	842	2020	594
Total	830	2011	587

Source: PECS-2016, authors' calculation.

Source: PECS-2016, authors' calculation.

Table A1 in the annex reports two hedonic regression models where logarithms of rent values are regressed on a series of housing characteristics. The first regression includes all respondents, while the second one includes only owners. Even after controlling for the dwelling characteristics, owners tend to report 30 percent higher values in rent values. This can be a result of respondent bias, or it can simply reflect rent controls which make values for renters lower. Concerns about rent control were the basis for deciding to use self-reported rents among owners, or the second model, to predict rent based on a series of housing attributes. To ensure that all households are treated similarly, the predicted rental value from the model is used for all households.[9]

Table 3 and Figure 4 below compare actual with predicted values of rent across areas for renters and owners. As one would expect with rent controls, predicted values are consistently higher than actual values for renters across all areas. Using predicted values also narrows the distribution among owners. This is particularly true in the West Bank, where very high self-reported values were observed. Given a small number of renters (about eight percent), the overall impact of using imputed rents on the total welfare aggregate is not expected to be high, but some re-ranking of households is expected to happen.[10]

In summary, rents account for a significant share of non-food expenditures, and how they are measured matters to the welfare ranking of households, as well as to the spatial distribution of household welfare. In the current data, rental values – whether they are self-reported, or imputed through regressions- likely reflect measurement error. Rent control laws further complicate this measurement issue. Improving data collection on rents will be very important to accurately measure the welfare aggregate in Palestine (Box 3).

Table 3: Comparing reported and predicted monthly rents for renters and owners across areas in NIS

	West Bank		East Jerusalem		Gaza	
item	reported rent	predicted rent	reported rent	predicted rent	reported rent	predicted rent
renter	674	873	1980	2098	488	591
owner	842	810	2020	2059	594	613
Total	830	814	2011	2068	587	611

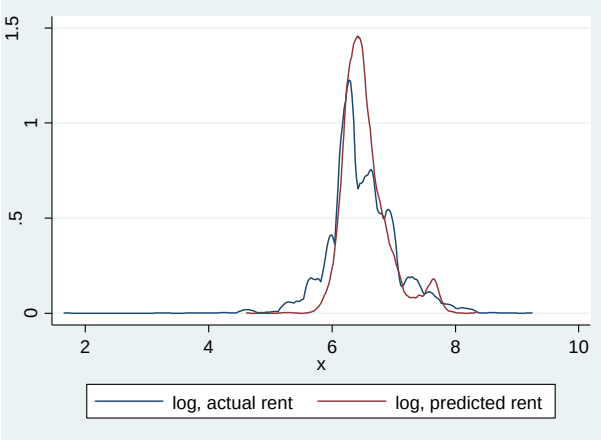
Source: PECS-2016, authors' calculation.

[9] Predicted log values were transformed to absolute numbers following Duan's (1983) smearing transformation. Predicted values were used for constructing Laspeyres with rent shown further in the text. Missing values if any will be replaced by medians which are calculated for at least four observations at the PSU, governorate and regional levels. Medians at the lowest aggregation are used for replacement.

[10] Despite the differences in rent values across two approaches, impact on average welfare aggregate, poverty and inequality does not seem to be large. In particular, imputing rent from the owners to everyone will make consumption per adult equivalent slightly lower, poverty and inequality slightly higher, but the difference is not statistically significant.

Figure 4: Box chart of actual and predicted rent among renters and owners, NIS

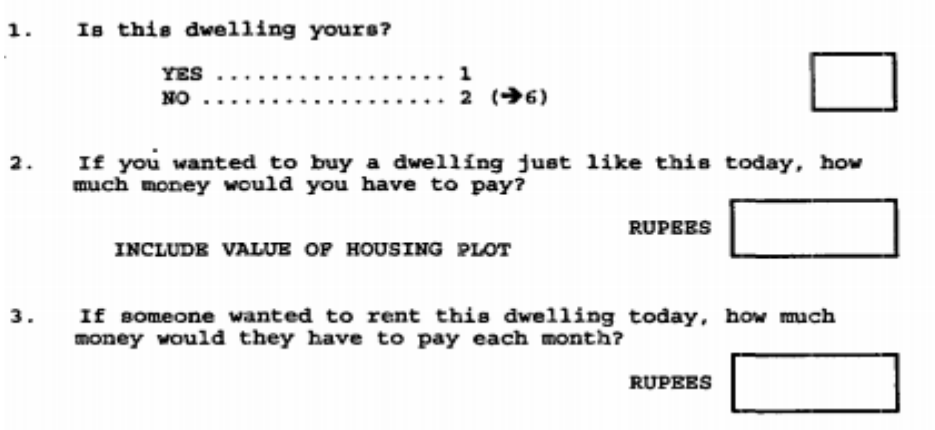
Figure 5: Kernel density function for logarithm of actual and predicted rents



Source: PECS-2016, authors' calculation.

Box 3: Improving data collection on rents

In 2010, it had been recommended that future PECS surveys make an attempt to improve the quality of information on housing by asking households to self-report the property value of their residences. Using an approach similar to that for durable goods, this 'stock' value, can then be used to estimate a 'flow of services" from housing (World Bank, 2010). However, this recommendation also came with a caveat – that these values could face similar shortcoming to the self-reported value for rent by owners in the current PECS survey. It is therefore recommended that this approach be carefully pilot tested for adoption in the next rounds of the PECS survey. A sample of this such a questionnaire from Deaton and Zaidi (2002) is below.



1. Is this dwelling yours?

   YES 1
   NO ..... 2 (→6)

2. If you wanted to buy a dwelling just like this today, how much money would you have to pay?

   RUPEES

   INCLUDE VALUE OF HOUSING PLOT

3. If someone wanted to rent this dwelling today, how much money would they have to pay each month?

   RUPEES

3.2.2 Durables

The flow of services from durable assets accounts for 11 percent of non-food expenditures on average. In line with greater durable asset ownership among more well-off quintiles, the share on durables in non-food is three times higher among the richest quintile relative to the poorest. There is also a clear variation in the ownership of these assets across space with households in Gaza being less likely to own durables including cars, TV, solar panels, smartphones, solar boilers (Table 4). Measuring the flow of services from durables in not trivial as it requires information not just on the stock of durables owned by the household, but also information on the year of purchase, purchase price and estimates of current sale value.

Table 4: Average household ownership of durables among households, %

Asset	West Bank	East Jerusalem	Gaza	Total
Private car	36%	65%	6%	27%
Public car	3%	3%	2%	3%
Motorcycle	1%	2%	7%	3%
Tuk-Tuk	0%	0%	2%	1%
Refrigerator	99%	99%	95%	98%
TV	64%	90%	30%	54%
Washing machine regular	50%	15%	57%	51%
Automatic washing machine	50%	85%	42%	49%
Solar panel	60%	39%	31%	49%
Solar boiler	54%	84%	37%	50%
Satellite	92%	97%	69%	84%
Computer	41%	29%	28%	36%
Smartphone	86%	98%	75%	83%
Play station	3%	6%	1%	2%
Ipad/tablet	19%	11%	18%	18%

Source: PECS-2016, authors' calculation.
Note: Household weights are used.

In the past, the PECS included information on purchases of durable assets during last year, assets related to transportation during last three years. While this approach is used in some countries due to its simplicity (and the absence of a data requirements on the stock of durables), this does not follow best practice methods. In particular, it can be misleading because durables are consumed over a longer time range, while the purchase price corresponds to the value of good for its entire life (Amendola and Vecchi 2014). Instead of focusing on purchases, the welfare aggregate should ideally include only the use value of a durable for a given reference period – which is typically a year. In order to properly estimate a consumption flow from durables, the survey instrument should collect detailed information on the stock of durables, including the year of purchase, and purchase and current values. For the first time, PECS-2016 collected all this information for the fifteen key durables assets. For each asset, information about three most recently purchased items was collected.

This additional survey data allows us to test two methods to calculate consumption flow from durables. The first method is very simple and is based on assumed life-time for each item (T). In this method, the depreciation rate (δ) will be equal to δ=1/T, while consumption flow=p_t*δ, where p_t is the current value

of a durable. The key advantage of this method is simplicity, but the assumed life-time for durables will be arbitrary numbers.

The second method is based on Deaton and Zaidi (2002). Following this method, median depreciation rates are calculated from the data for each item using the following formula

$$\delta = 1 - \left(\frac{p_t}{p_{t-T}}\right)^{1/T},$$

where p_{t-T} is initial value in current prices, p_t is current values, and T is time the durable is owned.

The flow of consumption services is then calculated then using the formula

$$\text{consumption flow} = p_t * \delta/(1- \delta)\ .$$[11]

Several important assumptions had to made while implementing two methods. Firstly, public cars were dropped from calculation consumption flow because it was not possible to separate business and household related consumption. Secondly, median depreciation rates are calculated for the whole country and not for specific regions because for some durables the number of observations were not sufficient. Thirdly, there were items with missing current values. The following algorithm was used to impute the values for them. Average current values were calculated for each household and each durable across non-missing values for three reported items. The averages were used to calculate median values for each durable at the PSU, governorate, area and regional levels for at least four observations. Both averages and medians were used to replace missing values for three items and to impute values for 4th item and above. If the household possessed less than four items and had a non-missing current value for at least one of them, the average of non-missing values was imputed. If all current values were missing, the median at the lowest aggregation level was used. For households with four items and more, the value of the third item was used. If it was missing, the average was used and if the average was missing, the median at the lowest aggregation level was imputed.

Table 5 shows the depreciation rates from two methods that were tested. On average, cars and motorcycles have the lowest depreciation rates about nine percent a year, while electronics such as smartphones and iPads loose one third of their value in a year. The estimated depreciation rates are different and higher from what was *a priori* assumed almost for all durables.

The choice of how durables are treated has an important implication for the welfare aggregate as shown below (Table 6 and Figure 6). As expected, a simple inclusion of purchases underestimates welfare aggregate, especially for the poorest who own assets, but rarely buy them. Using consumption flow for durables instead also makes the distribution narrower. Given that estimated depreciation rates are higher for most items than rates from assumed lifetime, consumption flow from this method is also higher.

[11] In both methods, real interest rates are assumed to be zero. CPI is used to bring purchase values into current prices.

Table 5: Depreciations rates using two approaches

	assumed lifetime	depreciation rate based on assumed lifetime	estimated median depreciation rates	lifetime based on median depreciation rates	N
Private car	15	7%	9.1%	11	607
Motorcycle	15	7%	8.7%	12	54
Tuk Tuk	15	7%	8.8%	11	14
Refrigerator	10	10%	16.2%	6	2523
TV	10	10%	21.0%	5	1491
Washing machine regular	10	10%	18.5%	5	1315
Automatic washing machine	10	10%	19.8%	5	1167
Solar panel	5	20%	11.2%	9	1303
Solar boiler	5	20%	17.7%	6	1380
Satellite	5	20%	16.1%	6	2210
Computer	5	20%	19.3%	5	1122
Smartphone	5	20%	33.3%	3	3506
Play station	5	20%	21.0%	5	57
Ipad/tablet	5	20%	33.5%	3	485

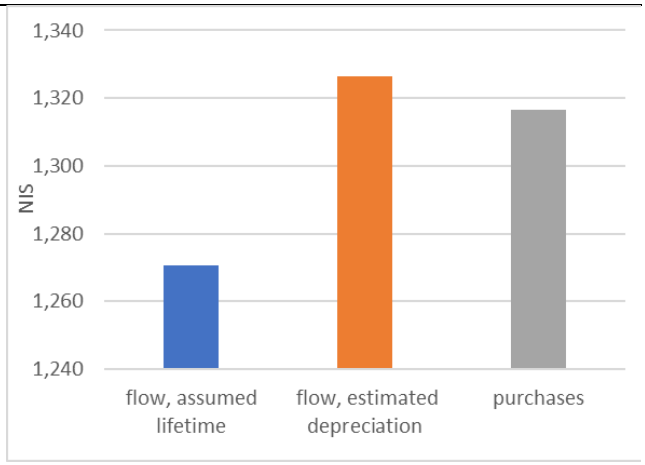
Source: PECS-2016, authors' calculation.
Note: Household weights are used.

Table 6: Monthly value of durables under different approaches per adult equivalent, NIS

	flow, simple approach	flow, estimated depreciation	purchases of durables
poorest	13	22	15
2	29	45	31
3	51	86	70
4	90	147	130
richest	224	376	379
total	81	135	125

Source: PECS-2016, authors' calculation.
Note: quintiles are different for each scenario.

Figure 6: Treatments of durables in welfare aggregate per adult equivalent, NIS



Source: PECS-2016, authors' calculation.

In summary, using median depreciation rates from the data is a preferred option for calculation of consumption flow from the durables and is feasible with new data in PECS-2016. The 2016 survey adopted a durables module that was used recently in Iraq, and some key takeaways from the experience of implementing this in Palestine are highlighted in Box 4.

Box 4: Measuring the flow of services from durables in the 2016 PECS

The 2016 PECS added new questions on the flow of services from durables. The design of this module (below), followed a module adopted recently in Iraq. While this module was successful in that it was able to deliver key data needed to measure the flow of services from durables, one question in particular had a high rate of item non-response due to the difficulty faced by households in recalling the year of manufacture of durables (H27).

LINE NUMBER	COMMODITY	H24	H25	H26	H27	H28	H29
		What is the total number of ...DURABLE GOOD]... owned by the members of this household?	Commodity order according to last acquired	When owned /bought family this good	What is the year of Manufacturing	How much You paid a price for this good?	If you were to sell this good today, how much would you get in the market
		NUMBER		YEAR	YEAR		
01	Private cars		1				
			2				
			3				
02	Public vehicles		1				
			2				
			3				
03	Motorcycle		1				
			2				
			3				

3.2.3 Education and Health

Health and education expenditures together account for 11 percent of average non-food expenditures, and are roughly equally important in their contribution to the welfare aggregate. As noted in section two, there are no clear rules on whether education and health expenditures should be included or excluded from welfare aggregate and the decision is mostly based on country context and empirical relationships between these two groups of expenditure with total welfare aggregate. The current methodology used by PCBS includes both education and health expenditure to welfare aggregate.

Before calculating elasticities as suggested in Deaton and Zaidi (2012), shares of households with non-zero expenditures on health and education were calculated. Overall, expenditures on health and education are quite regular. Thus, about 84 percent of households had health expenditure and 89 percent of households with children age 7-22 spent money on education. Shares of health and education expenditure in total consumption as well as absolute values spent per adult equivalent are shown in Table 7. There is a positive relationship between budget shares and amounts spent on education and health with wealth, but the income gradient is not steep at least for shares.

The elasticity of education and health expenditures with respect to total expenditure per adult equivalent has been estimated to determine whether education and health expenditures are closely associated with wellbeing. [12] The point is to keep expenditures with high elasticities to total expenditures. In contrast to many countries, both elasticity coefficients for health and education expenditures to total expenditure was found to be lower than one: 0.89 and 0.91 respectively. Elasticity of health expenditure is significantly lower than one, while for education is not significantly different from one. Given this empirical finding and recommendations from Deaton and Zaidi (2002), the decision is to keep education in and drop health expenditure from welfare aggregate. Exclusion or inclusion of these components change welfare aggregate by about 8 percentage points (about 4 percentage points from each component).

Table 7: Monthly expenditure and budget spent on education and health

	Education		Health	
	expenditure per adult equivalent, NIS	share	expenditure per adult equivalent, NIS	share
bottom	19	3.3	17	2.9
2	36	4.1	34	3.8
3	53	4.4	46	3.8
4	78	4.8	66	4.1
top	148	5.5	110	4.1
Total	67	4.4	55	3.7

Source: PECS-2016, authors' calculation.

Note: household weights are used. Spatially adjusted per adult equivalent welfare aggregate including health and education is used.

This analysis suggests that education expenditures should continue to be included in the welfare aggregate, while health expenditures could be dropped due to their low elasticity. However, access to health insurance may underlie these low levels of spending on health and additional analysis may be warranted.

3.3 Adjustments to welfare aggregate

Once the welfare aggregate is estimated, it is important to undertake adjustments to make the aggregates comparable for households interviewed in different months within the survey period, and for households living in different parts of the country, so that price differences can be appropriately accounted for.

3.3.1 Inter-temporal adjustment

Given that survey data collection was undertaken over a 12-month period, some households may have higher expenditures simply because of higher rates of inflation during the month in which they were interviewed. Therefore, a within year price adjustment is needed to make sure inflation does not alter the ranking of households. The current methodology does not include this type of inter-temporal adjustment.

[12] The regressions are run on welfare aggregates (without health and education) and its components after inter-temporal and spatial deflation. In order to keep zero expenditures on health and education, the inverse hyperbolic sine transformation was applied, which approximates the logarithm for large values (Burbidge, Magee, and Robb 1988). For education expenditure, the sample was limited to households with kids (6-22 age).

An inter-temporal adjustment is incorporated by using the monthly CPI to rebase all expenditures reported in the survey to the average of survey period (October 2016 till September 2017).[13] Since inflation during survey period was lower than one percentage point, the impact of inter-temporal adjustment on the welfare aggregate is negligible in this case. Nevertheless, this adjustment should be included in the methodology going forward for survey years when month-to-month price variations may be more important.

3.3.2 Spatial adjustment

Spatial adjustment is another crucial step to make sure that the expenditure or consumption of households in different regions can be compared. The current methodology constructs a Laspeyres index using prices for 143 food and nonfood products from urban areas of West Bank and Gaza. The index is constructed for three areas: West Bank, East Jerusalem and Gaza. The base is national average prices. A detailed explanation of how the spatial index is constructed can be found in World Bank (2010). As part of the analysis undertaken in this note, we also constructed two alternate price indices to this baseline index. The first is a Paasche index using unit food values and the second is a Laspeyres index which attempts to incorporate spatial difference in housing costs by including rental values for three-room apartments from the CPI.[14]

The food spatial deflator is constructed from unit values of purchased food products (excluding food away from home) and is based on Paasche price index following Deaton and Zaidi (2002). Paasche index is calculated using the formula below

$$P_P = \left(\sum_{k=1}^{K} w_{hk} * \frac{P_{0k}}{P_{hk}} \right)^{-1},$$

where w_{hk} is the share of household h's budget devoted to good k. P_0 is reference price vector at the national level. P_h is vector of prices household face. For the spatial deflator, food unit prices are used to calculate household level deflators, which are then averaged to three areas: West Bank, East Jerusalem and Gaza. The whole process is described below.

Unit food prices are calculated by dividing inter-temporally (within-year) adjusted expenditures by purchased quantities. To make sure prices are calculated for consistent units, all quantities are transformed to kilograms or liters. Products with zero or missing quantities are dropped. Products observed less than six times at the national level are dropped as well. Finally, outliers in unit prices at the sub-regional level - lower or higher than 2.5 standard deviation from the mean – were identified and replaced by missing values. Missing values were replaced by median values at the lowest possible level

[13] Monthly CPI series from PCBS were used. Recall period was different across products including one month, one year and three years. Therefore, adjustments were done separately for each group of products. Applied CPI is shown in the annex.

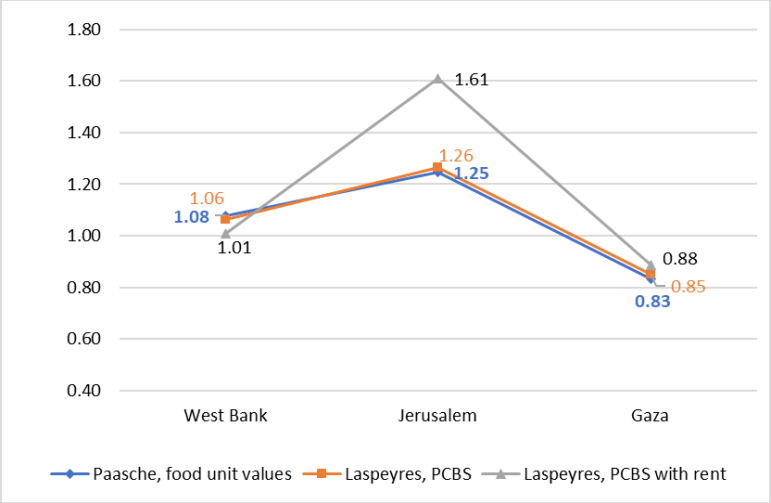
[14] To be consistent with the way preferred welfare aggregate is constructed, rent expenditures are based on imputed values for both renters and owners.

starting from PSU level, followed by strata, governorate, area and finally the national level. Households expenditures were recalculated using cleaned unit values and reported quantities.

Household level deflators are constructed for each product by dividing household level prices over median prices at the national level. For each household, the average deflator is constructed using expenditure shares of different products as the weight. Thereafter, average deflators by area are calculated and will be applied to each household for the spatial adjustment.[15]

Figure 7 compares the Paasche food index with the baseline Laspeyres index based on food and nonfood prices. Both indices are quite close to each other even though the Laspeyres index includes prices on selected non-food products. This probably happens because the Laspeyres index includes only a limited range of nonfood items and does not include prices on dwellings which might have the largest price variation across areas. Indeed, the alternate Laspeyres index with rents is very different for Jerusalem from the other two. In particular, it shows that prices in East Jerusalem are 61 percent higher than average prices in the country.[16]

Figure 7: Paasche index based on unit food values and Laspeyres based on food and nonfood consumer prices



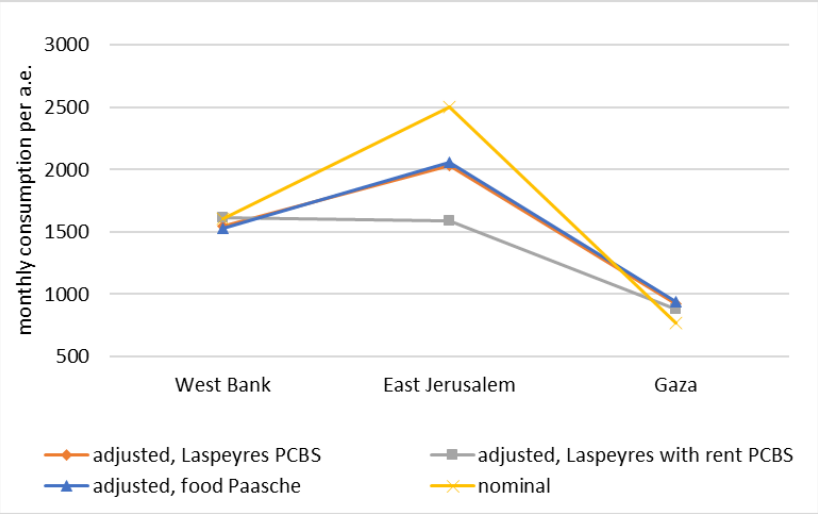
Source: PECS-2016, authors' calculation.

[15] Using area level deflators is easier for communication than having household specific deflators and is more robust to extreme values.

[16] One alternative way to capture better spatial variation in prices if prices on dwelling are not available is to construct rent deflator using estimated rents of owners and predicting rent for a common dwelling. Constructed deflator can be then applied to housing component of welfare aggregate. A hedonic regression model is estimated based on owners. The specification of the regression is the same as for the one used to predict rents to be included to welfare aggregate. Rent is predicted for three areas for a typical media dwelling defined at the national level. In particular, the most common dwelling selected has 4 rooms, two bedrooms with walls from concrete bricks, with reinforce concrete casting roof, water coming from local public network, drinking water coming from pipe, public network sewage, heating coming from electricity, and distance from public transportation less than one kilometer. Predicted rents were used to construct national weighted average and to calculate rent deflator. Obtained rent deflator was 1.01 for West Bank, 2.09 for East Jerusalem and 0.80 for Gaza.

The impact of using spatial adjustments on the welfare aggregate is shown below (Figure 8). Clearly, using nominal expenditure makes regional differences unreasonably high. As expected, correction for spatial variation in prices reduces the gap between areas. In particular, the population in East Jerusalem becomes less well-off, while the population in Gaza becomes better off after spatial adjustment. The largest adjustment comes from using the Laspeyres index with rent. Using this deflator actually changes the ranking of regions based on the adjusted versus unadjusted welfare aggregate. In particular, average consumption per adult in equivalent in East Jerusalem becomes slightly lower than average consumption in West Bank. Overall, these findings signal about importance of taking into consideration the differences in prices across areas, in particular price differences related to dwellings, which are the single largest non-food component.

Figure 8: Welfare aggregate using different spatial deflators



Source: PECS-2016, authors' calculation.
Note: Welfare aggregate is in adult equivalent terms.

In line with the large share of dwelling services in the total welfare aggregate, spatial price differences in housing, if taken into account, have major implications for spatial patterns of welfare. Thus, improvements in measuring the flow of services from housing in the welfare aggregate and in measuring spatial differences in rental values are one of the most important issues to address going forward, and will significantly affect welfare and distributional measures of welfare.

3.3.3 Adjustment to demographic composition

PCBS uses an adult equivalence scale for the construction of poverty lines. Children are assumed to consume less than adults and economies of scale in larger households are taken into account. Specifically, the calculation to adjust the poverty line across different households is (Number of adults + 0.46 * number of children) ^ 0.89. The parameters were obtained empirically from PECS-1996 (Khawaja 1998). The same equivalence scale is used in the proposed CBN method. The implications of using per capita welfare aggregate are discussed later in the text.

4. Construction of the poverty line

We now examine the application of an absolute poverty line using data from the 2016-PECS survey.

4.1 Food poverty line

The first step in the construction of food poverty line is to calculate the average costs per calorie. This cost per calorie is then multiplied by an estimated minimum number of calories to give the food poverty line. In order to estimate cost per calorie, food consumption (purchases) from the diary need to be converted into calories. Given that kilocalories information for each product is provided for 1 kilogram/liter, all products in the diary should be in the same measurement units. There is no established table with calories for all products in West Bank and Gaza. For this, we use as a base calorie information for a restricted product list from the Palestinian Bureau of Statistics, and we extended this list using calories from Jordan, Lebanon and other sources such as the Food Agricultural Organization, and the United States Department of Agriculture.

After assigning calories to each food product, the total number of calories consumed by each household can be calculated along with the associated total expenditures (spatially adjusted). This allows us to estimate the cost per calorie. Calorie intake and costs of one calorie are shown in Table 8. As expected, the price per calorie is higher for wealthier households because they purchase more expensive products and because they also consume more calories on average.

The next step is to select a reference group upon which the cost per calorie is based. Typically, the reference group should not be very rich as they are likely to have a notably different and more costly food consumption patterns than the rest. At the same time, the reference population should not be very poor because their consumption patterns of this groups may reflect their difficult economic circumstances rather than their preferences. Given this, we estimate the cost per calorie based on the consumption patterns of the second and third deciles.

More formally, the food poverty line is defined as follows: $PL^{food} = CR * \frac{\sum_i p_i * q_i}{\sum_i C_i}$, where CR is a calorie requirement to meet basic needs, pi prices, qi quantities, Ci calories of households i in reference group.

Table 8: Calorie consumption and costs per calorie by quintiles

quintiles based on adult equivalent	calories per adult equivalent	calories per capita	cost per calorie, NIS
bottom	2310	1716	0.0031
2	2810	2076	0.0036
3	2944	2160	0.0040
4	3187	2419	0.0044
top	3677	2863	0.0049
total	2985	2246	0.0040

Source: PECS-2016, authors' calculation.
Note: Calories per adult equivalent are based on the formula adult+0.4*child. Economy of scale is not taken into account.

CR is defined in this case by using the daily caloric requirement for Jordanians from Jordanian Department of Statistics and World Bank (2009) and population structure from PECS 2016. Table 9 shows this information in detail. Given that proposed welfare aggregate is in adult equivalent terms, the calorie requirements should be also for adult population aged 18 years and older. Caloric requirements are calculated for men and women, using an average that is weighted by the population shares of different age groups. A simple average was then taken to get an overall calories anchor for adults. This anchor is equal to 2720 calories per day. In this review, this threshold is that is needed for daily average energy needs/for maintaining a healthy life. The per capita threshold is lower and equal to 2353 calories per day.

Table 9: Nutrition requirements from Jordan and population shares from PECS 2016

	all population shares		adult population shares		nutrition requirement, Jordan 2009	
age groups	male	female			male	female
<2	5	5			791	740
2-5	8	8			1618	1480
6-9	9	9			1924	1689
10	3	3			1990	1728
11	3	3			2084	1790
12	3	3			2199	1858
13	3	3			2522	2048
14	3	2			2720	2124
15	2	2			2917	2262
16	3	3			3092	2353
17	2	2			3216	2406
18-29	23	20	40	36	3156	2262
30-59	28	30	51	53	3167	2375
60+	5	6	9	11	2710	2247
total	100	100	100	100		

Source: Jordanian Department of Statistics and World Bank (2009), Source: PECS-2016, authors' calculation.
Notes:

The median cost per one calorie for the reference population of the second and third deciles is equal to 0.003378 NIS. The estimated food poverty line is simply equal to a product of 2720 times the cost of a calorie for a reference population. In monthly terms, the food poverty line is equal to 279.48 NIS per adult equivalent.

4.2 Non-food component of poverty line

One of the common ways to estimate the non-food allowance is to increase the food poverty line by the average nonfood share of households whose total expenditures or food expenditure are close to food poverty line. But, because of a relatively high average nonfood share, no individual in West Bank and Gaza has a consumption per adult equivalent lower than food poverty line. Therefore, the reference group was selected for those households whose food expenditure are close to food poverty line. The following three steps were conducted to estimate nonfood share:

1. Estimate an average budget share of food items in total consumption for those whose food consumption is within one percent of the food poverty line.

2. Repeat the above process for 9 additional times by increasing the range from which the reference is selected by an inclement of one percent.
3. Take the median of the average food shares estimated over 10 iterations. This implicitly places more weights to those whose food consumption is closer to the food poverty line as they will be included in the reference more often. The resulting nonfood share was about 65.63 percent which is close to the national average.

Now, with the food poverty line estimated and the nonfood allowance estimated, the cost-of-basic-needs poverty line is defined simply as:

$$poverty\ line = \frac{food\ poverty\ line}{1-nonfood\ share}$$=813.11 NIS per month for adult equivalent.

In other words, a person who is consuming less than 813.11 NIS annually is identified as poor, and anyone consuming more than this amount is not poor.

Table 10 summarizes all decisions made for construction welfare aggregate and poverty line using costs of basic needs and compares with the current methodology.

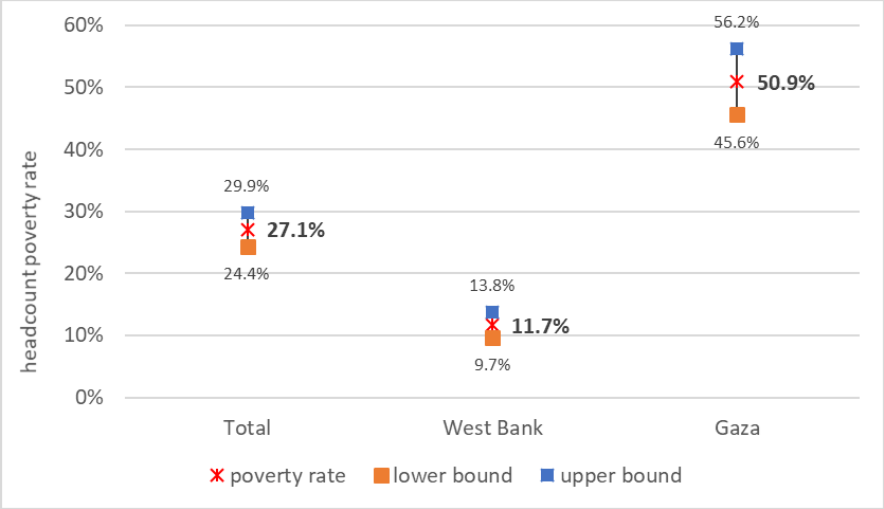
Table 10: Comparison of the current poverty methodology with a new methodology based on costs of basics needs

Methodological step	Proposed method for CBS approach	Current methodology
Food component	Include purchases and own-production	
Health	exclude	include
Education	include	
Lumpy infrequent expenditure: funerals, weddings, Hajj	All dropped	Hajj is included
Rent	Use self-reported rent for owners and run hedonic model to impute rent for everyone. In the next PECS add a question asking about rent control.	Include actual rent for renters and self-reported rent for owners.
Durables	Drop purchases of durables. Median depreciation rates are calculated for 15 key items using survey data and the used to calculate consumption flow by multiplying them to current values of 15 key durable items.	Include purchases of durables during last 12 month and purchases of transport during last 3 years.
Inter-temporal adjustment for inflation within survey period	All expenditures are in average prices of survey period (October 2016 – September 2017).	No adjustment is made.
Spatial adjustment	Spatial deflator is based on Laspeyres index constructed for food and nonfood consumer prices from urban areas. National average is the base.	
Adjustment to household size	The following adult equivalence scale is used AE=(Adult+0.46kid)^0.89	

Extreme poverty line	Extreme poverty line is represented by food poverty line. Food poverty line is constructed using calories requirement and median price of calories of the reference population from the second and third deciles.	Extreme poverty line is calculated based on median actual expenditures of a reference household of two adults and three kids on food, clothing, and housing.
Upper poverty line	Upper poverty line is defined as a ratio of food line over 1 – nonfood share from the reference population whose food expenditures are close to food poverty line.	The upper poverty line adds other necessities, including health care, education, transportation, personal care, and housekeeping supplies.
Source: Authors compilation based on World Bank (2011).		

Figure 9 shows interval estimates for poverty rates in West Bank and Gaza regions using the CBN based poverty line. 27.1 percent of population in West Bank and Gaza had consumption per adult equivalent were below this poverty line. In West Bank, the poverty rate was about 12 percent which is much lower than poverty rate in Gaza of about 51 percent. The Gini coefficient measuring inequality was equal to 0.298.

Figure 9: 95 percent confidence interval poverty estimates for West Bank and Gaza by regions in 2016/2017 using CBN approach, %



Source: PECS-2016, authors' calculation.

5. Robustness of poverty estimates to methodological choices

This section explores how robust poverty estimates are to different choices made during construction of poverty line and welfare aggregate.

Adjustment to prices and the choice of reference population

The impact of adjusting the welfare aggregate to account for inter-temporal variation in prices during survey period is minimal. This is not perhaps not surprising given low inflation during October 2016-

September 2017. In particular, with this low rate of inflation, there is no statistically significant differences either in the welfare aggregate or in poverty rates with this adjustment (Table 11). With greater within-year variations in inflation, these adjustments are likely to have effects.

Table 11: Impact of intertemporal deflation on welfare aggregate and poverty

	consumption per adult equivalent		poverty	
	with inter-temporal adjustment	without inter-temporal adjustment	with inter-temporal adjustment	without inter-temporal adjustment
West Bank	1588.8	1588.9	11.7%	12.1%
Gaza	920.1	920.1	50.9%	51.6%
total	1326.3	1326.4	27.1%	27.6%

Source: PECS-2016, authors' calculation.

In contrast, the impact of spatial adjustments is substantial, and the methodology used for this adjustment matters. This impact of using spatial adjustments is not surprising given the large differences in prices across different areas. There are several ways in which the spatial adjustment can affect welfare aggregate. The first direct way is through the welfare aggregate which becomes lower in areas with high prices and higher in areas with lower prices. This leads to a re-ranking of the population, and it affects both poverty rate and to a larger extent inequality. The second way is through the poverty lines. In particular, the spatial adjustment affects the cost per calorie and the reference population.

Figure 10 compares poverty rates using a spatially adjusted (Laspeyres index) and nominal welfare aggregate. Poverty in West Bank would be much lower without spatial adjustment (mainly because of East Jerusalem), while poverty in Gaza will be slightly higher. Overall, the spatial adjustment makes poverty rate higher by two percentage points. As mentioned above, the spatial adjustment also has a strong impact on inequality: the Gini index drops by three percentage points if consumption is spatially adjusted.

An increase in poverty rates after spatial adjustment may happen for several reasons. One key reason is the change in reference population used to calculate costs per calorie and the non-food allowance. This is clearly seen in Figure 11 when the structure of reference population changes to include a predominantly rich population from East Jerusalem and reduce the share of predominantly poor population from Gaza after controlling for the differences in prices across area. As a result, the food line increases from 251.6 to 279.5 NIS and the upper poverty line increases from 711.8 to 813.1 NIS per month per adult equivalent.

Figure 10: Impact on poverty from spatial adjustment

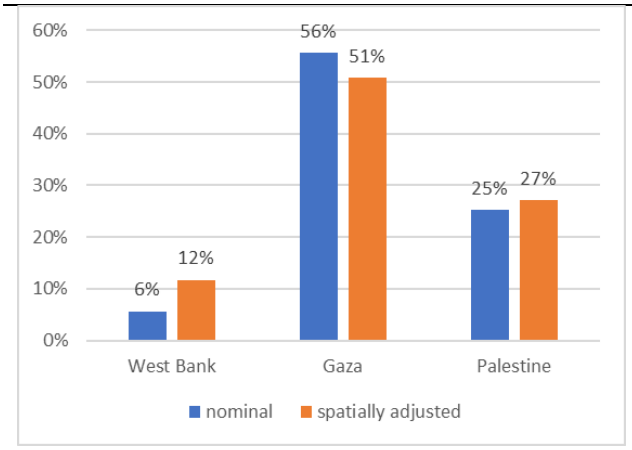
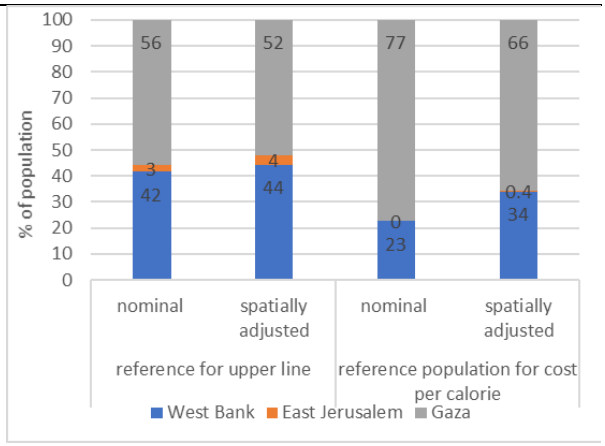


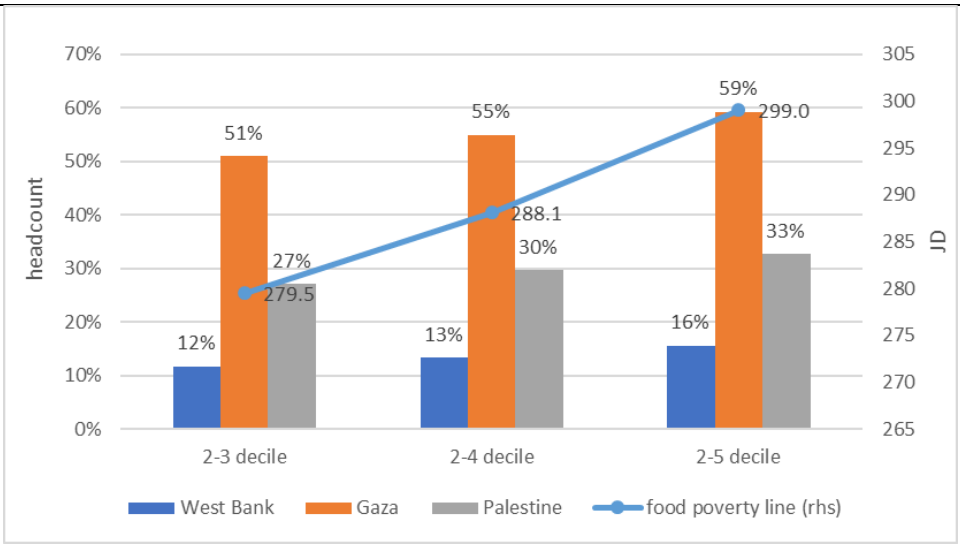
Figure 11: Impact on reference population from spatial adjustment



Source: PECS-2016, authors' calculation.

The current methodology uses the second and the third deciles to calculate costs per one calorie. However, nothing precludes to use different reference groups. Figure 12 shows how the choice of reference population affects the poverty line and the poverty rate. As one would expect, shifting the reference group to the right, by adding wealthier population from the fourth and fifth deciles will increase the costs per calorie and food line. As a result, poverty rates will also increase gradually.

Figure 12: Food poverty line and poverty rates for different reference population groups



Source: PECS-2016, authors' calculation.

Adjustment to household size

The methodology proposed for household size follows the current practice used by the PCBS, and it adjusts welfare aggregate taking into account adult equivalence and economy of scale. The underlying assumptions are that children have lower requirements than those of adults, and that there are underlying

economies of scale. In particular, with these economies of scale, several people may be able to live more cheaply if they live together rather than if they live separately. The assumption of lower needs is more relevant for private non-sharable food consumption (if one individual consumes an item, another individual cannot consume the same item). The economy of scale assumption is more relevant for nonfood items as many of them are akin to public goods that can be consumed by many individuals at once (housing, means of transportation like cars, access to water and so forth).

The current methodology to adjust for demographic composition follows the official PCBS approach and takes into account adult equivalence and economy of scale. The formula used is

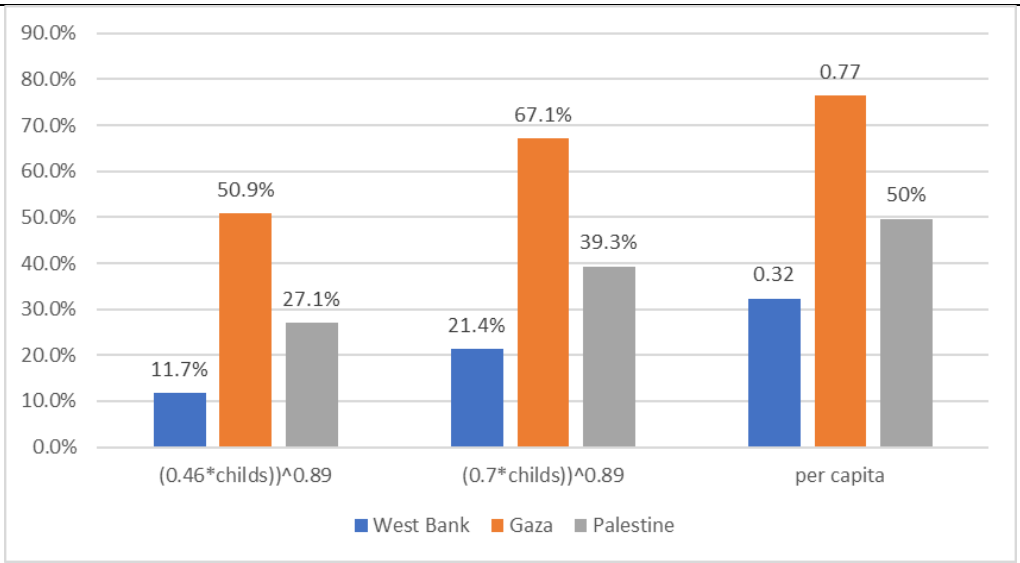
Adult equivalence scale=(A+αK)^θ, where

A is the number of adults in the household, and K is the number of children. The parameter α is the cost of a child relative to that of an adult, and is equal to 0.46, while the other parameter θ is equal to 0.89. The first equivalence scale assumes that the consumption needs of children (0-18 age) is 0.46 of that of the consumption needs of adults (above 18 age). The second parameter assumes an economy of scale equal to 0.89. Given high non-food share in West Bank and Gaza and its young population, poverty measurement is likely to be quite sensitive to the choices made for adjustment to household size.

In order to check the sensitivity of poverty estimates to the choice of using an adult equivalent, we also consider the impact of using a per capita welfare aggregate. This implies that the food poverty line should be changed because it is anchored to 2720 calories as the estimated nutritional requirement for an average adult person in West Bank and Gaza. In per capita terms, the nutritional requirement is lower and is equal to 2353 calories per day (which is obtained as a weighted average using the daily caloric requirement of Jordanians from Jordanian Department of Statistics and population structure of Palestinian society).

As expected, using per capita or adult equivalent terms has important implications for poverty rates (Figure 13). In particular, using consumption per capita increases poverty by 12 percentage points overall (10 percentage points in West Bank and by 16 percentage points in Gaza). Even increasing the cost of a child to 0.7 of an adult will increase poverty by almost ten percentage points. Given large household sizes and many children, this is not surprising. Given the importance of adjustment related household size, additional work should be done to check the relevance of the current equivalence scale, and to update this if needed.

Figure 13: Poverty rates for different adjustments to household size



Source: Authors' calculations

6. Concluding remarks and further steps

This main objective of this review is to inform internal debate and discussion on poverty measurement I the Palestinian Territories. Within this, has two overall goals: (i) to test methodological improvements in constructing the welfare aggregate for key non-food items with new survey data where possible, and to make recommendations of improving data where needed; and (ii) to examine the relevance of an absolute CBN based poverty line.

In line with an earlier technical review supported by the World Bank in 2010, we find that using a cost of basic needs approach produces poverty rates close to official estimates published by the PCBS. Despite this similarity, from a technical perspective, it will carefully understand and document the pros and cons of using a CBN in a middle-income country like Palestine with very little food poverty.

Several important methodological improvements in the welfare aggregate that were tested in this note, as well as the suggestions on improving survey measurement should be considered for implementation in the future.

The first important potential improvement is associated with the ability to estimate median depreciation rates from the data and calculate consumption flows from the most important durables. This improvement is possible to implement, with the extended module on durables that was introduced in PECS-2016. Including the consumption flow instead of purchases of durables makes a difference for welfare aggregate and this is indeed a better choice because durables are consumed over a long-time period. In particular, including purchases rather than the consumption flow seems to underestimate welfare across the board, except the population from the richest quintile.

Second, prevailing rent control laws are likely to have a direct effect on rent values reported from renters (they are artificially lower than the market value) in the welfare aggregate. One way to overcome this is by using a hedonic regression, based on information from owners and impute rents for everyone. However, owners tend to over-report rents; and this may also be a flawed measure. Given this, pilot testing some alternative methods to collect better data on the flow of services from housing, would be important.

This note also tested the sensitivity of poverty rates to the scale of adjustment to household size. Even a small modification in the existing equivalence scale leads to substantial changes in poverty. Therefore, it might be useful to further investigate and check whether the current parameters for adult equivalence and economy of scale are still relevant or should be updated.

This review also points to the importance of using spatial adjustments for an accurate welfare ranking of households. The current spatial deflator based on a Laspeyres index is be very close to a Paasche food deflator based on unit food values. This suggests that the current deflator may not fully capture variation in non-food prices. In particular, the impact of accounting for the price of dwellings across areas has a significant influence on the accuracy of the welfare aggregate. Including rental values in the Laspeyres index or using estimated rent deflators, tested in this note, may better capture spatial variation in prices. However, before constructing spatial deflators with rent prices, the issue of rent control needs to be better understood.

Summing up, several modifications proposed in this note to the current official poverty measurement methodology have the potential to increase the accuracy of poverty estimates in West Bank and Gaza. Some areas for improvements suggested in this note will require additional analysis. Many of the proposed improvements (except spatial deflation) do not seem to significantly change the level of poverty estimates. At the same time, it is important to note that any changes in the poverty methodology are likely to result in break in series; and pros and cons of doing this should be considered carefully.

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Annex

Table A.1 Results from hedonic models for the whole sample and owners only

logarithm of rent value	all sample	only owners
h1: base villa		
2.h1: traditional house	-0.615***	-0.621***
3.h1: flat	-0.517***	-0.520***
4.h1: separate room	-1.415***	-1.444***
6.h1: marginal	-1.289	-1.339
8.h1: other	-1.974***	-1.972***
area: base West Bank		
2.area: Jerusalem	0.786***	0.723***
3.area: Gaza	-0.188***	-0.238***
h12: base stone		
2.h12: stone and cement	-0.179***	-0.175***
3.h12: old stone	-0.371***	-0.260***
4.h12: concrete bricks	-0.297***	-0.279***
5.h12 : concrete	-0.373***	-0.392***
6.h12 : mud	-0.731	-0.354
7o.h12: cloth	-	
8.h12: other	-0.427*	-0.429*
h13 base: reinforced concrete		
2.h13: metallic	-0.116**	-0.0994*
3.h13: wood	-0.0208	-0.0155
4.h13: asbestos	-0.128***	-0.124***
5.h13: straw	-0.297	-0.391
6.h13: other	0.162	0.137
h15_10: how many rooms, excluding kitchen	0.0568***	0.0574***
Trash collected by municipality or put in container	0.0703	0.0749
h17_1: local public network		
2.h17_1:Israeli network	0.0114	0.00943
3.h17_1: collected rain water wells	-0.087	-0.0719
4.h17_1: spring	-0.0128	-0.0391
5.h17_1: tanks	-0.00419	-0.0058
6.h17_1: other	0.0649	0.0779
h17_3: base public sewage		
2.h17_3: porous cesspit	-0.135***	-0.143***
3.h17_3: tight cesspit	-0.0803***	-0.106***
4.h17_3: no sewage	-0.321	-0.327
h20: base pipeline		
2.h20: protected dug well	0.243***	0.223***
3.h20: tanks	0.0461	0.0615*
4.h20: rain water collection	-0.0162	-0.0281

5.h20: bottled water	0.263***	0.265***
6.h20: other	0.0990**	0.142***
Distance to public transport more than 1 km	-0.0695***	-0.0913***
Number of bedroom	0.0627***	0.0656***
h22: base other		
1.h22_2:gas	0.152***	0.157***
2.h22_2: kerosene	0.257***	0.257***
3.h22_2: electricity	0.138***	0.145***
4.h22_2: wood	0.0471*	0.0530**
5.h22_2: diesel	0.700***	0.664***
6.h22_2: coal	0.065	0.0716
7.h22_2: other	-0.0679	-0.0486
owners	0.274***	
Constant	6.583***	6.852***
Observations	3,739	3,477
R-squared	0.46	0.47

Source: PECS-2016, authors' calculation.
Notes:

Table A.2 CPI index rebased to average inflation during Sep 2016-October 2017

period in the survey		monthly CPI	Calculated CPI index to rebase expenditure for different recall periods		
			one-month recall	one-year recall	three-year recall
2016	Sep-16	1.1131	1.0043	1.0031	0.9943
2016	Oct-16	1.1030	0.9952	1.0019	0.9948
2016	Nov-16	1.1021	0.9943	1.0006	0.9951
2016	Dec-16	1.1052	0.9972	0.9999	0.9957
2017	Jan-17	1.1067	0.9985	0.9992	0.9960
2017	Feb-17	1.1135	1.0047	0.9994	0.9965
2017	Mar-17	1.1255	1.0155	1.0007	0.9972
2017	Apr-17	1.1198	1.0104	1.0016	0.9979
2017	May-17	1.1104	1.0019	1.0016	0.9985
2017	Jun-17	1.0998	0.9923	1.0013	0.9991
2017	Jul-17	1.0982	0.9908	1.0006	0.9995
2017	Aug-17	1.1043	0.9963	1.0004	0.9997
2017	Sep-17	1.1115	1.0028	1.0003	0.9999
2017	Oct-17	1.1137	1.0049	1.0004	1.0002

Source: PCBS

Table A.3 Different spatial deflators

Area	Food and nonfood deflator, Laspeyres using PCBS methodology	Food and nonfood deflator including rent prices, Laspeyres	Food deflator based on unit values from the survey, Paasche	Experimental rent deflator
West Bank	1.06	1.01	1.08	1.01
East Jerusalem	1.26	1.61	1.25	2.09
Gaza	0.85	0.88	0.83	0.80
National level	1	1	1	1
Source of price data	Survey on prices from PCBS-2016		Unit values from the PECS-2016	Information on estimated rent from owners from the PECS-2016 is used to predict average rent for a common dwelling across three areas

Source: PECS-2016, authors' calculation.
Note: Spatial deflator in column one is different from official PCBS deflator because of the way welfare aggregate is created. After applying spatial deflators means of spatially adjusted consumption groups were re-centered to match the mean before the deflation.

Table A.4 Additional information on selected bins for calculating food deflator using Paasche index

	population share	N	N of unit values	number of food items
West Bank	55	2764	134142	325
East Jerusalem	5	133	6146	265
Gaza	39	842	48236	325
Total	100	3739	188524	

Source: PECS-2016, authors' calculation.