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*Research Article*

# A Decomposition of Poverty Headcount: Income and Population Dynamics

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**Abstract.** We formalise and present a detailed decomposition method to explain changes in poverty when the poverty line is not fixed and depends on the income distribution. Using the shift-share simulation approach, we decompose poverty change into four components, namely income growth, change in inequality, change in poverty line, and change in total population. We provide empirical illustrations with EU-SILC data for Malta between 2005 and 2018. We find that the poverty line and income growth have been the most important contributors to poverty changes, especially during periods of rapid income growth. This decomposition can be used either to interpret changes between two periods or to microsimulation models of taxes and benefits.

**Keywords:** At-risk-of-poverty rate, relative poverty, shift-share.

## 1 Introduction

The proportion of people in material deprivation in Malta almost halved in 2018 to 8.7% compared to the year when the indicator started to be surveyed, 2009. Yet, with a few exceptions, the number of individuals at-risk-of-poverty increased at a yearly rate to reach 16.8% by 2018. At first glance, such divergent trends may seem unusual and underscore that poverty dynamics and related indicators require a more detailed assessment.

There is no single definition of poverty in a society: value judgments play an important role. Whether poverty is absolute or relative has long been debated. Some say that the poverty line should reflect the absolute poverty threshold, i.e., the cost of purchasing a fixed basket of goods and services that enables people to meet their basic needs; the demarcation between poor and non-poor. Others argue that we should instead look at poverty as a relative threshold, i.e., relative to the country's standard of living. Those who view poverty in relative terms would argue that the poorest members of society appear to have lagged behind the rest; hence the term at-risk-of-poverty. In the absence of an absolute poverty indicator, debates about poverty can easily become deadlocked, as a change in relative poverty does not necessarily reflect a change in absolute poverty.

Social scientists are often interested in explaining why or how at-risk-of-poverty rates change over time. Microsimulation modelling applications, e.g., EUROMOD (Sutherland, 2007), have aided the analysis by evaluating the immediate impact of socio-economic policies on individuals and households. However, in most applications, the poverty line is not fixed and is set as a percentage of the median income of the total population in each year. As a result, the relative poverty line can change from year to year, making it difficult to interpret changes in poverty as a real change or simply as a consequence of a mechanical change in the poverty line. Interpreting poverty change is complex because it mirrors not only gross income change, which reflects labour market developments, but also changes in tax and benefit parameters, the underlying income distribution, and population change. Failure to consider these four components may lead to misinterpretation of the change, and even skewed results. For example, the poverty threshold may fall faster than average income when the economy sinks into a recession, and the poverty rate decreases as a result (Koutsampelas, 2014). While it appears that the number of people previously living just below the poverty line has escaped poverty, after accounting for the decline in the poverty line, poverty would have increased. As a remedy one can set the poverty threshold as fixed in the previous years to avoid conflicting results (Picos et al., 2016), but this comes at the cost of losing important information

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about the dynamics of poverty.

In this paper, we contribute to literature and policy analysis by presenting a quadruple decomposition method that breaks down changes in poverty into four components, namely:

i. changes in the poverty line, which depends on the income of the non-poor,
ii. changes in the underlying income distribution that change due to market and policy developments,
iii. income growth, and
iv. population changes.

We argue that demographic change is another important factor, especially for small countries undergoing rapid demographic transformation, even for developed countries. As a case study, we use Malta, which we consider a classic example due to its small size and ageing population. Malta has become heavily dependent on migration flows to sustain economic growth, with sharp changes in the poverty line and income as well modest higher inequalities at the high end of the income distribution (Vella et al., 2021).

Second, this methodology is of great interest to policy makers and social scientists, as we are able to analyse the components that contribute to the change in poverty, to understand what caused the change in poverty dynamics and their magnitude. Different contributions require different packages of measures to tackle poverty. For example, if poverty is caused by income inequality, this would require a redistributive policy, while poverty, which is mainly caused by the poverty line, might be best addressed by uprating those on fixed incomes and consequently not falling behind the others.

Finally, using the shift-share simulation approach and building on the method proposed by Günther (2007), we set up the theoretical framework of a four-way decomposition. By applying this methodology on Maltese data between 2005 and 2018, this is, to our knowledge, the first such attempt for Malta. We find that the components of the poverty line and income growth have been the most important contributors to poverty changes, particularly during periods of rapid income growth. We also find that the population contribution is particularly relevant in countries undergoing rapid demographic change, such as the admission of a large proportion of refugees and migrant workers.

The paper is organised in four sections as follows. Section 2, which follows this introduction, presents the theoretical framework for decomposing the headline poverty rate. Section 3 uses Malta as a case study and presents recent trends in the four components of poverty, namely income growth, income distribution, population changes and poverty line changes. The section also reports the decomposition exercise. Section 4 will conclude the study and puts forward a number of implications that are derived from the results presented in the previous section.

## 2 Theoretical Framework

Drawing from Kakwani (2000) and Mishra (2015), assume that there is a population set $N = 1, \dots, n$ of $n$ individuals. For each $i = 1, \dots, n, x_i \in \mathbb{R}_+$ is the income of individual $i$. Let vector $(x_1, \dots, x_n) \in \mathbb{R}^n_+$ be income ranked in non-decreasing order. All finite income distributions are represented by $\mathcal{D} = \bigcup_{n \geqslant 1} \mathbb{R}^n_+$. For any given poverty line $z \in \mathbb{R}_{++}$ and for any distribution $x \in \mathcal{D}$, the set of poor people is defined as $Q(x, z) = \{i \in N / x_i < z\}$, and the number of poor by $q(x, z)$. Let $\sigma_x$ be income distribution of the population and $\mu_x$ be the mean income of the population. We define the poverty headcount in period $t$ as $P(\mu_t, \sigma_t, z_t) = q(x, z)$.

We now consider two time periods and start with the quadruple decomposition. In each period we consider the mean income of the population $\mu_t$, the income distribution $\sigma_t$, the poverty threshold $z_t$, and the population size $\eta_t$ with $t = 1, 2$. The changes in poverty along the period can be decomposed as follows:

$$\begin{aligned} \Delta P_{(t+1,t)} = {} & [P(\mu_{t+1}, \sigma_t, z_t, \eta_t) - P(\mu_t, \sigma_t, z_t, \eta_t)] \\ & + [P(\mu_t, \sigma_{t+1}, z_t, \eta_t) - P(\mu_t, \sigma_t, z_t, \eta_t)] \\ & + [P(\mu_t, \sigma_t, z_{t+1}, \eta_t) - P(\mu_t, \sigma_t, z_t, \eta_t)] \\ & + [P(\mu_t, \sigma_t, z_t, \eta_{t+1}) - P(\mu_t, \sigma_t, z_t, \eta_t)] + R_{t+1} \end{aligned} \tag{1}$$

$P(\mu_t, \sigma_t, z_t, \eta_t)$ is the measure of poverty with a mean income $\mu_t$, an income distribution $\sigma_t$, a poverty line $z_t$ and a population size $\eta_t$ over the period $t$.

The first component corresponds to the change in poverty explained by *income growth*, keeping all other components constant. Another way of depicting the income growth components is to plot income on the horizontal axis, count how many people earn that particular income level, and then stack them so that the number on the vertical axis represents them (figure 1). From the hypothetical example, it can be seen that a rightward shift in income distribution through income growth will lift people out of poverty. This is because, all else being equal, fewer people will fall below the poverty line represented by the vertical line.

The second component measures the change in poverty, which is explained by changes in *income distribution*, with other factors remaining unchanged. As movements in income distribution become more unequal, it becomes more difficult to lift people out of poverty. Figure 1 presents a hypothetical case by showing that when the new income distribution is significantly lower than the previous income distribution, poverty will increase and lifting people out of poverty through growth alone is likely to become increasingly difficult.

The third component corresponds to the change in poverty, which is explained by changes in the *poverty line*, everything else remaining constant. The direct effect of a higher poverty line leads to a higher poverty rate. As shown in figure 1, it can be seen that the higher the threshold, the higher the proportion of poor people.

The fourth component captures the impact of population change on poverty. Importantly, in this decomposition we distinguish between changes in income distribution due to changes in inequality and demographic changes. In times of rapid *population change*, especially in times of migration, we expect the impact of income distribution to be substantial when these interactions are taken into account. The effect of population growth is an upward shift in the income distribution curve, with many more people living at or near the poverty line, everything else remaining constant.

$R_{t+1}$ represents the residual term, which is the interaction term between all components.

In the decomposition, the size of each component is path dependent, that is, it depends on whether one considers the growth, distribution, poverty line, and population components first, or other order combinations. In the quadruple decomposition, we consider $4! = 24$ interaction paths for each component. This effectively means that 96 interaction paths are modelled, and therefore the residual can be eliminated.

It is noteworthy that the methodology used is an accounting decomposition and does not take into account dynamic changes in poverty outcomes. Income growth thus reduces poverty, while inequality, the poverty line and population growth increase poverty, assuming the other components remain unchanged. The income and population components only reflect average change, but if most of the income and/or population change has occurred amongst in the richest or poorest households, this will be reflected in the inequality change component.

Let $\dot{\mu}$ be average income growth, $\bar{\mu}_{(t+1)}/\bar{\mu}_t - 1$, and $\bar{\mu}$ be mean income for a given year and let $\dot{\eta}$ be population growth.

In the decomposition exercise, the income growth effect is calculated as follows:

$$
\begin{aligned}
\Delta P^{\mu}_{t+1} = {} & [P(\mu_{t+1}, \sigma_t, z_t, \eta_t) - P(\mu_t, \sigma_t, z_t, \eta_t)]\frac{6}{24} \\
& + [P(\mu_{t+1}, \sigma_{t+1}, z_t, \eta_t) - P(\mu_t, \sigma_{t+1}, z_t, \eta_t)]\frac{2}{24} \\
& + [P(\mu_{t+1}, \sigma_t, z_{t+1}, \eta_t) - P(\mu_t, \sigma_t, z_{t+1}, \eta_t)]\frac{2}{24} \\
& + [P(\mu_{t+1}, \sigma_t, z_t, \eta_{t+1}) - P(\mu_t, \sigma_t, z_t, \eta_{t+1})]\frac{2}{24} \\
& + [P(\mu_{t+1}, \sigma_{t+1}, z_{t+1}, \eta_t) - P(\mu_t, \sigma_{t+1}, z_{t+1}, \eta_t)]\frac{2}{24} \\
& + [P(\mu_{t+1}, \sigma_t, z_{t+1}, \eta_{t+1}) - P(\mu_t, \sigma_t, z_{t+1}, \eta_{t+1})]\frac{2}{24} \\
& + [P(\mu_{t+1}, \sigma_{t+1}, z_t, \eta_{t+1}) - P(\mu_t, \sigma_{t+1}, z_t, \eta_{t+1})]\frac{2}{24} \\
& + [P(\mu_{t+1}, \sigma_{t+1}, z_{t+1}, \eta_{t+1}) - P(\mu_t, \sigma_{t+1}, z_{t+1}, \eta_{t+1})]\frac{6}{24}
\end{aligned} \tag{2}
$$

Using the same analogy as before, the first component corresponds only to the change in poverty over two periods due to a change in average income, with income distribution, poverty live, and population unchanged. Besides this, to derive the full effect of income growth, we account for interactions with income, so the order of the components would not affect the derived results. In fact, the last component captures the effect of a change in average income, this time, income distribution, poverty live, and population take on the next period's value. Similarly, the second component also captures the impact of a change in average income on poverty, but this time the income distribution is unchanged from that of the next period. The third component captures the effect of a change in average income, but includes the next period's population size, while the fourth component uses the next period's poverty threshold, and so on. The fractions represent the weighted contribution of each respective component to the overall income effect. The smaller fractions represent the relative weights for all other possible interactions with income, using either the previous or next period's values. In this way, the residual is eliminated.

Likewise, the inequality component is given by:

$$
\begin{aligned}
\Delta P^{\sigma}_{t+1} = {} & [P(\mu_t, \sigma_{t+1}, z_t, \eta_t) - P(\mu_t, \sigma_t, z_t, \eta_t)]\frac{6}{24} \\
& + [P(\mu_{t+1}, \sigma_{t+1}, z_t, \eta_t) - P(\mu_{t+1}, \sigma_t, z_t, \eta_t)]\frac{2}{24} \\
& + [P(\mu_t, \sigma_{t+1}, z_{t+1}, \eta_t) - P(\mu_t, \sigma_t, z_{t+1}, \eta_t)]\frac{2}{24} \\
& + [P(\mu_t, \sigma_{t+1}, z_t, \eta_{t+1}) - P(\mu_t, \sigma_t, z_t, \eta_{t+1})]\frac{2}{24} \\
& + [P(\mu_{t+1}, \sigma_{t+1}, z_{t+1}, \eta_t) - P(\mu_{t+1}, \sigma_t, z_{t+1}, \eta_t)]\frac{2}{24} \\
& + [P(\mu_{t+1}, \sigma_{t+1}, z_t, \eta_{t+1}) - P(\mu_t, \sigma_t, z_t, \eta_{t+1})]\frac{2}{24} \\
& + [P(\mu_t, \sigma_{t+1}, z_{t+1}, \eta_{t+1}) - P(\mu_t, \sigma_t, z_{t+1}, \eta_{t+1})]\frac{2}{24} \\
& + [P(\mu_{t+1}, \sigma_{t+1}, z_{t+1}, \eta_{t+1}) - P(\mu_{t+1}, \sigma_t, z_{t+1}, \eta_{t+1})]\frac{6}{24}
\end{aligned} \tag{3}
$$

The poverty threshold component is given by:

$$
\begin{aligned}
\Delta P^{z}_{t+1} = {} & [P(\mu_t, \sigma_t, z_{t+1}, \eta_t) - P(\mu_t, \sigma_t, z_t, \eta_t)]\frac{6}{24} \\
& + [P(\mu_{t+1}, \sigma_t, z_{t+1}, \eta_t) - P(\mu_{t+1}, \sigma_t, z_t, \eta_t)]\frac{2}{24} \\
& + [P(\mu_t, \sigma_{t+1}, z_{t+1}, \eta_t) - P(\mu_t, \sigma_{t+1}, z_t, \eta_t)]\frac{2}{24} \\
& + [P(\mu_t, \sigma_t, z_{t+1}, \eta_{t+1}) - P(\mu_t, \sigma_t, z_t, \eta_{t+1})]\frac{6}{24}
\end{aligned} \tag{4}
$$

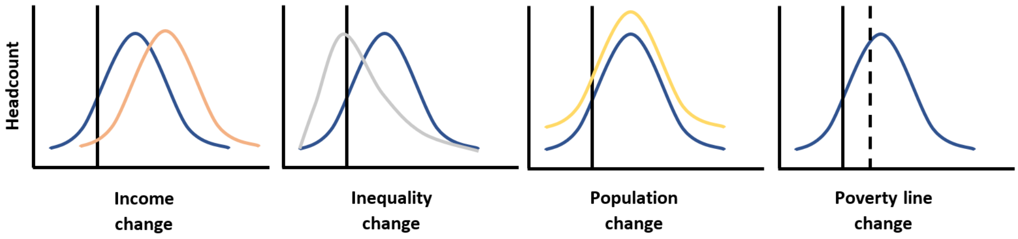


**Figure 1:** Changes in the components of poverty
*Note: The vertical solid lines represent the poverty threshold, with the dashed line representing the adjusted poverty threshold.*

$$
\begin{aligned}
&+ [P(\mu_{t+1}, \sigma_{t+1}, z_{t+1}, \eta_t) - P(\mu_{t+1}, \sigma_{t+1}, z_t, \eta_t)]\frac{2}{24} \\
&+ [P(\mu_{t+1}, \sigma_t, z_{t+1}, \eta_{t+1}) - P(\mu_{t+1}, \sigma_t, z_t, \eta_{t+1})]\frac{2}{24} \\
&+ [P(\mu_t, \sigma_{t+1}, z_{t+1}, \eta_{t+1}) - P(\mu_t, \sigma_{t+1}, z_t, \eta_{t+1})]\frac{2}{24} \\
&+ [P(\mu_{t+1}, \sigma_{t+1}, z_{t+1}, \eta_{t+1}) - P(\mu_{t+1}, \sigma_{t+1}, z_t, \eta_{t+1})]\frac{6}{24}
\end{aligned}
$$

The population component is estimated by:

$$
\begin{aligned}
\Delta P^{\mu}_{t+1} = {} & [P(\mu_t, \sigma_t, z_t, \eta_{t+1}) - P(\mu_t, \sigma_t, z_t, \eta_t)]\frac{6}{24} \\
&+ [P(\mu_{t+1}, \sigma_t, z_t, \eta_{t+1}) - P(\mu_{t+1}, \sigma_t, z_t, \eta_t)]\frac{2}{24} \\
&+ [P(\mu_t, \sigma_{t+1}, z_t, \eta_{t+1}) - P(\mu_t, \sigma_{t+1}, z_t, \eta_t)]\frac{2}{24} \\
&+ [P(\mu_t, \sigma_t, z_{t+1}, \eta_{t+1}) - P(\mu_t, \sigma_t, z_{t+1}, \eta_t)]\frac{2}{24} \\
&+ [P(\mu_{t+1}, \sigma_{t+1}, z_t, \eta_{t+1}) - P(\mu_{t+1}, \sigma_{t+1}, z_t, \eta_t)]\frac{2}{24} \\
&+ [P(\mu_{t+1}, \sigma_t, z_{t+1}, \eta_{t+1}) - P(\mu_{t+1}, \sigma_t, z_{t+1}, \eta_t)]\frac{2}{24} \\
&+ [P(\mu_t, \sigma_{t+1}, z_{t+1}, \eta_{t+1}) - P(\mu_t, \sigma_{t+1}, z_{t+1}, \eta_t)]\frac{2}{24} \\
&+ [P(\mu_{t+1}, \sigma_{t+1}, z_{t+1}, \eta_{t+1}) - P(\mu_{t+1}, \sigma_{t+1}, z_{t+1}, \eta_t)]\frac{6}{24}
\end{aligned}
\tag{5}
$$

The components can be interpreted using the same analogy as above. The poverty change can now be estimated as:

$$\Delta P_{t+1} \cong \Delta P^{\mu}_{t+1} + \Delta P^{\sigma}_{t+1} + \Delta P^{z}_{t+1} + \Delta P^{\eta}_{t+1}, \tag{6}$$

and be expressed in terms of either population or headcount ratio by dividing each component by population size, $n$. Let $\Delta P^{\mu}_{t+1}$ be the change in poverty due to the income growth component, $\Delta P^{\sigma}_{t+1}$ is the change brought about by income distribution component, $\Delta P^{z}_{t+1}$ represents changes in poverty due to the poverty line effect, and $\Delta P^{\eta}_{t+1}$ be the change in poverty attributed to the population size component. The STATA command file used to generate the results in Section 3 is included in the Appendix.

# 3 An Empirical Example: The Case of Malta

## 3.1 Poverty in Malta

We begin the analysis with the headline indicator of poverty for the period 2005–2018. The headline poverty indicator is the incidence of poverty by counting the people in poverty and expressing them as a proportion of the total number of people in society. The headcount poverty measure ignores the actual incomes of the poor, save for the fact that they fall below the poverty line.

Between 2005 and 2018, the number of people below the relative poverty line rose from approx. 57,000 to around 79,000, with the poverty rate increasing from 14.4% to 16.9% (figure 2). The general conclusion is that there is a higher incidence of poverty and that this incidence is generally increasing over the years, apart from some periods, despite normalising the indicator by population size. The reason for this is that as income levels change over time, so does the poverty line and income distribution.

The dynamics shown in figure 2 do not mean more people cannot lead decent lives, but more members of society seem to have fallen behind the rest. It is of interest to analyse which factors had the greatest impact on these changes in poverty rates.

## 3.2 Changes in Income and Poverty Line

We expect that an increase in the poverty threshold leads to an increase in the headcount indicator, everything else remaining constant. Figure 3 shows how mean and median household equivalised income changed during under study. Since the poverty line is defined as 60% of median equivalised household disposable income, both the median income and the poverty threshold lines follow the same trajectory. It can be seen that the largest increases in income occurred in 2008 and 2014–2017. In the 2000s and early 2010s, the Maltese economy was bound by a process of aligning public finances with the Maastricht

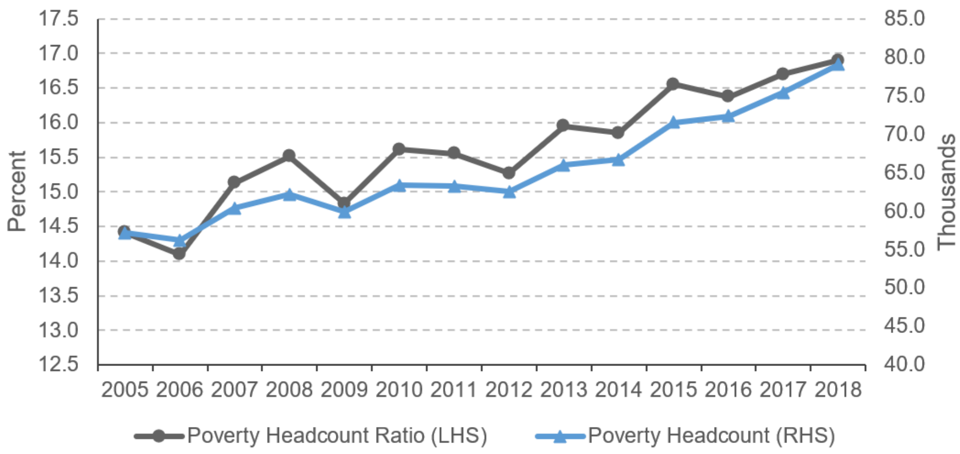


**Figure 2:** Poverty Headcount Indicators in Malta

criteria and an excessive deficit procedure, which in the process slowed economic momentum. Having said that, the emergence of sectors such as financial services and remote gaming were the key sectors driving growth, hence the emergence of a two-speed economy. Income levels fell only once in 2010, reflecting the effect of the recession[1]. In addition, concurrent to the increase in the incidence of relative poverty is a steady rise in the poverty threshold. The increase in relative poverty does not mean that more people cannot live a decent life, but that more members of society appear to have lagged behind the others.

### 3.3 Changes in Income Inequality

Another factor related to poverty dynamics is income inequality. A priori, the effect of a change in the income distribution could be interpreted differently since it can affect both the bottom and the top of the distribution. First, higher income inequality could be viewed to mean that more people are at the bottom of the distribution. Alternatively, this could result in more people being at the top of the income distribution.

A review of headline statistics for Malta shows that the Gini coefficient increased from 27.0 to 28.7 between 2005 and 2018 (figure 4). A coefficient of 0 means perfect equality, where everyone has the same income. In contrast, a coefficient of 100 implies absolute inequality if only one person has all the income. This development shows that inequality has increased over the past thirteen years despite social policies. However, social assistance from the state dampened the general increase in inequality. In addition, a more detailed analysis for the same period shows that modest higher inequalities happened at the high end of the income distribution. A more detailed analysis is provided by Vella et al. (2021).

### 3.4 Changes in Total Population

Another important factor related to the poverty indicator is total population. The size of population often goes unnoticed in economically advanced countries, but has a great deal of say for poverty dynamics, especially for small economies.

Malta is the smallest EU Member State, with a population of less than half a million, which acceded to the EU on May 2004 and adopted the euro in January 2008. Due to its small size and ageing population, Malta has become heavily dependent on migration inflows to sustain rates of economic growth above EU-average. According to Eurostat, the population living in Malta increased by 20% during the survey period, mainly due to large economic immigration flows from EU and non-EU countries (figure 5). The share of foreign workers increased rapidly considering that in 2019 almost one in four workers was foreigner compared to only 5.6% in 2008 (DG for Economic and Financial Affairs (ECFIN), 2019, 2020).

A priori, a larger population increases the number of people living below the poverty line, all other things remaining constant. Furthermore, it can also be argued that the interaction between population and inequality has become more pronounced due to the dichotomous profile of economic migrants, ranging from professional to elementary occupations, and the rapid per capita inflow of irregular migrants. We also expect that the inequality component will be sizeable over the recent years due to recently

[1] The income reference year of the SILC survey is one calendar year prior to the survey year. For example, the income collected in 2010 refers to the calendar year 2009.

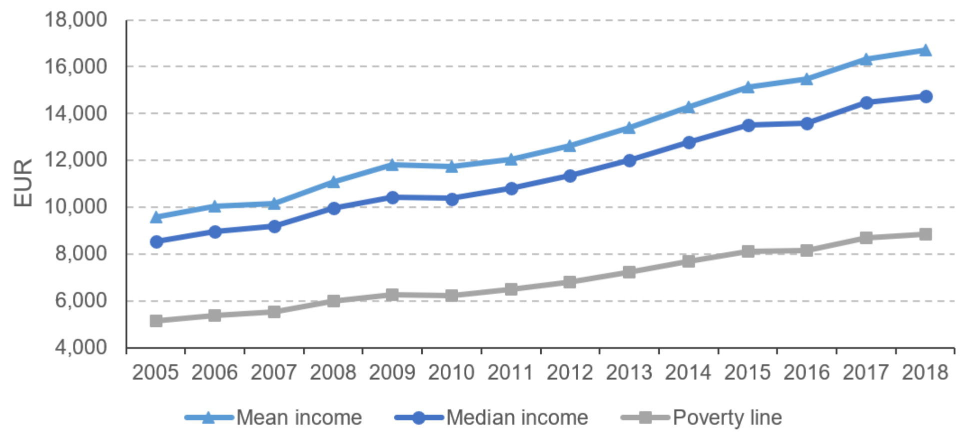


**Figure 3:** Equivalised household disposable income

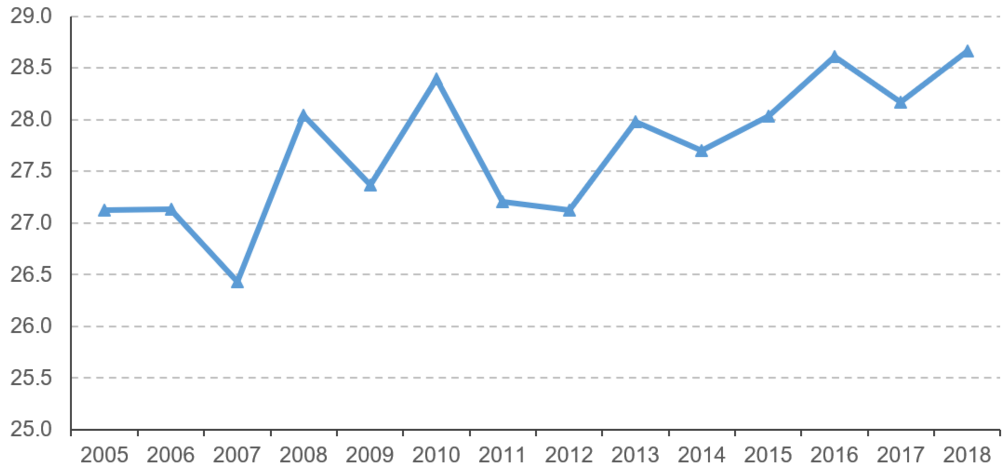


**Figure 4:** Gini coefficient

introduced programmes to address at-risk-of-poverty and social exclusion, including increasing pensions, reducing taxes for all workers, and a new housing benefit in order to improve rent affordability in the private sector (Ministry for Finance (MFIN), 2019).

### 3.5 Decomposition Analysis

In this section, we use equation (6) to study the poverty dynamics in Malta between 2005 and 2018 and present the results in figure 6 and table 1. Figure 6 shows the decomposition of change in poverty headcount in thousands, while table 1 shows the poverty rates and the contribution of each component to the change in the poverty rate, i.e., by dividing the number of poor people by size of the population.

All years have been characterised by income growth, and 2010 was the exception, reflecting the global recession of 2009. Disposable income growth has, on average, exerted a downward pressure of 1.9 p.p. between 2005 and 2012 and of 2.4 p.p. during the 2013—2018 period.

Because the poverty threshold depends on the median equivalised disposable income we expect the threshold to rise rapidly in a growing economy, but conversely fall in a recession. With the exception of 2010, the poverty line again put upward pressure on poverty. The impact of changes in the poverty line depends not only on the magnitude of the change, but also on the distribution of the poor—that is, the number of people just living below or above the poverty line. If people are concentrated around the poverty line, then more elastic poverty is proportional to changes in the threshold. Seven out of thirteen periods were characterised with poverty threshold

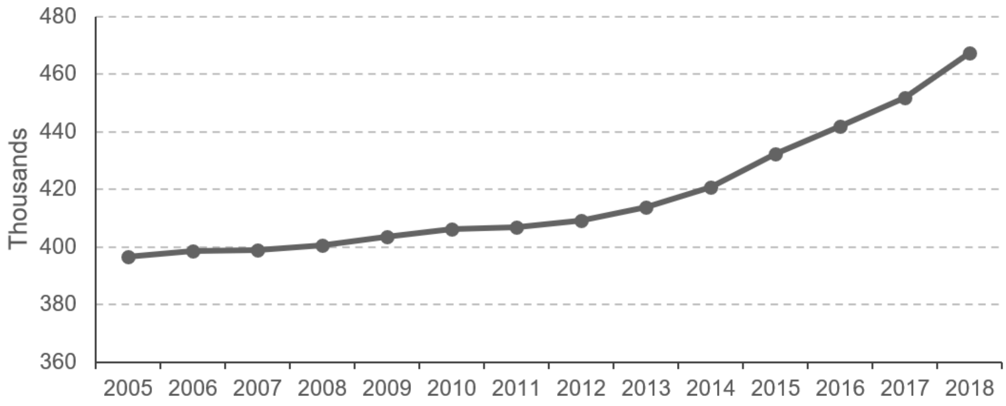


**Figure 5:** Total Population

contribution that outweighed income growth contribution, implying that the poverty threshold has risen faster than average income.

The inequality change effect shows the extent to which poverty has been changed by income inequality. The contributions move in parallel with changes in the Gini coefficient. Again, the effect swings from positive to negative over time but, overall the magnitude of the upside contribution exceeded the negative contribution. This means that inequality tendencies lead to poverty, everything else remains constant.

Finally, the impact of total population change shows that, other things being equal, the impact of economic growth on poverty is dampened by an increase in total population. The population effect has been amplified in recent years due to reliance on foreign labour to fill labour shortages. In 2018, the population effect reduced the impact of economic growth on poverty reduction by nearly half.

## 4 Conclusions

In this paper we present a detailed decomposition method to decipher changes in components using a shift-share simulation approach. The method attributes the changes to four different effects and helps interpret of poverty change when poverty line is calculated using the distribution of equivalised disposable income.

We provide empirical illustrations with Maltese EU-SILC data for 2005–2018. They show that while income growth has contributed to poverty change, so has the poverty threshold. We also separated the income distribution effect and showed that the distribution effect is actually a combination of the change in total population inequality. Changes in the total population suggest that the increase in migration inflows is likely to have contributed to increases in poverty.

In summary, our paper has methodological improvements that draws from Kakwani (2000) and Mishra (2015) and expands on the methodology of Günther (2007). To our knowledge, this is the first such attempt on Maltese data. Many studies fix the poverty line to study difference of poverty between two periods of time, but it comes at the cost of losing important information about the four components, including any interactions between them.

Another important contribution of this exercise from a policy perspective is that it allows social scientists to understand how earnings, income distribution, poverty line and demographics affect poverty outcomes and helps communicate the results to policy makers and the public. The proposed decomposition may provide a unique avenue for an improved analysis of taxes and benefits by integrating results from microsimulations with poverty change decomposition. This simplifies interpretation and avoids counter-intuitive results without the need to fix the poverty line. While growth remains vital, we must complement our efforts to increase growth with policies that make more resources available to the relatively poor. To some extent, this can be achieved by focusing on inclusion, specifically by helping people below the poverty line to move up the income ladder faster.

## 5 Disclaimer

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| | Poverty Head-count ('000) | Poverty Ratio (%) | Poverty Change (p.p.) | Income Change (p.p) | Population Change (p.p.) | Inequality Change (p.p.) | Poverty Line Change (p.p.) |
|---|---|---|---|---|---|---|---|
| 2005 | 57.1 | 14.4 | | | | | |
| 2006 | 56.2 | 14.1 | −0.3 | −1.9 | 0.1 | −0.6 | 2.1 |
| 2007 | 60.3 | 15.1 | 1.0 | −0.5 | 0.0 | 0.3 | 1.2 |
| 2008 | 62.2 | 15.5 | 0.4 | −4.4 | 0.1 | 1.0 | 3.8 |
| 2009 | 59.9 | 14.8 | −0.7 | −3.2 | 0.1 | −0.1 | 2.5 |
| 2010 | 63.4 | 15.6 | 0.8 | 0.3 | 0.1 | 0.8 | −0.3 |
| 2011 | 63.2 | 15.5 | −0.1 | −1.3 | 0.0 | −0.8 | 2.0 |
| 2012 | 62.5 | 15.3 | −0.3 | −2.2 | 0.1 | −0.6 | 2.5 |
| 2013 | 66.0 | 15.9 | 0.7 | −3.0 | 0.2 | 0.9 | 2.6 |
| 2014 | 66.7 | 15.9 | −0.1 | −3.1 | 0.2 | −0.4 | 3.2 |
| 2015 | 71.5 | 16.5 | 0.7 | −2.9 | 0.4 | 0.5 | 2.7 |
| 2016 | 72.3 | 16.4 | −0.2 | −1.1 | 0.3 | 0.3 | 0.3 |
| 2017 | 75.5 | 16.7 | 0.3 | −2.9 | 0.3 | −0.5 | 3.5 |
| 2018 | 79.0 | 16.9 | 0.2 | −1.2 | 0.5 | −0.2 | 1.1 |

**Table 1:** Quadruple-decomposition of poverty headcount ratio

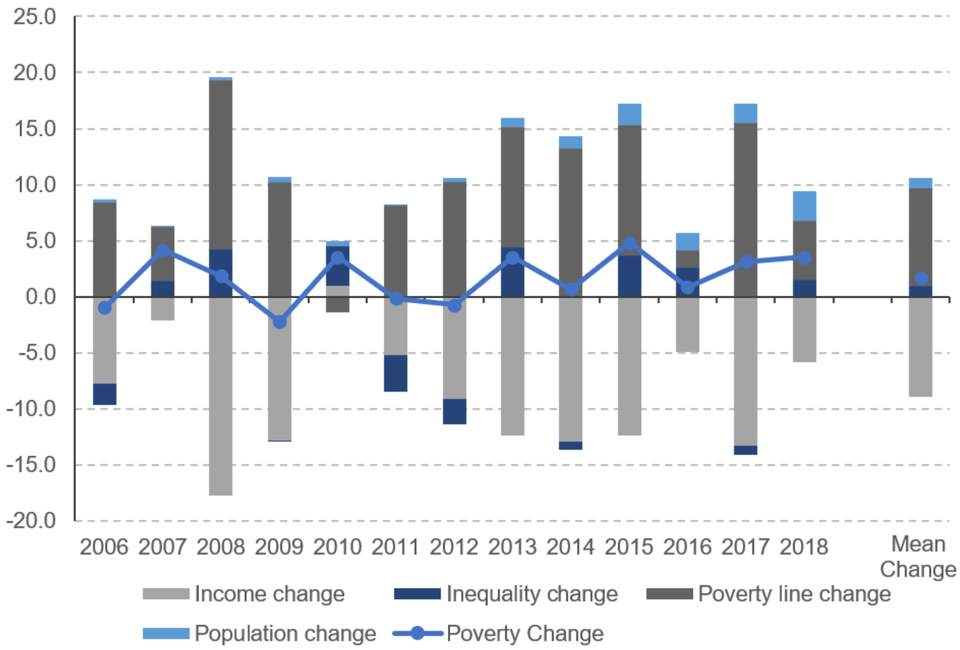


**Figure 6:** Quadruple-decomposition of poverty headcount, thousands

The present document has been produced using the EU-SILC 2005–2018 Data—National Statistics Office, Malta. The calculations and conclusions within the document are the intellectual product of the undersigned.

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# Appendix

Stata code for a Quadruple Poverty Decomposition (2018 over 2017)

```
**poor2111 poverty rate at mu2 and sigmal and zl and eta1
gen poor2111=0
replace poor2111=1 if (ehhydisp2017 * $ymean2018 / $ymean2017 < $pl2017)
sum poor2111 [aw = dhweight2017]
return list
gen poor2111=r(sum)

**poor1111 poverty rate at mul and sigmal and zl and eta1
gen poor1111=0
replace poor1111=1 if (ehhydisp2017 < $pl2017)
sum poor1111 [aw = dhweight2017]
return list
gen poor1111=r(sum)

**poor2211 poverty rate at mu2 and sigma2 and zl and eta1
gen poor2211=0
replace poor2211=1 * $pop2017 / $pop2018 if (ehhydisp2018 < $pl2017)
sum poor2211 [aw = dhweight2018]
return list
gen poor2211=r(sum)

**poor1211 poverty rate at mul and sigma2 and zl and eta1
gen poor1211=0
replace poor1211=1 * $pop2017 / $pop2018 if (ehhydisp2018 * $ymean2017 / $ymean2018 < $pl2017)
sum poor1211 [aw = dhweight2018]
return list
gen poor1211=r(sum)

**poor2121 poverty rate at mu2 and sigmal and z2 and eta1
gen poor2121=0
replace poor2121=1 if (ehhydisp2017 * $ymean2018 / $ymean2017 < $pl2018)
sum poor2121 [aw = dhweight2017]
return list
gen poor2121=r(sum)

**poor1121 poverty rate at mul and sigmal and zl and eta1
gen poor1121=0
replace poor1121=1 if (ehhydisp2017 < $pl2018)
sum poor1121 [aw = dhweight2017]
return list
gen poor1121=r(sum)

**poor2112 poverty rate at mu2 and sigmal and zl and eta2
gen poor2112=0
replace poor2112=1 * $pop2018 / $pop2017 if (ehhydisp2017 * $ymean2018/$ymean2017 < $pl2017)
sum poor2112 [aw = dhweight2017]
return list
gen poor2112=r(sum)

**poor1112 poverty rate at mul and sigmal and zl and eta2
gen poor1112=0
replace poor1112=1 * $pop2018 / $pop2017 if (ehhydisp2017 < $pl2017)
sum poor1112 [aw = dhweight2017]
return list
gen poor1112=r(sum)

**poor2221 poverty rate at mu2 and sigma2 and z2 and eta1
gen poor2221=0
replace poor2221=1 * $pop2017 / $pop2018 if (ehhydisp2018 < $pl2018)
sum poor2221 [aw = dhweight2018]
return list
gen poor2221=r(sum)
```

```
**poor1221 poverty rate at mu1 and sigma2 and z2 and eta1
gen poor1221=0
replace poor1221=1 * $pop2017 / $pop2018 if (ehhydisp2018 * $ymean2017/$ymean2018 < $pl2018)
sum poor1221 [aw = dhweight2018]
return list
gen poor1221=r(sum)

**poor1122 poverty rate at mu1 and sigma1 and z2 and eta2
gen poor1122=0
replace poor1122=1 * $pop2018 / $pop2017 if (ehhydisp2017 < $pl2018)
sum poor1122 [aw = dhweight2017]
return list
gen poor1122=r(sum)

**poor2212 poverty rate at mu2 and sigma2 and z1 and eta2
gen poor2212=0
replace poor2212=1 if (ehhydisp2018 < $pl2017)
sum poor2212 [aw = dhweight2018]
return list
gen poor2212=r(sum)

**poor1212 poverty rate at mu1 and sigma2 and z1 and eta2
gen poor1212=0
replace poor1212=1 if (ehhydisp2018 * $ymean2017 / $ymean2018 < $pl2017)
sum poor1212 [aw = dhweight2018]
return list
gen poor1212=r(sum)

**poor2222 poverty rate at mu2 and sigma2 and z2 and eta2
gen poor2222=0
replace poor2222=1 if ehhydisp2018 < $pl2018
sum poor2222 [aw = dhweight2018]
return list
gen poor2222=r(sum)

**poor1222 poverty rate at mu1 and sigma2 and z2 and eta2
gen poor1222=0
replace poor1222=1 if ehhydisp2018 * $ymean2017 / $ymean2018 < $pl2018
sum poor1222 [aw = dhweight2018]
return list
gen poor1222=r(sum)

**poor2122 poverty rate at mu2 and sigma1 and z2 and eta2
gen poor2122=0
replace poor2122=1 * $pop2018 / $pop2017 if (ehhydisp2017 * $ymean2018 / $ymean2017 < $pl2018)
sum poor2122 [aw = dhweight2017]
return list
gen poor2122=r(sum)

gen changep2018= poor2222 - poor1111
gen income1    = poor2111 - poor1111
gen income2a   = poor2211 - poor1211
gen income2b   = poor2121 - poor1121
gen income2c   = poor2112 - poor1112
gen income2ab  = poor2221 - poor1221
gen income2bc  = poor2122 - poor1122
gen income2ac  = poor2212 - poor1212
gen income2    = poor2222 - poor1222
gen dist1      = poor1211 - poor1111
gen dist2a     = poor2211 - poor2111
gen dist2b     = poor1221 - poor1121
gen dist2c     = poor1212 - poor1112
gen dist2ab    = poor2221 - poor2121
gen dist2ac    = poor2212 - poor2112
```

```
gen dist2bc     = poor1222 - poor1122
gen dist2       = poor2222 - poor2122
gen povl1       = poor1121 - poor1111
gen povl2a      = poor2121 - poor2111
gen povl2b      = poor1221 - poor1211
gen povl2c      = poor1122 - poor1112
gen povl2ab     = poor2221 - poor2211
gen povl2ac     = poor2122 - poor2112
gen povl2bc     = poor1222 - poor1212
gen povl2       = poor2222 - poor2212
gen pop1        = poor1112 - poor1111
gen pop2a       = poor2112 - poor2111
gen pop2b       = poor1212 - poor1211
gen pop2c       = poor1122 - poor1121
gen pop2ab      = poor2212 - poor2211
gen pop2ac      = poor2122 - poor2121
gen pop2bc      = poor1222 - poor1221
gen pop2        = poor2222 - poor2221
gen res2018     = changep2018-income1-dist2a-povl2ab-pop2
gen incomeeffect2018 = (income1*6 + income2a*2 + income2b*2 + income2c*2 + income2ab*2 + income2ac*2 + income2bc*2 + income2*6)/24
gen disteffect2018 = (dist1*6 + dist2a*2 + dist2b*2 + dist2c*2 + dist2ab*2 + dist2ac*2 + dist2bc*2 + dist2*6)/24
gen povleffect2018   = (povl1*6 + povl2a*2 + povl2b*2 + povl2c*2 + povl2ab*2 + povl2ac*2 + povl2bc*2 + povl2*6)/24
gen popeffect2018    = (pop1*6 + pop2a*2 + pop2b*2 + pop2c*2 + pop2ab*2 + pop2ac*2 + pop2bc*2 + pop2*6)/24
```