Caribbean Economic Research Team

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## **CERT Working Paper**

# Estimating Household Distribution of Inflationary Conditions: Aruba

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### Estimating Household Distribution of Inflationary Conditions: Aruba<sup>1</sup>

#### ABSTRACT

In this paper, the researcher sets out to ascertain if there is an occurrence of inflation inequality in Aruba. Using an Income and Expenditure Survey data as an indicator of consumption, and CPI figures for inflation, we are able to decompose expenditure shares by socioeconomic subgroups and determine if there exists variation among the income groups. During the period studied, the findings indicate that the middle-class experienced higher price level changes during inflationary periods. This study is critical for policymakers to determine cost factors impacting (a) subgroup(s) more heavily than others, and allows for the development of policy actions targeted towards groups most vulnerable in high-price environments.

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#### **Chapter 1: INTRODUCTION**

In 2023, inflation is the buzzword in economics. Coming out of the COVID-19 pandemic and being confronted with the Russian invasion of Ukraine has deprived the global economy of time to recover. These crises have compounded the effect on the supply chain of global markets, which have not left prices untouched. In addition, governments' fiscal stimulus has contributed to elevated price levels (Jaramillo & O'Brien, *Inflation, a rising threat to the poor and vulnerable in Latin America and the Caribbean* 2022).

For an extended period, prices have been stable, with inflation remaining consistently below many central banks' target rates. However, since the summer of 2021, prices have risen faster than anticipated, increasing worries among economists and central bankers about the future inflation and growth trajectory. With central banks worldwide tightening financing conditions to rein in inflation rates and cool the economy, fears of recession among consumers and businesses have been widespread.

Inflation is a relevant topic to study today. Pinpointing its determinants and determining the appropriate route and tools to quell surging price levels is a crucial task of central banks globally. In the Caribbean and among small islands, this research is even more critical as small islands and Caribbean states tend to be price takers and exhibit limited control over imported inflation (Boz et al., *Smaller economies in Latin America and the Caribbean face a more significant inflation challenge* 2022). Considering that most products, including food items, are imported, it is of utmost importance that the root causes of inflation are targeted by government policies and central banks who hold the mandate to maintain price stability. In Chart 2, the 12-month average inflation of Aruba is benchmarked against its regional peers. Historically, Aruba has experienced volatile inflationary periods ranging from -2.4 to 9.0 per cent during the last 15 years. However, compared to peers from the region, Aruba is not an outlier, likely due to the nature of small islands and countries in the region, as explained above.



Figure 1: 12-month average inflation for Aruba and peers, Barbados, Bahamas, Jamaica and Suriname throughout the last 15-year period

Note: Right axis is applicable for Suriname only, while left axis applies to other countries including Aruba.

The main objective of this paper is to examine the occurrence of inflation inequality<sup>2</sup> across income quartiles in Aruba. By using consumer expenditure data from the 2016 income and expenditure survey in Aruba and official inflation (consumer price index) statistics from the Central Bureau of Statistics (CBS), this paper sets out to estimate the impact of inflation across households from different socioeconomic subgroups. Consumer-price inflation measures such as the CPI are calculated using a basket of goods representative of the average consumer. However, the actual composition of spending and consumption can vary significantly by income group (Gill & Nagle, *Inflation could wreak vengeance on the world's poor* 2022). By decomposing the expenditure shares into socioeconomic strata, policymakers can better identify the cost factors affecting vulnerable populations and design more targeted policies to provide support in high-price environments.

The following section covers the literature on inflation among income groups. Section three describes the data used, while section four explains the methodology. After that, section five presents the results, and section six presents the accompanying policy recommendations. Finally, section seven concludes.

<sup>&</sup>lt;sup>2</sup> According to Claeys et al., Inflation inequality is defined as the spread of the inflation burden among income, ethnic, and other minority groups (2022). In this study, inflation households of different income groups use inequality in the context of varying inflation experiences.

#### Chapter 2: LITERATURE REVIEW

The impact of inflation on varying income groups has been broadly studied, particularly in the last few years. A large part of the literature while using varying methods concludes that poorer households tend to experience higher inflation.

The Federal Reserve of Dallas has published one of these studies. In the study, *High inflation Disproportionately Hurts Low-income Households*, the researchers use stress caused by rising inflation, gathered in the Household Pulse Survey by US Census Bureau<sup>3</sup>, as a proxy to determine the population most affected by rising prices (Jayashankar & Murphy, 2023). In contrast, the US Department of Labour uses a more commonly used method known as the Laspeyres index, a similar method applied in this paper for Aruba. Nonetheless, the results are comparable, with the study finding that the index for poorer households grew faster than the average of all urban households (Klick & Stockburger, *Experimental CPI for lower and higher income households*, 2021). For wealthier households, the study found slower growth compared to the average. The Wharton School of Business also researched this topic for the US population and estimated how much inflation would cost the average US household in 2021 to maintain the same level of consumption as opposed to 2020 and 2019. The researchers find that an estimated additional \$ 3,500 would be needed for the average US household to maintain the same level of consumption. In addition, lower-income households will have to spend seven per cent more on goods and services as prices rise on the goods and services they consume, while for wealthier households, the outcome is six per cent (He & Sun, *Impact of inflation by household income*, 2021).

Aside from the research on the US population, there is also literature highlighting the effect of inflation on people with low incomes in other parts of the world. Breugel, an economic think tank based in Belgium, also published an analysis of the situation in Europe, focusing on Italy, France, and Belgium. This analysis suggests that in early 2022, low-income households in the abovementioned countries suffered the most as a large share of their income went to housing, which includes energy prices. In the article, the authors single out energy prices "as the main culprit" in the impact of inflation on lower-income households in France, Italy, and Belgium (Claeys & Guetta-Jeanrenaud, *Who is suffering most from rising inflation?* 2022). Another study focusing on the world's poorer households from the Brookings Institution clarified why lower-income households are more impacted during inflationary periods. The study mentions the

<sup>&</sup>lt;sup>3</sup> The Household Pulse Survey is a monthly survey commenced in April 2020 as a means to promptly gather key economic indicators, including housing, food, and child care, on households during the pandemic. Access to near real-time data enables policymakers to respond swiftly to emerging issues in the community.

composition of income, assets, and consumption baskets as reasons that poorer households feel the impact of rising prices the hardest (Gill & Nagle, *Inflation could wreak vengeance on the world's poor* 2022). On the composition of income and assets, the authors emphasize that poorer households often rely on wages and transfers, which can be eroded during inflationary periods, while wealthier households have access to financial products such as savings accounts, certificates of deposits (CDs) or investment funds, which may shield them from inflationary periods in the long term. On the other hand, poorer households are more likely to rely on nonmonetary income, such as agriculture workers consuming their yield or, in the Aruban context, fishermen putting food on the table. Consumption baskets also play a role in the impact of inflation, as higher-income households are likely to purchase already the least expensive option (Gill & Nagle, *Inflation could wreak vengeance on the world's poor* 2022).

However, there is a portion of the literature on inflation among income that does not necessarily conclude that poorer households experience higher inflation compared to other income groups. A study by Breugel titled "*Does inflation Hit the Poor Hardest Everywhere?*" sets out to determine the factors that allow the inflation burden to be felt more equally or unequally among income groups (Claeys et al., 2022). The research elaborates on the term *inflation inequality*, measuring the spread of the inflation burden among income, ethnic, and other minority groups. For income groups in particular, the authors argue that in countries with low inflation inequality, consumption patterns, or share of income spent on specific categories, may not be very different between lower and higher income households. Another factor that has a role is a significant price increase in luxury items, which may offset the increase in the price of food and energy prices, for example. Lastly, the article mentions certain national policies controlling prices on specific goods (Claeys et al., *Does inflation hit the poor hardest everywhere?* 2022).

Middle-income households may also be the most affected under certain conditions, according to the Federal Reserve Bank of New York (Chakrabarti et al., *Inflation disparities by race and income narrow* 2023). The study provides evidence that between 2021 and June 2022, the most affected households included middle-income households and households of Black or Hispanic ethnic background. The article explains that the income group affected depends mainly on the goods and services experiencing inflation at the time. During the period in question, prices rose steadily in the transportation component, in particular for used cars and motor fuel. These are goods on which a more significant share of these groups' expenditures are spent. The pattern can be further supported considering that as inflation in transportation started to decline, inflation for the mentioned groups also declined (Chakrabarti et al., *Inflation disparities by race and* 

*income narrow* 2023). This research highlights the importance of determining the source of inflation, pinpointing the most affected groups, and developing targeted policies to alleviate the burden for specific income or ethnic groups. The abovementioned actions are vital in combatting inflation inequality.

In comparison to larger countries in the Latin American and Caribbean (LAC) region, smaller economies face more significant inflation challenges according to the IMF. The paper highlights the reasons why smaller economies in Central America, the Caribbean, and South America are more vulnerable to inflationary episodes, including their reliance on imports, low diversification of economies, higher public debt, and fewer monetary policy tools at their disposal due to pegged exchange rates (Boz et al., Smaller economies in Latin America and Caribbean face a more significant inflation challenge 2022). Since food prices rived the inflation waves in 2022, it impacted poorer households the most due to a more significant proportion of these households' income being devoted to food. The World Bank also published a paper on the impacts of inflation on the LAC region, reiterating food and energy as the main drivers of inflation during the 2021 wave. As mentioned multiple times above, poorer households spend more of their income on basic needs such as food and shelter. In the LAC, on average, approximately 40 per cent of the budget share goes to food and energy, with inflation only putting further pressure on the disposable income of lowerincome households (Jaramillo & O'Brien, Inflation, a rising threat to the poor and vulnerable in Latin America and the Caribbean 2022). Empirical analysis pointed to demand-side pressures pushing up inflation, particularly the expansionary policies during the pandemic alongside supply chain disruptions. On top of these factors, the Russian invasion of Ukraine exacerbated the inflationary pressure (Jaramillo & O'Brien, Inflation, a rising threat to the poor and vulnerable in Latin America and the Caribbean 2022). Lastly, to compare against a peer in the region, the study titled Inflation Across Different Groups in Trinidad and Tobago is a good comparison in which using the Laspeyres index, the authors find that poorer households are more affected by high inflation, in particular when the latter is driven by food and energy (Mahabir et al., 2016).

Based on the literature, there seems to be a consensus that poor households are disproportionately affected by higher inflation. However, there is research to support instances in which this is different. Therefore, the **null hypothesis** is that high inflation in Aruba affects all income groups equally. The **alternative hypothesis** is then that (an)other income group(s) (Quartile 1, 2, 3, or 4) is more affected during inflationary periods in Aruba than the other socioeconomic subgroups.

#### Chapter 3: DATA

This research paper uses consumer expenditure data from the 2016 Income & Expenditure Survey (IES). The data is broken down by *income groups* and *number of children*, provided by the CBS of Aruba. As for inflation figures, the paper uses the official Consumer Price Index (CPI) for 2016 through 2022. The consumer expenditure data and CPI are the main variables in this study.

For this study, the IES 2016 data, broken down into four equal income groups, are used (See Table 1). These quartiles were determined based on the 25<sup>th</sup> percentile, 50<sup>th</sup> percentile, 75<sup>th</sup> percentile, and top 25<sup>th</sup> percentile of the respondents to the IES 2016 by the CBS Aruba.

Quartile	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Range in Aruban Florins ( 1 USD = 1.79 Afl)	< Afl. 1929	Afl. 1929 – Afl. 3558	Afl. 3559 – Afl. 6188	>Afl. 6188
N =	229	230	230	229

Table 1: Distribution of income groups based on 2016 Income and Expenditure Survey.

In 2019, based on the new IES conducted in 2016, a reweighting of the inflation calculation components was undertaken by the CBS. The new weights were retroactively applied to the years 2017 and 2018. Prior to 2019, the last reweighting was conducted in 2006.

As mentioned above, the CBS calculates the country's inflation statistics using the CPI. However, even though the CPI is the most commonly used measure of inflation, other measures may be better suited in other areas. For this reason, we include the distinction between some of the measures in this paper.

Firstly, the CPI is the most widely used measure of inflation as it aligns with international standards, making it suitable for comparing countries. The CPI measures the percentage change in the price of a basket of household goods and services (*Measures of consumer price inflation* 2023). The Harmonized Index of Consumer Prices (HICP) is commonly used in the Eurozone and EU. The main difference between the HICP and CPI is the composition of the basket of goods and services on which the index is based. Three main groups of goods and services are included in the CPI but excluded from the HICP, namely: i) Services related to owner-occupied dwellings; ii) Contributions to sport and leisure clubs; and iii) Consumption-related taxes (Statistics Netherlands, *Differences between consumer price figures* 2022). Owner-occupied dwellings are excluded, as these dwellings are considered investments and there is no actual rent price to be observed or measured; rather, it is imputed. Thus, in the case of HICP, only rental housing is included. Consumption-related taxes, such as motor vehicle and dog taxes, also fall outside the scope of the HICP. Conversely, co-

payments for living in an institution or a home are included in the HICP but not in the CPI. Specifically, groups excluded from HICP: COICOP 042100 Imputed rentals of owner-occupied dwellings; COICOP 094130 Contribution to sports and leisure associations; COICOP 130000 Consumption-related taxes; and COICOP 140000 Consumption abroad by residents.

A third measure used, particularly by the Bureau of Economic Analysis and preferred by the US Federal Reserve Bank, is the Personal Consumption Expenditure Price Index (PCE). The Fed prefers this measure to the CPI used by the US Bureau of Labour Statistics (Prices and Inflation). The FOMC (Federal Open Market Committee) focused on CPI inflation prior to 2000 but, after extensive analysis, changed to PCE inflation for three main reasons: 1) The expenditure weights in the PCE can change as people substitute away from some goods and services toward others, 2) the PCE includes more comprehensive coverage of goods and services, and 3) historical PCE data can be revised (more than for seasonal factors only) (Prices & inflation).

#### Chapter 3.1: DATA LIMITATIONS

It is important to note that while working on this research paper, a few challenges have turned into data limitations. Firstly, the housing component *level* and *weight* are likely understated in the inflation calculation. The lower *level* of expenditure on housing is due to an adjustment made by the researcher to match the IES data to the official weights used to calculate CPI figures<sup>4</sup>. Additionally, the *housing prices* in the CPI calculation are currently imputed, as a rental survey needs to be conducted regularly. Instead, the 2010 Census and 2016 IES are used to determine a factor to account for increases in accommodation costs. Notably, since 2016, the island has also experienced a boom in the rental property market, such as Airbnb accommodations, which has set upward pressure on prices in the housing market in Aruba. Furthermore, in August of 2022, the utilities companies also increased the water and electricity prices in line with international petroleum prices posing an additional reason why the housing component is likely to be understated.

Furthermore, the IES data is from 2016 and reflects the consumption patterns per income group that were applicable then. With the COVID-19 pandemic and tax reforms introduced since 2017, this data would not

<sup>4</sup> Initially, the weights assigned to the housing component in the 2016 IES and CPI figures contained a discrepancy of about 12 percentage points. For consistency, the researcher made the decision to adjust the weight in the overall IES 2016 down to reach near the weight included in the CPI calculation. The difference, in Afl. amount was excluded from the total expenditure, and the difference in weight then redistributed among the remainder of the components. The proportion between the new and old levels of Afl. amounts, was then applied to each quartile, allowing the weight to be calculated based on this "new" level.

capture any behavioural shifts that may have occurred. An income and expenditure survey is set to be carried out in 2023/2024, and the second part of this research could be carried out when updated IES data is available.

#### Chapter 3.2: METHODOLOGY

As explained in section III, in this paper, we use the official headline inflation of Aruba (as measured by CBS). The headline inflation rate of a country refers to the average inflation experienced in a given country. It is computed based on the price changes of items in a predetermined basket of goods and services. The basket varies from country to country as it is meant to constitute a nationally representative collection of expenditures in each country. In Aruba, major commodity items and services are calculated based on the most recent Income and Expenditure Survey 2016. Throughout the region, the components included in baskets include measures of food and non-alcoholic beverages, alcohol and tobacco, housing, clothing and footwear, medical items and services or health expenditures, transport including taxi fares and cost of vehicles, communication, education, recreation and culture, and miscellaneous items. Table 2, lays out the results of the 2016 IES in Aruban Florins (Afl.) and in a share of the total (percentage).

Budget Component	In Afl.	Percentage share (%)
Food and non-alcoholic beverages	374	8.7
Alcoholic beverages and tobacco	27	0.6
Clothing and footwear	95	2.2
Housing	1613	37.6
Household operation	320	7.5
Health	77	1.8
Transport	518	12.1
Communications	316	7.3
Recreation and Culture	346	8.1
Education	34	0.8
Restaurants and hotels	152	3.5
Miscellaneous goods and services	421	9.8
Total	4294	100.0

## Table 2: Income and Expenditure Survey 2016 results in Aruba Florin (Afl.) and the percentage of total share(%)

To compute the rate of headline inflation, the annual average changes in the overall basket's total price, the Laspeyres Price Index (LPI) is used. The LPI provides the relative price change for the average household between the current time (current month or year) and the most recent equivalent period before (respective month or year). In theory, the LPI requires the presence of quantity and price indicators; however, quantity is often only available at the time of the national survey of expenditures. Thus, this is constructed as a baseline where prices are measured, and quantities are used to define the weight or shares of expenditures on the respective items. In subsequent measurement periods, the quantity is held constant and constructed as an inherent weighting of the shares of expenditures. At the same time, prices change based on market surveys of the respective items. This way, the index can capture the change in expenditure on the items included in the basket.

The formula denotes the LPI:

$$LPI_{t}^{n} = \sum \frac{Q_{io}^{n} P_{it}}{\sum_{t=1}^{n} Q_{i0}^{n} P_{i0}} \times 100$$

Where Q is the quantity consumed, P is the base year price, and t is time.

To account for the missing data on quantity in the subsequent years, the LPI is modified to hold the expenditure shares constant. This is done by adjusting the formula to reflect the weight of the items consumed in the base year (*W*). As such, the formula is adjusted to:

$$LPI = \sum w_{io}^n (\frac{P_{it}}{P_{io}}) \times 100$$

Where,

$$W_{io}^{h} = \frac{Q_{io}^{n} P_{i0}}{\sum_{t=1}^{n} Q_{i0}^{n} P_{i0}}$$

This study takes the analysis of inflation a couple of steps further. It seeks to separate the basket of goods into four strata, essentially breaking down the country's population into socioeconomic subgroups. The boundaries of these subgroups are determined based on the most recent Income and Expenditure Survey (2016). The disaggregation helps to identify the differences in consumption between the income groups. Section II states that the literature broadly supports the hypothesis that lower-income groups devote a larger share of their household income to food and housing.

In contrast, the higher income groups assign a more significant share to the components: transportation and consumer durables. By decomposing the expenditure shares into socioeconomic strata, policymakers can better identify the cost factors affecting poor and vulnerable populations and consequently can design more targeted policies to assist in high-price environments.

As such, the formula used in this study for inflation is denoted as:

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$$LPI = \sum QI_{i=1}^{4}(w_{io}^{n}(\frac{P_{it}}{P_{io}})) \times 100$$

Where, *QI* is the income quartile.

Once the respective inflation rate for each quartile is computed, the results are compared among the income groups to show the dispersion of price pressures according to socioeconomic strata. This is a critical part of this research as it facilitates the estimation of the actual inflationary pressures felt according to the relative expenditure patterns of the households. Consequently, the inflation per quartile can be further broken down by component level to determine the exact goods or services impacting certain groups the hardest. To do this, the *P* and *Q* variables are split into their parts and then remeasured for commodity-specific inflation rates. This does not require changing the formula but rather separating the commodities into sub-groups rather than computing the overall basket.

A similar representation of this is:

$$LPI = \sum QI_{i=1}^{4} \left( \sum C_{i=1}^{n} (w_{io}^{n} (\frac{P_{it}}{P_{io}})) \right) \times 100$$

Where, C is the commodity subgroup.

#### **Chapter 4: RESULTS**

**Table 3**, shows the weights associated with each component per socioeconomic subgroup based on the 2016 IES, including an adjustment for the housing component. These weights are to be compared among the income groups. Considering quartile 1, this income group devotes a significant share to the housing component, namely 36.2 per cent. When combining housing with food and non-alcoholic beverages, this proportion of quartile 1 income rises to 50 per cent. Another thing that stands out is that housing represents the largest share of expenditure among all income groups. In contrast, the second largest component varies depending on the income (food for lower-income, transport for income quartiles 2, 3, and 4). The miscellaneous category is also noteworthy as this component rises steadily between income quartiles 1 and 2 compared to income quartiles 3 and 4.

	Components of expenditure		П	Ш	IV
01	Food and non-alcoholic beverages	13.8	12.0	10.5	8.7
02	Alcoholic beverages and tobacco	0.5	1.7	0.4	0.6
03	Clothing and footwear	1.9	2.7	2.9	2.7
04	Housing	36.2	27.4	25.5	20.6
05	Household operation	8.4	8.8	9.0	9.2
06	Health	2.3	2.6	2.5	1.7
07	Transport	8.4	14.4	15.9	15.5
08	Communications	8.6	9.4	9.3	8.3
09	Recreation and Culture	5.9	7.2	8.2	12.7
10	Education	1.3	0.7	0.9	0.9
11	Restaurants and hotels	3.0	3.2	3.3	5.7
12	Miscellaneous goods and services	9.6	9.8	11.6	13.4
	Total	100.0	100.0	100.0	100.0

Inflation per component	2016	2017	2018	2019	2020	2021	2022
Food and non-alcoholic beverages	-0.6	-3.0	7.6	11.1	-0.4	-0.2	10.1
Alcoholic beverages and tobacco	2.6	-5.7	6.2	19.1	3.3	0.1	4.2
Clothing and footwear	0.9	0.2	2.0	4.8	-4.0	-6.8	5.9
Housing	-2.5	-1.5	-0.1	2.1	-1.8	0.7	5.0
Household operation	-1.5	-2.6	3.3	-0.6	-2.8	-1.1	3.9
Health	1.1	-1.3	8.8	5.4	-0.4	-3.6	1.2
Transport	-1.6	1.2	8.6	2.6	-5.8	9.5	16.4
Communications	0.6	-1.0	5.1	8.7	0.2	-0.1	-2.6
Recreation and Culture	-0.8	-4.4	3.7	1.2	1.1	-1.9	1.8
Education	1.8	2.0	3.9	2.8	0.7	1.9	2.6
Restaurants and hotels	1.9	-0.7	4.9	7.0	3.0	0.3	5.7
Miscellaneous goods and services	0.7	-1.2	2.0	3.9	0.0	-0.1	1.9
All items	-0.9	-1.0	3.6	3.9	-1.3	0.7	5.5

**Table 4** lists the 12-month average inflation rates per component for 2016 through 2022. At the bottom, the row 'all items' refers to the overall 12-month average inflation for the year in Aruba. The table shows that Aruba experienced deflation in 2016, 2017, and 2020, while 2018, 2019, 2021, and 2022 experienced inflation. In 2019, food, beverages, and tobacco were the main drivers of high inflation, while in 2022; this was a result of higher transport and food prices. **Figure 2**, the components of headline inflation measured as the average over 12 months.



Figure 2: Aruba's Headline inflation broken down into inflation per components (2016-2022)

Lastly, the compilation of **Tables 5 – 8**, provides details on the expenditure of households in each quartile. The bottom row, 'Percentage change,' represents the change experienced in expenditure due to pricing changes only. The central assumption here is that consumption patterns remained constant over the sample period.

Quartile 1	2016	2017	2018	2019	2020	2021	2022
Food and non-alcoholic beverages	259.2	251.5	270.5	300.5	299.3	298.6	328.9
Alcoholic beverages and tobacco	9.8	9.2	9.8	11.7	12.1	12.1	12.6
Clothing and footwear	35.4	35.5	36.2	37.9	36.4	33.9	35.9
Housing	678.2	668.3	667.4	681.2	669.1	673.5	706.9
Household operation	157.9	153.8	158.8	157.8	153.3	151.7	157.6
Health	42.9	42.4	46.1	48.6	48.4	46.7	47.3
Transport	156.8	158.7	172.3	176.8	166.4	182.3	212.3
Communications	161.1	159.6	167.7	182.4	182.7	182.6	177.9
Recreation and Culture	109.7	104.8	108.7	110.0	111.2	109.2	111.1
Education	25.0	25.5	26.5	27.2	27.4	28.0	28.7
Restaurants and hotels	56.1	55.7	58.4	62.5	64.4	64.6	68.3
Miscellaneous goods and services	179.8	177.7	181.3	188.3	188.4	188.2	191.8
Total expenditure	1,871.9	1,842.7	1,903.8	1,984.9	1,959.2	1,971.4	2,079.2
Percentage change (%)		-1.6	3.3	4.3	-1.3	0.6	5.5

Table 5: Development of expenditure for the lowest income group (quartile 1) per component and total inflation experienced through 2016-2022.

Quartile 2	2016	2017	2018	2019	2020	2021	2022
Food and non-alcoholic beverages	332.1	322.3	346.7	385.0	383.5	382.7	421.5
Alcoholic beverages and tobacco	47.5	44.8	47.6	56.7	58.6	58.7	61.1
Clothing and footwear	74.8	74.9	76.4	80.1	76.9	71.7	75.9
Housing	755.1	744.1	743.1	758.5	745.0	749.9	787.1
Household operation	241.5	235.2	242.9	241.4	234.5	232.0	241.1
Health	72.3	71.3	77.6	81.8	81.5	78.6	79.5
Transport	397.0	401.8	436.3	447.6	421.4	461.5	537.5
Communications	259.6	257.1	270.2	293.8	294.4	294.2	286.7
Recreation and Culture	199.8	191.0	198.1	200.4	202.7	198.9	202.4
Education	19.6	19.9	20.7	21.3	21.4	21.9	22.4
Restaurants and hotels	87.0	86.4	90.6	96.9	99.9	100.2	105.9
Miscellaneous goods and services	271.6	268.4	273.8	284.4	284.5	284.2	289.6
Total expenditure	2,757.9	2,717.3	2,824.0	2,948.0	2,904.3	2,934.5	3,110.7
Percentage change (%)		-1.5	3.9	4.4	-1.5	1.0	6.0

Table 6: Development of expenditure for lower middle-class (quartile 2) per component and total inflationexperienced through 2016-2022.

# Table 7: Development of expenditure for upper middle-class (quartile 3) per component and total inflationexperienced through 2016-2022.

Quartile 3	2016	2017	2018	2019	2020	2021	2022
Food and non-alcoholic beverages	369.5	358.6	385.7	428.4	426.7	425.7	468.9
Alcoholic beverages and tobacco	14.6	13.8	14.7	17.5	18.0	18.1	18.8
Clothing and footwear	102.0	102.2	104.2	109.2	104.8	97.7	103.5
Housing	900.7	887.5	886.3	904.7	888.6	894.4	938.8
Household operation	315.7	307.6	317.6	315.6	306.6	303.4	315.2
Health	88.0	86.9	94.5	99.7	99.3	95.7	96.9
Transport	560.0	566.8	615.4	631.3	594.4	651.0	758.1
Communications	328.0	324.8	341.5	371.3	372.0	371.8	362.2
Recreation and Culture	290.0	277.1	287.4	290.8	294.1	288.6	293.7
Education	32.4	33.1	34.3	35.3	35.6	36.3	37.2
Restaurants and hotels	116.6	115.8	121.5	130.0	133.9	134.4	142.0
Miscellaneous goods and services	408.5	403.8	411.8	427.8	428.0	427.6	435.7
Total expenditure	3,526.1	3,477.9	3,614.9	3,761.5	3,701.9	3,744.6	3,971.0
Percentage Change (%)		-1.4	3.9	4.1	-1.6	1.2	6.0

Quarter 4	2017	2016	2018	2019	2020	2021	2022
Food and non-alcoholic beverages	521.0	536.9	560.4	622.5	620.0	618.6	681.3
Alcoholic beverages and tobacco	33.7	35.7	35.8	42.6	44.0	44.1	45.9
Clothing and footwear	169.2	168.9	172.5	180.8	173.6	161.8	171.4
Housing	1,251.8	1,270.4	1,250.1	1,276.1	1,253.3	1,261.5	1,324.1
Household operation	550.0	564.6	567.9	564.4	548.4	542.6	563.7
Health	102.6	103.9	111.6	117.6	117.2	113.0	114.3
Transport	969.4	957.8	1,052.5	1,079.7	1,016.7	1,113.4	1,296.6
Communications	508.5	513.5	534.5	581.2	582.3	582.0	567.0
Recreation and Culture	751.7	786.5	779.6	788.8	797.7	782.8	796.8
Education	59.1	58.0	61.4	63.1	63.6	64.8	66.5
Restaurants and hotels	346.8	349.3	363.8	389.2	401.0	402.3	425.4
Miscellaneous goods and services	814.5	824.0	830.7	862.9	863.2	862.4	878.8
Total expenditure	6,078.2	6,169.5	6,320.9	6,569.0	6,480.9	6,549.4	6,931.7
Percentage change (%)	-1.5		4.0	3.9	-1.3	1.1	5.8

# Table 8: Development of expenditure for the highest income (quartile 4) per component and total inflationexperienced through 2016-2022.

From the tables above, it can be noted by considering the inflationary years 2018, 2019, 2021, and 2022 that quartile 1 experienced the lowest inflation among the income groups in 2018 and 2021. In contrast to most of the literature, the lowest income group did not experience the highest inflation level among income groups during any of the years included in the research period. Considering quartile 2, we can see that the income group experienced higher price level changes than the other income groups in 2019 and 2022. Quartile 3 experienced higher inflation in 2019 and 2021, while quartile 4 experienced a higher price level only in 2018.

By analyzing the shares of consumption per income group and inflation experienced per category, there are several possible explanations for the most impacted groups in each of the inflationary years. First, in 2018, quartile 4 experienced higher inflation compared to other income groups. The largest contribution to the elevated price level during 2018 was the component health. Aruba has a universal healthcare system coordinated by the executive body Algemene Ziektekosten Verzekering (AZV). The AZV is financed partly by social contributions through a share of income of the employed population, while another (consumptive) tax, the BAZV, is levied on most goods and services. During 2018 as a part of a broader fiscal reform, the BAZV was increased from two per cent to three per cent. Additionally, the BAVP, a purely consumptive tax levied to be able to pay the costs associated with the PPP infrastructure projects, was introduced at 1.5 per cent. This led to a higher overall tax on consumption of goods and services, rising from 3.5 to 6.0 per cent. A higher overall tax rate could have contributed to this group experiencing higher price levels compared to

other groups when considering the considerably higher share of income by quartile 4 spent on the components restaurant and hotels, recreation and culture, household operation (which includes furniture), as well as miscellaneous goods and services<sup>5</sup>. These components do not include goods and services classified as needs, and thus are less consumed by lower income groups. Research from the US Department of Agriculture has shown that higher income groups, due to time constraints, spend more on convenience foods including all-service restaurants, which tend to be more expensive (Rahkovsky & Jo, Higher incomes and greater time constraints lead to purchasing more Convenience Foods 2018). Additionally, the higher inflation experienced by quartile 4 during 2018 can also be explained by considering the exemptions to the turnover tax, most notably water supply and electricity services. Water and electricity are included in the housing component, for which a meaningfully smaller share of income is devoted by quartile 4 compared to the other quartiles <sup>6</sup>(see Table 3).

In 2019, quartile 2, considered a portion of the middle class, experienced highest inflation among the socioeconomic groups in Aruba. This group traditionally devotes the largest share of its income on alcoholic beverages and tobacco, and on communications. The higher price level changes experienced during 2019 can therefore be explained by a rise in the import duties and excise duty on alcoholic beverages and tobacco products, which disproportionately affected quartile 2.

Inflation in 2021, and partly in 2022, were largely affected by the transport component, in particular gasoline prices and prices of car rental and leasing. The group with the largest share of their income going to transport, compared to other income groups is quartile 3, which in turn caused them to experience higher inflation during 2021. This group is most likely to drive larger, and perhaps second hand, vehicles, which may be less, fuel efficient.

Lastly, for 2022, in addition to fuel prices driving inflation during the year, the Russian invasion of Ukraine also contributed to elevated price levels in the food components which affected quartiles 2 and 3 the most. This finding can be explained by analyzing the compounding effect of having high transportation prices and thereafter adding food prices. For lower income households, while food takes up a large part of their income, the effects of fuel prices are felt less as they might take public transportation for which the prices are capped, or have smaller vehicles, which use less fuel. As for high-income households, the transportation

<sup>&</sup>lt;sup>5</sup> Miscellaneous goods and services includes goods such as makeup, hair products, lotions but also jewelry and watches. Services included in this component include childcare, hair salon and beautician services, barber, and insurance services. This component does not compose of necessities, and this is also reflected in the larger share devoted to this category by high income households. <sup>6</sup> Quartile 4 devotes 20.6 per cent of its income to the housing component while for quartile 3, this is 25.5 per cent, for quartile 2 27.4 per cent and for quartile 1 36.2 per cent.

may be felt more, perhaps due to larger vehicles but food make up a considerably larger share of their income and therefore the effects are partly offset.

In 2017 and 2020, Aruba experienced deflation, a period in which prices dropped compared to the previous year. Negative inflation in 2017 likely resulted from an Aruban recession that started in mid-2015 and 2016, where real GDP declined by 0.5 and 0.2 per cent, respectively. As for 2020, the COVID-19 pandemic impacted Aruba's economy heavily, resulting in a drop in domestic demand and deflation. **Figure 2**, the above tables summarize inflation for each socioeconomic subgroup.



Figure 3: Inflation rates per income quartile compared to headline inflation

#### Chapter 5: DISCUSSION AND CONCLUSION

This paper employs an indicator of consumption, IES 2016 data, and the national average CPI figures for Aruba and provides an estimation of what the inflation levels could be per income quartiles throughout the 2016 to 2022 period. The objective of this paper was to determine if the data for Aruba supports findings in the literature that lower-income households are more affected during high inflation periods than higher income groups, owing to the larger share of lower income household incomes spent on needs, like food and housing. However, the data for Aruba does not seem to support these findings in the literature. Instead, with the findings presented in the previous section, it can be concluded that a large portion of the burden in the Aruban society falls the heaviest on the middle class<sup>7</sup> (quartiles 2 and/or 3) as these two groups experience the highest inflation among the groups in this study in most years. This can be attributed to high inflation on food and beverages (alcoholic and non-alcoholic), communications, and restaurants and hotels in 2019, while in 2022, food and non-alcoholic beverages played a vital role alongside the transport component. It is also notable that in 2018, quartile 4 experienced the most inflation. The high inflation in 2018 was due to an overall elevated price level in connection with the increase of the turnover tax alongside the included exemptions on services in which lower-income households devote to a larger share of income.

The findings of this study do not support the hypothesis that all income groups are impacted by inflation equally. Rather, the study finds that a specific income group may be relatively more hampered compared to lower and higher income groups. In Aruba, this may reflect that traditional targeting programs, such as a progressive tax system and allowances, may already be in place or NGOs providing assistance through food baskets that may be achieving their goal. It may also be that particular policies such as the "canasta basico<sup>8</sup>" are in place to protect the most vulnerable, and are effective in doing so However, a large proportion of the Aruban population, between 38<sup>9</sup> and 46<sup>10</sup> per cent, continues to live below the minimum subsistence level, and any shocks or inflationary pressures on these groups may make the difference in allowing these families to have enough food on the table or not.

<sup>&</sup>lt;sup>7</sup> In this study, we classify quartiles 2 and 3 as the "middle class" due to similar patterns of consumption. Further, quartile 1 is classified as "low income", while quartile 4 is classified as "high income". Quartile 1 and 4 display a distinguishing pattern of consumption to be able to differentiate themselves from the other groups.

<sup>&</sup>lt;sup>8</sup> The "Canasta basico" translates to basic basket, which refers to price regulation applied on basic consumer goods providing a price ceiling to protect the most vulnerable.

<sup>&</sup>lt;sup>9</sup> According to Income and Expenditure Survey data 2016 by the Central Bureau Statistics of Aruba.

<sup>&</sup>lt;sup>10</sup> According to the Financial Wellbeing of Households 2021 report by the Centrale Bank van Aruba.

Lastly, even though the housing component may be understated and the 2016 IES may not take into account behavioral shifts undertaken by the Aruban population groups due to fiscal reforms and the COVID-19 pandemic, this paper provides us with the insight on how inflation, or high inflation, is distributed on a small island like Aruba.

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## CERT Research Agenda 2022/2024 CERT Workstream 3 – Future Paths to Regional Resilience

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For more than a decade, the global economy enjoyed relatively calm periods of low and stable price levels, record low-interest rates (even negative rates existed) and stable trade and supply links with perceived little or no risk to output and operational resilience. Understandably, policy measures (monetary and fiscal), economic systems and business operations all adjusted to this new environment with the general understanding that it represents the new normal. The COVID-19 pandemic, Russia-Ukraine war and geopolitical tensions have considerably altered this environment and presented a much changed future outlook. Moreover, these events have not only exposed the frailty of the global trade and supply links but also highlighted the unintended risk they pose to price and output stability. Further, it is now fully understood and accepted by many that policy measures do not necessarily operate symmetrically that is, tools and instruments calibrated for low price, low volatility regimes may not function as effective for the high price, high volatility regimes.

The Region is facing daunting challenges accentuated by the fallouts from the pandemic, the Russian-Ukraine war and geopolitical tensions. These events have significantly altered the global economic and monetary landscapes. In fact, it is now widely accepted that global prices and interest rates may have to be settled at higher levels than existing targets in order to strike an appropriate balance between inflation and growth concerns, the probable legacy of the decade old ultra-low interest rate environment and the economic and policy disruptions caused by the pandemic and the Russia-Ukraine war. In addition, low carbon transitioning while likely to be a major economic challenge for the region because of countries' high climate exposure and limited financing capacity, is equally likely to provide opportunities to build a more resilient regional economy.

The work stream objective is to explore suitable policy solutions to the broad question of how the region can re-design or re-calibrate its policy framework and institutions to support the creation of a resilient economic system for sustainable growth in the context expected for future pandemics, possibly higher monetary rate and price levels and net zero transitioning. At a minimum, a resilient economic system should be taken to mean an economy with sufficient internal capacities (inclusive of support mechanisms) to absorb and contain acute macro-shocks and spillovers to acceptable tolerance levels and concomitantly, appropriately positioned to maximise the benefits from net zero transitioning.