Income and Consumption Inequalities in Palestine: a Regression-Based Decomposition Approach

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Abstract

The inequality in the households' living standards is commonly measured by either income or consumption. Different household's attributes may affect inequality in these living standards. This study aims to investigate the factors affecting income and consumption, quantifies their proportionate contributions to income and consumption inequalities, and compares them. The data are collected from the Palestinian Household Expenditure and Consumption Survey (PECS) in 2017. To cast light on this issue, the study applies a regression-based decomposition approach to income-generating function. The results suggest that household attributes better explain adjusted consumption inequality than adjusted income inequality, which should be a better measure of living standards. Moreover, the results indicate that the region, education, and employment status are the major factors of adjusted income and consumption inequalities, while the other factor's contributions have been minimal. For policy interventions, multidimensional policies should be formulated to reduce inequality in all dimensions for achieving an overall equal society.

Keywords

Inequality, regression-based decomposition, income, consumption, Palestine

JEL code

C01, C21, D63

INTRODUCTION

In recent years, economists' interest in inequality, its dimensions, and decomposition has arisen. Inequality has several dimensions; it can be accompanied by inequality of education, skills, health, opportunities, welfare, access to infrastructure, in addition to inequality of income and wealth. In particular, several dimensions may be linked to economic inequality such as earnings, wages, consumption, expenditure,

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and income. According to the economic theory, economic inequality is usually described either in terms of variations among households/ individuals in the distribution of income or consumption within a country, between countries and across geographical regions. Cowell (2009) defined inequality as a scalar numerical value that indicates the discrepancies of an individual's income within a certain population.

A huge body of research is interested in measuring households' living standards, to what extent these living standards are equally distributed, and whether its levels are high or low. Therefore, the income either at household's or per adult equivalent level is commonly used as a proxy in measuring its living standards while consumption, alternatively, is long-preferred by economists. The use of consumption may reflect the actual living standards. Meanwhile, the use of income may give us an actual economic power and measures how households differ in their incomes that come from wages, earnings and self-employment, but it may be under-reported especially for households with little resources. Therefore, income and consumption will differ due to the fact that all households should consume, but not all of them earn income, which in turn leads to higher income inequality compared to consumption inequality. Hence, household living standards should be better measured by household's consumption (Goodman and Oldfield, 2010; Brewer and O'Dea, 2012; Meyer and Sullivan, 2013).

The historical records of inequality in Palestine have been based on the consumption data other than income. Palestine exhibits a decrease in consumption inequality in 2017. That is, the value of the Gini coefficient was 40.3% in 2011, which declined to 34.0% in 2017 (PCBS, 2018). Thus, inequality in Palestine is still observed, but remains low and around the world average.

The present study mainly focuses on studying the distributions of income and consumption. More specifically, this study seeks to give answers to the question of what kinds of sources / factors contribute to inequality and examines their shares in the observed inequality in Palestine. Moreover, this study compares the contribution of each factor to income and consumption inequalities. In terms of econometric settings, the present study applies the Fields (2003) regression-based decomposition approach because of its ability to capture the factor's proportional contribution to the total explained inequality, unlike the traditional methods. This study uses Household Expenditure and Consumption Survey (PECS) for the year 2017 provided by the Palestinian Central Bureau of Statistics (PCBS).

To the best of our knowledge, the study shows the first-ever exploratory results estimated for Palestine by using the regression-based approach. Our main conclusion is that our results confirm that consumption is a better measure of inequality in well-being than income. Moreover, the results from the present study shed light on the role of the region, education, age, gender, employment status, locality, and land ownership in explaining income and consumption inequalities, with the region being among the most important factors that explain both of these inequalities. However, income flows from the urban locality had a decreasing inequality effect. In general, each factor had contributed to different magnitudes to income and consumption inequalities, but each one performs almost similarly for both of inequalities.

To conclude, the findings might provide a shred of strong evidence for government and policymakers to formulate appropriate policies towards an overall improvement of well-being. Such required policies focus on diminishing the regional differences among the West Bank and the Gaza Strip in addition to the redistribution of economic resources among the population, particularly to those with lower incomes, which will lead to higher returns if they are investing in human capital.

The summary of the review of the literature is presented in Section 1. The data and the overview of income and consumption distributions are described in Section 2. The description of the methodology used is shown in Section 3. The regression and decomposition results are interpreted in Section 4. The discussions and conclusion are derived in the last section.

1 LITERAUTRE REVIEW

Recently, different methods have been applied to the decomposition of inequality, which has been largely debated in the literature depending on the raised research question. Heshmati (2004) reviewed most of these methods. Methods to decompose inequality are divided into descriptive and quantitative decomposition methods. The descriptive methods include the decomposition by factor component or sources of income, which allows for measuring the contributions of household's income factors relative to the observed income inequality (Fei et al., 1978; Pyatt et al., 1980; and Shorrocks, 1982), by disjoint population groups as well, which allows for decomposition of income inequality into between- and within-population group components (Pyatt, 1976; Shorrocks, 1984; Cowell and Jenkins, 1995). Such methods answered the questions about what income sources or population groups contribute to inequality. However, the contributions of the household's attribute to income inequality could not be measured and detected using such methods.

On the other hand, the quantitative analysis methods involved regression-based decomposition framework. It was firstly developed by Mincer (1958 and 1970), Becker (1964), Blinder (1973) and Oaxaca (1973), which concerns with estimating the differences in the means of income, where the decomposition had relied on the human capital variables in addition to some other controls. Morduch and Sicular (2002) also implemented a general method to regression-based decomposition. However, the contributions of each factor may differ with the selected inequality index. Wan (2002) relied on Shorrocks (1999) decomposition rule to solve the pitfalls of regression-based inequality decomposition in which there are no restrictions on the regression models and its applicability to be applied to any inequality measure. He showed that the constant and residual terms problems are caused by the methods used in the decomposition of inequality, not by the used index or indices.

However, Fields (2003) proposed a different method, which is applicable to inequality levels or changes and is able to decompose any inequality index. He used a standard semi-logarithmic regression model of income in order to obtain the contributions of different indicators to the changes and the levels of inequality. His approach overcomes several advantages, including its capability to add various predictors in the regression model. Moreover, it considers nonlinear effects and controls for endogeneity. The standard errors of source contributions were also computed. Meanwhile, Bigotta et al. (2015) used Shorrocks (1982) weak consistency assumption to show how to find the shares of Atkinson's inequality index. They revised the Fields (2003) decomposition approach to measure income inequality in terms of Atkinson's index and provided further theoretical results on the contribution of each factor in the regression model.

A number of empirical studies have applied the regression-based decomposition approaches in different countries to decompose inequality (Wan, 2004; Gunatilaka and Chotikapanich, 2009; Naschold, 2009; Manna and Regoli, 2012; Brewer and Wren-Lewis, 2016; Rani et al., 2017; Limanli, 2017; Tripathi, 2018). The finding from these studies revealed that gender, human capital, household size, geographical region, work status, and land ownership are considered to be the most common contributing factors to inequality.

The studies that compare income and consumption are broad. According to Friedman (1957), the household's welfare can be measured using consumption expenditure and may provide more accurate results than income, especially for households with insufficient resources (Blundell and Preston, 1998; Meyer and Sullivan, 2003 and 2013; Krueger and Perri, 2006). A study by Brewer and O'Dea (2012) has shown that if an imputed rent of owned houses is added to the measure of household resources, the average annual growth rates in standards of living will be changed considerably, even after adjusting the price deflator. Moreover, Meyer and Sullivan (2013) concluded that inequality in income was greater than consumption inequality, particularly in the distribution's tails. Despite the aforementioned studies had provided a useful comparison among inequalities in income and consumption, these studies were based on a descriptive analysis. One contribution of the present study is that it is the first study that compares income and consumption inequalities using a regression-based approach.

In the context of Palestine, the literature has, mostly, been based on the household expenditure and consumption rather than the household income. Ramadan et al. (2015) showed that expenditure inequality is mainly explained by education and geographical region using the household's monthly expenditure for the years 2007, 2010, and 2011. On the other hand, the Palestinian central bureau of statistics (PCBS) provided a descriptive analysis of inequality in terms of averages, Lorenz curve, Gini index, and decile ratios using consumption data only.

2 DATA AND OVERVEIEW OF INCOME AND CONSUMPTION IN PALESTINE

This section provides more details about the data used in the present study. Moreover, we will provide an overview of income and consumption distributions in Palestine for the year 2017 based on the data in our hands.

2.1 Data

The present study uses the Household Expenditure and Consumption Survey (PECS) collected by the Palestinian central bureau of statistics (PCBS) from October 2016 to September 2017. The target population in this survey comprised of all households and individuals who were normally lived in Palestine during the recording period 2016–2017. The sampling frame comprised of 532 enumeration areas. The design of the sample is a two-stage stratified cluster sample. In the first step, a random sample of 391 enumeration areas. In the second step, a systematic random sample of 12 households is drawn from each enumeration area selected in the first step.

The data contain information about household's heads monthly income, consumption, and expenditure as well as human capital, gender and some non-human capital such as household size, locality type, geographical region, dwelling, and employment status. The data consist of 3 739 household heads and are weighted by the PCBS sampling weights. Household head consumption data were adjusted by purchasing power to take into consideration the spatial and temporal variations in living costs that might arise when the price of the same goods varies across different locations. This adjustment was already done by the Palestinian central bureau of statistics (see PCBS, 2018, p. 32 for more details). Furthermore, we adjust household income and consumption for family composition (i.e., household size and age of its members) to take into account economies of scale. The present study applies the old OECD equivalence scale (Oxford scale).

Let $n_{adults,i}$ is the number of adults in household i, $n_{children,i}$ is the number of children in household i. The old OECD (Oxford) equivalence scale can be written as follows:

$$n_i = \left[1 + 0.7\left(n_{adults,i} - 1\right) + 0.5 n_{children,i}\right]. \tag{1}$$

The per adult equivalent monthly income is obtained by dividing the total monthly household income by the equivalence scale, n_i. The per adult equivalent monthly consumption is obtained analogously. In Palestine, the average household size is 5.52 individuals in 2017 (PCBS, 2018).

2.2 Overview of income distribution

The average monthly household income in Palestine is 4 586.60 New Israeli Shekels (NIS), while the per adult equivalent monthly income is 1 326.7 NIS in 2017. Since this study seeks to quantify the contribution of population attributes to the total income inequality, we first look at the average adjusted (per adult equivalent) monthly income by population groups that are expected to determine the distribution of income as shown in Table 1. These characteristics are gender, education, region, locality type, employment status, and land ownership. Table 1 indicates the structure of each attribute as well. It seems that

the mean adjusted monthly income of males is higher than that of their females counterparts. In other words, males earn 1 330.14 NIS while females earn 1 295.52 NIS. Moreover, education enhances income, that is, the average adjusted monthly income increases monotonically with education levels as shown in Table 1.

Furthermore, the locality type is considered as another factor that affect the distribution of income in Palestine. That is, the mean adjusted monthly income is greater in rural areas while it is lesser in urban and camp zones as shown in Table 1. This is probably because of higher employment rates of Palestinians in the Israeli labour market where the wages are higher and where low to no schooling is required compared with the local employment. In 2018, about 18.4% of Palestinian labor were employed in Israeli labor market as indicated by the report of Palestinian labor force survey 2018 (PCBS, 2018). Moreover, the political division since 2007 and the Israeli siege on Gaza Strip were considered as the main causes of income inequality according to region (ILO, 2018). That is, the mean adjusted monthly income in the West Bank is 1 667.95 NIS compared to 707.14 NIS in the Gaza Strip as indicated in Table 1.

The average per adult equivalent monthly income for employed workers is 1 418.93 NIS while it was 1 098.73 NIS for not employed workers counterparts as shown in Table 1. The later workers are receiving their income either in terms of transfer or assistances/aid programs by the ministry of social affairs and other private agencies in which they are more likely to be poor (PCBS, 2018). On the other hand, a low percentage of land ownership by Palestinians; about 27.0%, which in turn affects their incomes particularly those depend on agricultural income. This is probably due to the restrictions imposed by the wall built by the Israeli government in 2002 which resulted in loss of around 16.8% of the total area of the West Bank. Therefore, this area become fully controlled by the Israeli military in which they make it inaccessible to Palestinians (Hareuveni, 2012). In 2017, the average per adult equivalent monthly income of land owners is 1 705.17 NIS compared to 1 184.61 NIS for their counterparts owning no land as shown in Table 1.

Table 1 Share of positive answers to job search questions and item-response probabilities

Group	No. of obs.	Mean Adjusted Monthly income (S.E)	Mean Adjusted Monthly consumption (S.E)
Gender			
Male	3 363	1 330.14 (22.77)	1 624.76 (53.06)
Female	376	1 295.52 (80.96)	1 432.29 (17.11)
Education			
No education	178	986.64 (62.95)	1 330.32 (59.57)
Lower secondary	2 163	1 212.53 (27.21)	1 373.24 (20.73)
Secondary	584	1 350.24 (55.81)	1 471.43 (42.42)
Associate diploma	240	1 546.18 (67.37)	1 632.21 (65.50)
University	574	1 746.10 (72.24)	1 688.89 (45.56)
Locality			
Urban	2 732	1 327.18 (26.61)	1 473.10 (20.17)
Rural	652	1 541.75 (53.36)	1 570.85 (32.09)
Camp	355	927.83 (40.49)	1 067.84 (38.51)

Table 1 (continuation)

Group	No. of obs.	Mean Adjusted Monthly income (S.E)	Mean Adjusted Monthly consumption (S.E)
Region			
West Bank	2 411	1 667.95 (29.39)	1 798.89 (20.98)
Gaza Strip	1 328	707.14 (23.55)	821.35 (13.98)
Employment status			
Employed	2 662	1 418.93 (25.18)	1 458.21 (18.05)
Not employed	1 077	1 098.73 (43.72)	1 435.44 (34.89)
Land ownership			
Owned	1 020	1 705.17 (53.77)	1 659.38 (31.06)
Not owned	2 719	1 184.61 (22.01)	1 373.69 (18.96)

Note: Standard errors in parenthesis.
Source: Authors calculations by using PECS data, 2017

The simplest way to measure the income inequality can be represented by ranking the population from the poorest to the richest and show the percentage of income associated with each decile of the population. Table 2 shows the patterns of the household total monthly income distribution patterns. It appears from Table 2 that the 10% richest households' monthly income was 10.8 times of the income earned by the 10% poorest households in 2017.

Table 2 The patterns of adjusted monthly income and consumption distributions in Palestine

Poorest	10%	20%	30%	40%	50%	60%	70%	80%	90%	Ratio*
Per cent[a]	1.96	5.6	10.4	16.5	23.9	32.8	43.5	56.5	78.9	10.8
Per cent[b]	4.00	9.4	15.8	23.4	31.8	41.8	53.3	66.5	82.1	4.5

Note: * Ratio of 10% richest to 10% poorest; a: estimation based on per adult equivalent monthly income (adjusted income); b: estimation based on per adult equivalent monthly consumption (adjusted consumption).
Source: Author's calculations by using PECS, 2017

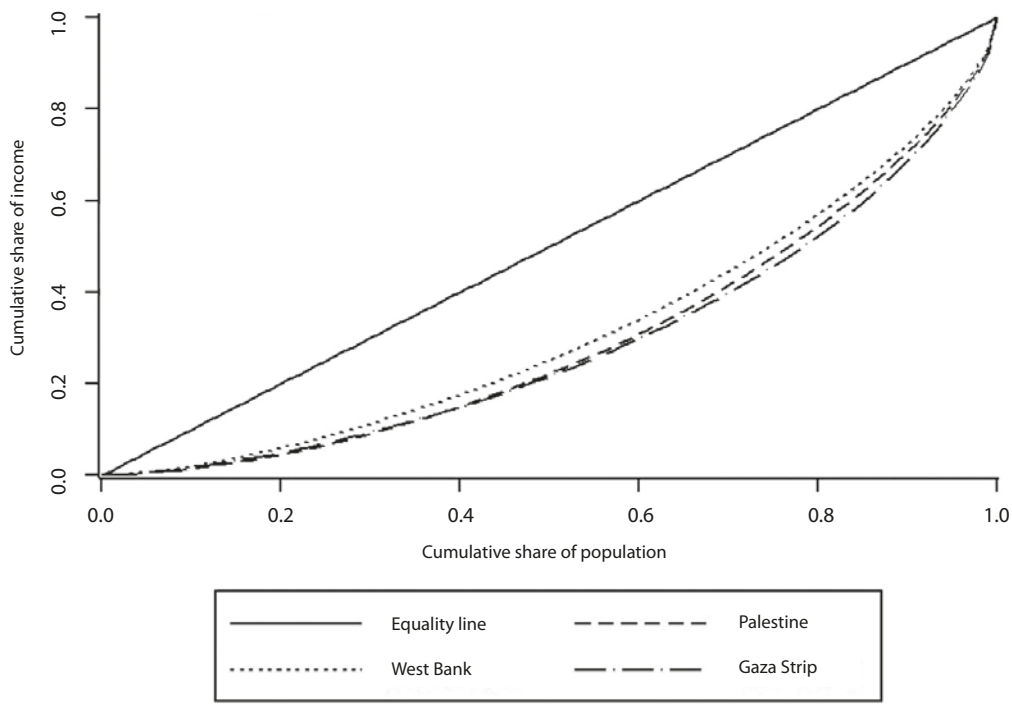
The Gini index of inequality was estimated as 40.98% in Palestine for the year 2017, representing a slight increase in income inequality compared to 40.23% in 2011.[4] The Lorenz curve, shown in Figure 1, is an alternative way to describe income inequality, which is a curve that draws the cumulative percentage of income and the cumulative percentage of ordered population from poorest to richest.

Since Palestine has its own regional characteristics, especially the political division between the West Bank and Gaza Strip and the Israeli blockade on Gaza Strip since 2007, it is worthy to decompose inequality by region, which might provide more insights about regional income inequality in Palestine.

[4] Gini coefficients were calculated using per adult monthly income in both years; 2011 and 2017 based on PECS, 2011 and 2017 data provided by PCBS.

Figure 1 shows the Lorenz curves of both the West Bank and Gaza Strip in addition to Palestine for per adult equivalent monthly income. It appears that income inequality in the Gaza Strip is considerably higher than in the West Bank. Moreover, Theil T inequality index has been estimated for both the West Bank and Gaza Strip since it is additively decomposable. The value of Theil T index in the West Bank is 25.2% while it is 34.3% in Gaza Strip. However, Theil T index for income inequality aggregated in Palestine is 30.6% in 2017 reflecting the extremely large differences among the richest in the West Bank and among the poorest in Gaza Strip (PCBS, 2018).

Figure 1 Lorenz Curve (adjusted income)



Source: Authors construction based on PECS, 2017 data

2.3 Overview of consumption distribution

The consumption usually takes into account the home-produced food and the imputed rent of owned dwelling. A full definition of consumption is provided in the Annex. In 2017, the average monthly household consumption in Palestine was 4 913.3 NIS, while the average monthly consumption per adult equivalent was 1 451.6 NIS. In order to provide a more detailed picture of the distribution of consumption, we will explore it across population attributes as shown in Table 1.

It is evident from Table 1 that the mean per adult equivalent monthly consumption of males is higher than their female counterparts. On the other hand, the inequality in the distribution of consumption is influenced by labour market outcomes such as education, that is, the average monthly consumption per capita rises with education. Ramadan et al. (2015) showed that education is the main determining factor of expenditure inequality for the years 2010 and 2011. Additionally, they found that the composition of the household and the geographical region were the main drivers of expanding the gap in the distribution of expenditure among educated and non-educated household heads.

The average per adult equivalent monthly consumption for those living in camp dwellings is lower compared with their urban and rural counterparts where they show lower average monthly consumption per capita as indicated in Table 1. According to the World Bank (2018) report, Palestine witnessed an increase in the welfare gap between non-camp and camp populations, and the Gini index of inequality in camps increased by 4.0% from 2011 to 2017. Moreover, a divergent regional difference in consumption is evident in Palestine, that is, a high gap exists between the West Bank and Gaza Strip. In 2017, the mean per adult monthly consumption of household living in the West Bank is 1 798.89 NIS compared to 821.35 NIS of their counterparts living in the Gaza Strip. This is pronounced by the high poverty gap at the regional level, which in turn widened the gap in the living standards at the same level. In the Gaza Strip, the poverty had reached 53.0%, while in the West Bank in 2017 it declined to 13.9%. As a result, high concentration of the poor households was in the Gaza Strip, that is, the poverty rate was 71.0% in 2017, compared to 57.0% in 2011 (World Bank, August 2018). Ramadan et al. (2015) also provided evidence that the geographical region was also considered as one of the main determinants of expenditure inequality in 2010 and 2011.

Furthermore, employment status also seems to have effects on the differences in consumption distribution. On average, the per adult equivalent monthly consumption of employed workers is 1.6% higher than that of their not employed counterparts as shown in Table 1. The inequality and poverty had declined over the period 2011 to 2017 in the West Bank due to the changes in labour earnings. In the Gaza Strip, however, the increase in both inequality and poverty rates were due to the reduction in income transfers. Despite the decrease in inequality and poverty by labour earnings, this reduction was not much enough to pay off the decrease in transfers (World Bank, 2018). Furthermore, the differences are also evident by land ownership as shown in Table 1. That is, the mean per adult equivalent monthly consumption of landowners is 1 659.38 NIS while that for non-landowners is 1 373.69 NIS.

In terms of inequality measures, the historical records of inequality in Palestine used consumption as a proxy of income. Palestine experienced a decline in consumption inequality in 2017, where the value of the Gini coefficient fell to 34.0% in 2017 compared to 40.3% in 2011.[5] Moreover, this decline was also exhibited by the decline in the ratio of 10% richest to 10% poorest, which was 4.5% in 2017 compared to 4.8% in 2011 as presented in Table 2 (PCBS, 2018).[6] The regional Gini index varied over the period 2011–2017. It has declined from 39.9% to 31.8%, while Gaza Strip experienced a slight rise from 27% to 28%. However, the inequality in consumption is higher at the country level (World Bank, 2018).[7] Additionally, Figure 2 presents the Lorenz curves of both the West Bank and Gaza Strip in addition to Palestine based on per adult equivalent monthly consumption data.

The inequality in consumption in the Gaza Strip is slightly higher than in the West Bank as illustrated in Figure 2. At the national level, inequality is higher due to the very high consumption gap among the poor in Gaza Strip and the richest in the West Bank. Consumption inequality is lesser than income inequality by about 6.98% points in terms of the Gini index. This is also pronounced if one compares between Lorenz curves exhibited in Figures 1 and 2 in addition to Table 2. Therefore, consumption may provide a better understanding of living standards. In other words, income data lead to larger inequality than consumption data.

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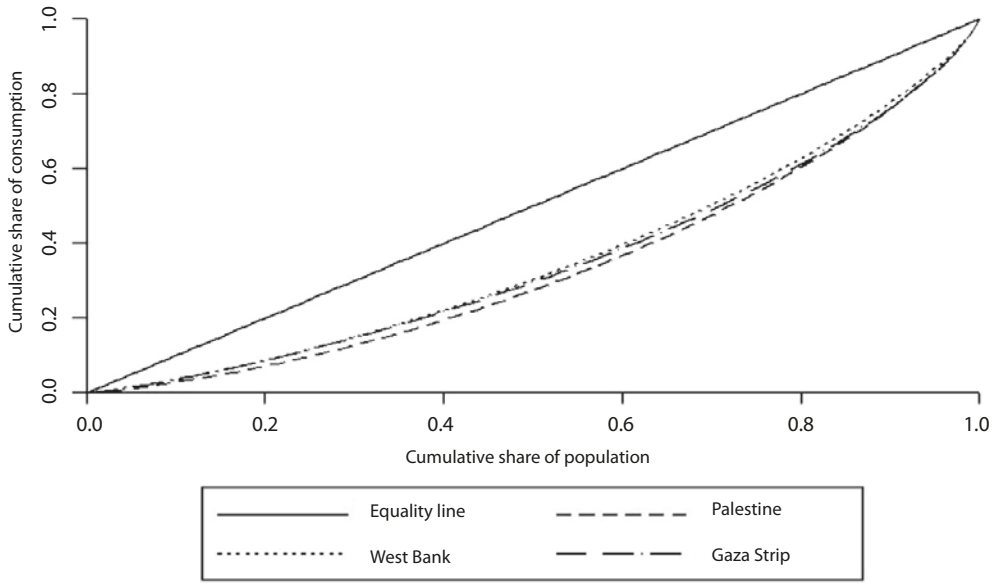
[5] Gini coefficients were calculated using per adult equivalent monthly consumption in both years, based on PECS, 2011 and 2017 data provided by PCBS.

[6] Consumption per capita was used in ranking the population and in calculating Gini index.

[7] The corresponding values of Theil T index in Palestine is 17.5%, in the West Bank is 13.5, and in Gaza Strip is 15.2%; calculated by authors based on consumption per capita using PECS, 2017 data.

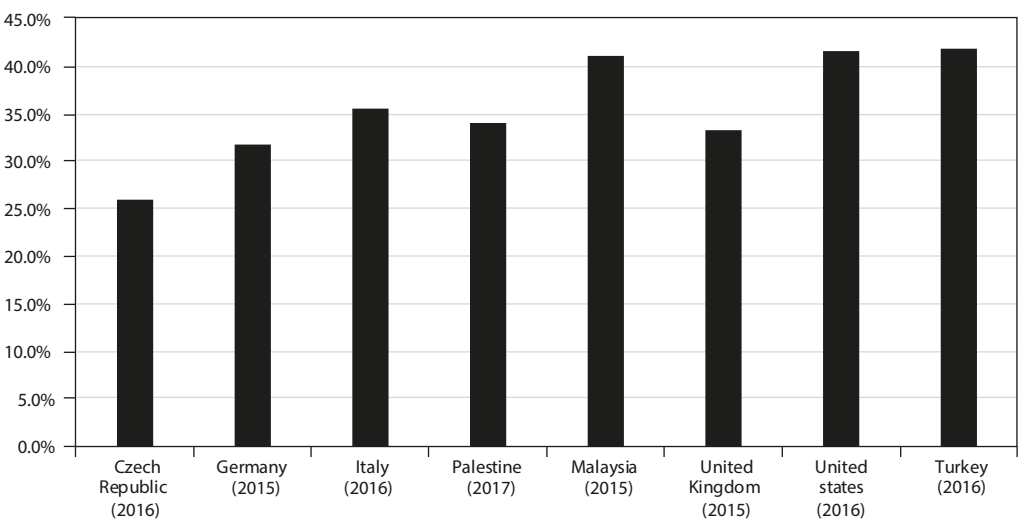
Figure 2 Lorenz Curve (adjusted consumption)



Source: Authors construction based on PECS, 2017 data

Inequality measured by consumption data in Palestine is low by global standards, and it is almost similar to the world average as shown in Figure 3. Estimates were based on the World Bank methodology that is adjusted by purchasing power parity (PPP) for each country.[8]

Figure 3 Gini indices for Palestine and some othe countries



Source: World Bank estimates

[8] More information is available at: <*http://iresearch.worldbank.org/PovcalNet/methodology.aspx*>.

3 METHODOLOGY

This paper uses Fields (2003) regression-based decomposition method to examine the contribution of each factor to income and consumption inequalities. This framework firstly applies a linear regression model with different exogenous covariates. That is, income and consumption; measured monthly will be regressed on a set of predictors, which contain some household's attributes such as gender, age, education, etc. Secondly, the proportional contribution of each one of them will be estimated using a specific formula. We briefly present the theoretical framework of this approach.

The starting point of Fields (2003) approach comprises of modelling the function of income, which can be written as:

$$\ln y_i = \beta_0 + \sum_{k=1}^{K} \beta_k x_{i,k} + u_i,\ k = 1,2,\ldots,K, i = 1,2,\ldots,n\ , \tag{2}$$

where, y_i is the outcome variable, which represents the income or consumption and we use the logarithmic transformation to avoid the skewness of the distribution, β_0 is the intercept, $x_{i,k}$ is the k^{th} exogenous factor, βk is the k^{th} coefficient of the k^{th} predictor, u_i is the residual term, and n and k represents the number of observations and the number of predictors, respectively. Formula (2) is a standard linear model, which follows its traditional assumptions (Fields, 2003). For interpretations of the regression results, the estimated regression coefficients from the log-linear models can be exponentiated using the following formula, $(e^{\beta}-1) \cdot 100\%$. For small values of the estimated coefficients, approximately $e^{\beta} \approx \beta$.

Formula (2) will be estimated using the classical approach, i.e., OLS. The results of the estimated Formula (2) are then used to calculate the proportional contribution for each factor k to inequality, which is also known as factor inequality weight denoted by s_k,

$$s_k = \frac{\hat{\beta}_k\, Cov\left(x_k, \ln y_i\right)}{Var\left(\ln y_i\right)},\ k = 1,2,\ldots,K\ , \tag{3}$$

where $\hat{\beta}_k$ is the estimated coefficient from ordinary least square multiple regression, $Cov(x_k, \ln y_i)$ is the covariance between the outcome variable and the k^{th} predictor, and $Var(\ln y_i)$ is the variance of the outcome variable. The positive sign of s_k exhibits that the k^{th} factor's contribution is an inequality increasing effect while the negative sign of it indicates that it has an inequality decreasing effect. Meanwhile, the value of zero exhibits that the k^{th} factor has no contribution to inequality. The contribution is cumulative in the case of categorical predictors and is estimated by summing the contributions of all respective dummies in the regression equation. In our case, the categorical variables consist of only two categories, which in turn need only one dummy variable. Fields (2003) showed that his decomposition procedure provides a robust method of determining weights to allocate to the several regressors in the linear model given that his six conditions of decomposition are already achieved.[9]

It should be noted that the sum of all factor inequality weights; s_k equal to the coefficient of determination; R-squared. It holds that:

$$\sum_{k=1}^{K} s_k = \frac{\sum_{k=1}^{K} \hat{\beta}_k Cov\left(x_k, \ln y_i\right)}{Var\left(\ln y_i\right)} = \frac{Var\left(\ln \hat{y}_i\right)}{var(\ln y_i)} = R^2\ . \tag{4}$$

[9] The six conditions are listed in the Appendix of Fields (2003).

It remains to show that the proportion of the unexplained inequality refers to the contribution of the residual term, which is denoted by s_u:

$$s_u = 1 - R^2. \quad (5)$$

The advantage of Fields (2003) decomposition procedure is that it can be applied to any inequality index such as the Gini index, variance of log income, and generalized entropy indices. Most importantly, this approach allows for adding any type of independent variables (i.e., categorical and quantitative). Additionally, it measures the contribution of each factor to total inequality by decomposing total consumption or income into components from various factors. However, this procedure is restricted to the log-linear functional form of income data and no contribution of the intercept term to inequality (Wan, 2004).

3.1 Variables

The outcome variables used in the present study are the natural logarithm of both monthly income per adult equivalent and monthly consumption per adult equivalent. The explanatory variables that might influence the distribution of income and consumption comprise of household attributes, which are the gender of household head, education, age, region, locality type, employment status, and land ownership. Table 3 consists of the definitions and descriptive statistics of these variables. The average natural logarithm of monthly income and consumption are 6.82 and 7.07, respectively. Moreover, about 90% of households are headed by males. The average age of the participants is 46.84 years. On average, the household heads have 9.94 years of schooling. The majority of household heads lives in urban areas by 73%. The average percentage of participants from the West Bank is 64.5%, while from Gaza Strip it is 36%. Approximately 71 percent of the households are employed. In terms of land ownership, the average percentage of household heads owned land is 27%, which exhibits that the majority of them are non-landowners.

Table 3 Descriptive statistics of the variables in the study

Continuous variables	Definition	Mean	Std. dev.
Ln (adjusted income)	natural log of total per adult equivalent monthly income in NIS*	6.82	0.90
Ln (adjusted consumption)	natural log of total per adult equivalent monthly consumption in NIS	7.07	0.65
Age	in years	46.84	13.70
Education	completed years of schooling	9.94	4.41
Dichotomous variables	**Definition**	**No. of obs.**	**Per cent[a] %**
Gender	1 for male; 0 for female	3 363	89.9
Urban	1 for urban; 0 for rural and camp	2 732	73.1
Region	1 for West Bank; 0 for Gaza Strip	2 411	64.5
Employment status	1 for employed; 0 for not employed	2 655	71.0
Land ownership	1 for yes, 0 for no	1 010	27.0

Note: * NIS: New Israeli Shekels; a: the percent is referred to the dummy variable with code 1; total number of observations is 3 739.
Source: Author's calculations based on PECS 2017 data

4 RESULTS

4.1 Regression results

In this study, we propose two different models. In model I, the natural logarithm of adjusted monthly income is regressed on the set of predictors mentioned earlier. In model II, the natural logarithm of adjusted monthly consumption is regressed on the same set of predictors. We start the decomposition by estimating both models using the ordinary least square method (OLS). The results of the estimated regression coefficients are presented in Table 4. For reliability, we report estimated regression coefficients with their respective standard errors in parenthesis.

Model I is expected to examine the determinants of income. It is found that model I explained about 37.6% of the total variability in the natural logarithm of monthly income per adult equivalent. On the other hand, the determinants of consumption are examined using model II in which this model explained about 41.6% of the total variability in the natural logarithm of monthly consumption per adult equivalent. However, both models are well fitted and passed all diagnostic tests. Additionally, both models performed well as indicated by their respective values of the adjusted R-square, which are conventional in this type of studies. Our results are in line with what was reported in the literature (Gunatilaka and Chotikapanich, 2009; Manna and Regoli, 2012; Bigotta et al., 2015; Rani et al., 2017; Tripathi, 2018). It seems that all predictors are positive and highly significant in both models except land ownership dummy in model II. In other words, these predictors are considered to be the determinants of income and consumption distributions.

Table 4 Multiple regression results for models I and II

Variable	Model I (Adjusted Income)	Model II (Adjusted Consumption)
	Mean (S.E)	Mean (S.E)
Intercept	4.761*** (0.081)	5.829*** (0.056)
Gender	0.152*** (0.044)	0.181*** (0.031)
Education (years)	0.049*** (0.003)	0.037*** (0.002)
Age (years)	0.014*** (0.001)	0.008*** (0.001)
Urban locality	0.059** (0.027)	0.123*** (0.019)
Region	0.887*** (0.026)	0.798*** (0.018)
Employment status	0.550*** (0.033)	0.092*** (0.023)
Land ownership	0.085*** (0.027)	0.031 (0.019)
R-Squared	0.377	0.418
Adj. R-Squared	0.376	0.416
F-Statistic	322.09	382.12
P-value	0.000	0.000

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: Author's calculations based on PECS 2017 data

The gender dummy is highly statistically significant in both models. The results show that, on average, per capita equivalent income for males is 16.4%[10] higher than their female counterparts. On the other hand, the average per capita equivalent monthly consumption of males is 19.8% higher than female counterparts. That is, the gender consumption gap is higher than the gender income gap.

In both models, education has highly positive and statistically significant effects, which shows that higher income and consumption are associated with higher levels of education. The average per capita equivalent monthly income increases by 5% as an individual's education increase by one year. Meanwhile, the average per capita equivalent consumption increases by 3.8% associated with one unit increase in schooling. Moreover, age is significant on both income and consumption, but this effect is negligible.

It is also found that the urban dummy is statistically significant in both models. That is, on average, a household resides in an urban locality earn monthly income 6% higher than those living in rural and camp localities counterparts. However, the average per capita equivalent monthly consumption of households living in urban areas is 13% higher than those living in rural and camp localities.

The coefficient of region dummy is strongly statistically significant, which indicates the presence of regional influence on both per capita equivalent income and per capita equivalent consumption distributions. This means that a considerable gap exists among those residing in the West Bank and Gaza Strip. The per capita equivalent income gap is 143%, while per capita equivalent consumption gap is 120% in favour of the West Bank. According to the income gap among the employed and not employed, the results reveal that, on average, per capita equivalent monthly income of employed workers is 73.3% higher than their not employed counterparts. However, the consumption gap is 9.6%, which is lower the income gap due to the fact that households might borrow to pay for their consumption, where these results are highly statistically significant.

The dummy of land ownership is statistically significant in model I. The results show when compared to non-land ownership; i.e., reference category, individuals owned land have positive income differentials. On average, individuals owned land receive per capita equivalent monthly income 9% higher than their counterparts owning no land. However, this effect is not significant on per capita equivalent consumption; model II.

Finally, the above results confirmed with what we have reported on the descriptive statistics and the earlier detailed discussions.

4.2 Income inequality decomposition

This section quantifies the contribution of all statistically significant predictors to the explained inequality in order to decide the most important ones in accounting for income inequality in Palestine in 2017. The estimation results of model I are used to calculate factor inequality weights based on Formula (2). Income inequality decompositions are illustrated in Table 5 based on Fields (2003) approach measured by the variance of log monthly income per adult equivalent. For simplicity, each factor inequality weight is divided by the explained income inequality (i.e., R-squared). The resulted percentages exhibit the proportional contributions of different household characteristics to the total explained inequality. It should be noted that even though all predictors are statistically significant in model I, their proportional contribution to the total explained inequality varies considerably.

The results suggest that the region emerges as the most dominant factor contributing to the total explained income inequality in Palestine. The contribution of the region to income inequality is 52.41%.

[10] This figure is obtained by $(e^{0.152}-1)\cdot 100\% = 16.4\%$. The remaining coefficients are interpreted analogously. Refer to Section 3 for more details.

The contribution of the employment status of the household head is captured by the employment status dummy, which substantially contributes to the explained income inequality in which its share reached 22.97%. Moreover, the contribution of education is 18.17%, which seems to be another major contributing factor to income inequality.

On the other hand, income flows from land ownership dummy contributed about 3.42%, while from gender dummy contributed about 2.23%. The contribution from age has been minimal (i.e., 0.98%). Most importantly, the urban dummy showed negative contributions to total explained inequality and thus has inequality decreasing effects. Finally, unobserved factors (i.e., residuals) contributed by about 62.3%.

Table 5 Proportional contribution of each factor to inequality

Variable	Model I (Adjusted Income)		Model II (Adjusted Consumption)	
	s_k%	% of R^2	s_k%	% of R^2
Gender	0.84	2.23	1.08	2.58
Education	6.85	18.17	7.45	17.82
Age	0.37	0.98	0.62	1.48
Urban locality	–0.07	–0.18	0.78	1.87
Region	19.76	52.41	28.39	67.92
employment status	8.66	22.97	3.26	7.80
Land ownership	1.29	3.42	–	–
Residual	62.30	–	58.42	–
Total	100.00	100.00	100.00	100.00

Note 1: % of R^2 – percentage contribution of the factor from the total explained inequality.

Note 2: The contribution of a non-significant predictor should not be considered and thus its contribution should be added to residuals and replaced by '–'.

Source: Author's calculations based on PECS 2017 data

4.3 Consumption inequality decomposition

We follow the same procedure in the previous section to determine the most important factors affecting the distribution of consumption in Palestine for the year 2017. The estimated regression results from model II is used to calculate factor inequality weights. All factors appear to have contributed positively to consumption inequality except land ownership dummy. The results indicate that the region accounted for the largest contribution to the total explained inequality by about 67.92%. This is followed by education, which accounts for 17.82% to the total explained consumption inequality. A considerable lower shares of employment status to consumption inequality if compared with its shares to income inequality, that is, the contribution of employment status is 7.80%.

However, the remaining variables with a small proportional contribution to consumption inequality are gender (2.58%) and age (1.48%). While urban dummy had positively accounted for consumption inequality, its contribution is relatively small, i.e., 1.87%. Lastly, the contribution of unobserved factors (i.e., residuals) is 58.42%, which is lower than the unexplained part of income inequality.

DISCUSSIONS AND COCLUSIONS

This study has applied the regression-based decomposition method developed by Fields (2003) to examine the extent to which different factors contribute to income and consumption inequalities in Palestine. It compares these inequalities as well. This approach is more preferred to other traditional decompositions because of its ability to include several factors in the decomposition model and its applicability to any inequality measure.

The results of the present study confirm various previous results yielded by the most recent literature (Gunatilaka and Chotikapanich, 2009; Naschold, 2009; Manna and Regoli, 2012; Ramadan et al., 2015; Bigotta et al., 2015; Rani et al., 2017; Limanli, 2017; Tripathi, 2018). The study concluded that the major contributing factors to income and consumption inequalities in Palestine are the region, education, employment status; with the region showing the highest contribution, which is similar to Turkey as shown by Limanli (2017). However, the region has very little contribution to inequality in Italy, India, and Sri Lanka (Gunatilaka and Chotikapanich, 2009; Manna and Regoli, 2012; Bigotta et al., 2015; Rani et al., 2017). The reason behind that region has the highest contribution percentage is due to the Israeli siege imposed on the Gaza Strip, where only workers from the West Bank are permitted to enter the Israeli labour market where the wages are very high compared with the domestic labour market. Additionally, the political division between the West Bank and Gaza Strip since 2007, which troubled income earners in Gaza Strip.

Meanwhile, almost similar are the contributions of education to income and consumption inequalities; i.e., 17.82–18.17% and similar to what was reported in the literature. However, minimal contributions to inequality in both income and consumption had attached to the remaining factors, which is in line with the literature as well. Our results reveal that the role of gender, however, is relatively small in Palestine compared to Italy in which gender accounted for 21.3% to Italian income inequality as shown by Manna and Regoli (2012). One possible explanation of the small contribution of gender to inequality in Palestine might be attributed to the prevailing traditions that most households are headed by males. Additionally, most households headed by females are either widowed or divorced or separated, which is reflected in our study sample in which the proportion of female household heads comprises of about 10.1% and the proportion of widowed and divorced female heads is about 80% of them.

Moreover, the analyses provide a useful comparison between income and consumption inequalities. Consumption inequality is lesser than income inequality in Palestine when adjusted for household size, which confirms that the living standards is better measured by consumption than income, which is reflected in terms of higher model fit, i.e., R-squared is 41.6% in model II while it is 37.6% in model I, and in terms of inequality measures, i.e., the Gini for per adult equivalent consumption is 34.0% while it is 40.98% for per adult equivalent income in 2017. This result is similar to the results found in the U.S and the U.K (Goodman and Oldfield, 2010; Meyer and Sullivan, 2013). It should be noted that all factors have almost the same contributions to inequality in Palestine except employment status. The inequality weight of employment status to consumption inequality is relatively smaller than its weight to income inequality. This is probably due to the fact that most unemployed households receive their income in terms of either transfer or social assistance programmes (PCBS, 2018). However, their consumption does not differ considerably from their employed household head counterparts.

Lastly, the findings from the present study are useful for policy implications. The study provides evidence about the drivers of inequality in living standards, which encourage policymakers to prioritize designing policies such as eliminating the regional differences and redistribution of economic resources to protect living standards and the welfare in Palestine and thus moving towards an overall improvement of well-being and a more equitable society. Enhancing education, particularly for those with lower income would lead to higher returns and thus reducing inequality as well.

References

BECKER, G. S. *Human Capital: a theoretical and empirical analysis*. New York: National Bureau of Economic Research, 1964.

BIGOTTA, M., KRISHNAKUMAR, J., RANI, U. Further results on the regression-based approach to inequality decomposition with evidence from India. *Empirical Economics,* 2015, 48, pp. 1233–1266.

BLINDER, A. S. Wage discrimination: reduced form and structural estimates. *Journal of Human Resources*, 1973, 8(4), pp. 436–455.

BLUNDELL, R. AND PRESTON, I. Consumption inequality and income uncertainty. *Quarterly Journal of Economics*, 1998, 113, pp. 603–40.

BREWER, M. AND O'DEA, C. *Measuring living standards with income and consumption: evidence from the UK, Institute for social and economic research*. Working paper No. 5/2012.

BREWER, M. AND WREN-LEWIS, L. Accounting for changes in income inequality: decomposition analyses for the UK, 1978–2008. *Oxford Bulletin of Economics and Statistics*, 2016, 78(3), pp. 289–322.

COWELL, F. A. *Measuring Inequality*. 3rd Ed. Oxford: Oxford University Press, December 2009.

COWELL, F. A. AND JENKINS, S. P. How much inequality can we explain? A methodology and an application to the USA. *Economic Journal*, 1995, 105, pp. 421–430.

FEI, J. C. H., RANIS, G., KUO, S. W. Y. Growth and the family distribution of income by factor components. *Quarterly Journal of Economics*, 1978, 92, pp. 17–53.

FIELDS, G. S. Accounting for income inequality and its change: a new method, with application to the distribution of earnings in the United States. *Research in Labour Economics*, 2003, 22, pp. 1–38.

FRIEDMAN, M. *A Theory of the Consumption Function.* National Bureau of Economic Research, Inc., 1957.

GOODMAN, A. AND OLDFIELD, Z. *Permanent Differences? Income and Expenditure Inequality in the 1990s and 2000s*. The Institute for Fiscal Studies, June, 2004.

GUNATILAKA, R. AND CHOTIKAPANICH, D. Accounting for Sri Lanka's Expenditure Inequality 1980–2002: Regression Based Decomposition Approaches. *Review of Income and Wealth*, 2009, 55(4), pp. 882–906.

HAREUVENI, E. *Arrested Development: The Long Term Impact of Israel's Separation Barrier in the West Bank*. Technical Report, Jerusalem: BeTSELEM – The Israeli Information Centre for Human Rights in the Occupied Territories, 2012.

HESHMATI, A. A Review of Decomposition of Income Inequality. *IZA discussion paper No. 1221*, 2004.

INTERNATIONAL LABOUR ORGANIZATION. *The Occupied Palestinian Territory: An Employment Diagnostic Study*. Regional Office for Arab States, Beirut: ILO, 2018.

KRUEGER, D. AND PERRI, F. Does income inequality lead to consumption inequality? Evidence and theory. *The Review of Economic Studies*, 2006, 73(1), pp. 163–193.

LIMANLI, O. Accounting for Income Inequality in Turkey: Regression Based Decomposition Approach. *Journal of Academic Researches and Studies*, 2017, 9(17), pp. 137–146.

MANNA, R. AND REGOLI, A. Regression-based approaches for the decomposition of income inequality in Italy, 1998–2008. *Rivista di statistica ufficiale*, 2012, 14(1), pp. 5–18.

MEYER, B. D. AND SULLIVAN, J. X. Measuring the Well-Being of the Poor Using Income and Consumption. *Journal of Human Resources*, 2003, 38, pp. 1180–1220.

MEYER, B. D. AND SULLIVAN, J. X. Consumption and Income Inequality and the Great Recession. *American Economic Review: Papers & Proceedings*, 2013, 103(3), pp. 178–183.

MINCER, J. Investment in Human Capital and Personal Income Distribution. *Journal of Political Economy*, 1958, 66, pp. 281–302.

MINCER, J. The Distribution of Labour Incomes: a survey with the special reference to the human capital approach. *Journal of Economic Literature*, 1970, 8(1), pp. 1–26.

MORDUCH, J. AND SICULAR, T. Rethinking inequality decomposition, with evidence from rural China. *Economic Journal*, 2002, 112(476), pp. 93–106.

NASCHOLD, F. Microeconomic Determinants of Income Inequality in Rural Pakistan. *Journal of Development Studies*, 2009, 45(5), pp. 746–768.

OAXACA, R. Male–female wage differentials in urban labour markets. *International Economic Review*, 1973, 14, pp. 693–709.

PALESTINIAN CENTRAL BUREAU OF STATISITICS. *Main Findings of Living Standards in Palestine in 2017 (Expenditure, Consumption and Poverty)*. Ramallah – Palestine: PCBS, 2018.

PYATT, G. On the interpretation and disaggregation of Gini coefficients. *Economic Journal*, 1976, 86, pp. 243–255.

PYATT, G., CHEN, C., FEI, J. The Distribution of Income by Factor Components. *The Quarterly Journal of Economics*, 1980, 95(3), pp. 451–473.

RAMADAN, R., HLASNY, V., INTINI, V. Inequality Decomposition in the Arab Region: Application to Jordan, Egypt, Palestine, Sudan and Tunisia. *IARIW-CAPMAS Special Conference: Experiences and Challenges in Measuring Income, Wealth, Poverty and Inequality in the Middle East and North Africa*, Cairo, Egypt, 2015.

RANI, U., KRISHNAKUMAR, J., BIGOTTA, M. Accounting for income inequality: empirical evidence from India. *Indian Economic Review*, 2017, 52(1–2), pp. 193–229.
SHORROCKS, A. F. *Decomposition Procedures for Distributional Analysis: a Unified Framework Based on the Shapley Value* (unpublished manuscript). Department of Economics, University of Essex, 1999.
SHORROCKS, A. F. Inequality decomposition by factor components. *Econometrica*, 1982, 50(1), pp. 193–211.
SHORROCKS, A. F. Inequality decomposition by population subgroups. *Econometrica*, 1984, 52(6), pp. 1369–1385.
TRIPATHI, S. Source of Inequality in Consumption Expenditure in India: A Regression-Based Inequality Decomposition Analysis. *Journal of Income Distribution,* 2018, pp. 1–34.
WAN, G. Regression-based Inequality Decomposition: Pitfalls and a Solution Procedure. *WIDER Working Paper Series 101*, *World Institute for Development Economic Research (UNU-WIDER)*, 2002.
WAN, G. Accounting for Income Inequality in Rural China: A Regression Based Approach. *Journal of Comparative Economics*, 2004, 32, pp. 348–63.

ANNEX

Here, we provide the definitions of household, household head, household income and household consumption as they defined by the Palestinian central bureau of statistics (PCBS).

HOUSEHOLD

'A household is defined as a group of persons who share the same living accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food. Households are mainly consumers, but they may also be producers. All economic activity taking place within the production boundary and not performed by an entity maintaining a complete set of accounts is considered to be undertaken in the household sector'.

HOUSEHOLD HEAD

'A person who generally provides the chief source of income for the household unit. He is the adult person, male or female, who is responsible for the organization and care of the household or who is regarded as such by the members of the household'.

INCOME

'Cash or in-kind revenues to an individual or household within a given period of time: could be a week, a month, or a year'.

HOUSEHOLD CONSUMPTION

'It refers to the amount of cash spent on purchase of goods and services for living purposes, and the value of goods and service payments or part of payments received from the employer, and own-produced goods and food, including consumed quantities during the recording period, and imputed rent for owned houses'.