How much money do you need to live in different European countries?

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I. Data Story Summary

The goal of this data story is to show the amount of money that is enough to live or retire in various European Union (later in the text – EU) countries in different time periods (1, 5, 10 and 20 years). The story tells how cost of livings distributed among European regions and if the average local can cover their own expenenses. It helps to see if the country is cheap/expensinve in general (for locals) or only for foreigners. The story shows which countries have a significant increase or decrease in living expenses. If the country had a high increase in cost of living, it is most likely that its living costs' growth in the future will be bigger than inflation growth. It also covers the predicted amount of money, how much a one person requires to live for specific period in selected contry.

The story tells which part of expenses have the highest proportion. At the same time, it shows if proprotions of living expenses are different if the countries have different living expenses. This could help to see a picture for which part of expenses you might spend most of the money. It is helpful to decide personally in which country (and in which period) current budget is enough to have a convenient life. Which countries might become more expensive to live in the future.

This topic is mainly suitable for a person who is looking for a country to live (work) or retire without any extra income and to have an access to live comfortably. The story is made for a single person, because by this measure, it is easier for multiple group to decide how much money they will need (for 4 person group, multiplying living expenses by 4 times). I am using the EU example where inhabitants are mostly based on a middle class. I assume to have a comfortable life, you have to be able to do what average person could.

II. Dataset Summary

To analyse living expenses, I am using the Eurostat database [1] for latest allowed period 2009-2018 period (avoiding 2008 outlier which was affected by financial crisis) in EUR currency and the values of variable means - the cost on average of one citizen's spending for a specific variable per year. The chosen data covers 28 EU Countries and additionally Iceland, Norway with Switzerland. The quality of data is reliable from Eurostat (it is a sum of databases from every country, so I don't have to check every countries' department of statistics). The list of all variables [2] from Eurostat database I am using:

1. Food and non-alcohol beverages; **2.** Alcoholic beverages and tobacco; **3.** Clothing and Footwear; **4.** Furnishing **5.** Health (hospital services); **6.** Transport services **7.** Communication services; **8.** Recreation and culture **9.** Restaurants and hotels **10.** Miscellaneous goods and services (personal care, insurance, financial services).

Additionally, I am including in living expenses an average rent price for a 1-bedroom flat in the most expensive cities of each EU country (later in the text – rent price). The idea is – if you can afford to live in the most expensive place, you can live in the rest of the country. I am using information provided in the reports made by estate agency rent surveys (EARS) - Eurostat [3] to get rent prices (**11.** Variable). The data I am taking is for 2009-2018 period in EUR currency for each EU countries' most expensive city.

Subsequently, I am taking data about eco-friendly cars' costs (variable no **12)** from the news media [4]. For electronics, I am looking at the Apple Shop for current iPhone prices (variable no **13.)** [5]. The last-mentioned variables are not necessary for daily life, but gives a comfortable life and the price is approximately the same in all European countries. Additionally I am taking *average annual net earnings* (2018) [6], [7]. I am using this variable to compare how much of living expenses can be covered by annual net earnings.

The sum of the whole mentioned **13** variables is the living expenses for selected periods for every country separately, which helps to compare the results. To have living expenses for upcoming years (from 2020), I am using 2% inflation, because it is a goal for the ECB [8] monetary policy. If the countries' living expenses increased averagely more than 4% in the past 5 years, I am using increased rate of 4% instead of inflation. Additionally, I am using data in the range 2009-2018 to check which countries have higher increase of living expenses by percentage. Moreover, I am taking the most outstanding countries based on expenses (highest, lowest and highly increasing, decreasing) for analysing their proportions of living expenses. I use all the consumption variables to compare with the total sum of expenses for every year, for selected countries.

III. Visualisations

A. Living Expeses in 2018, EUR (2009-2018)

1) **Description**:

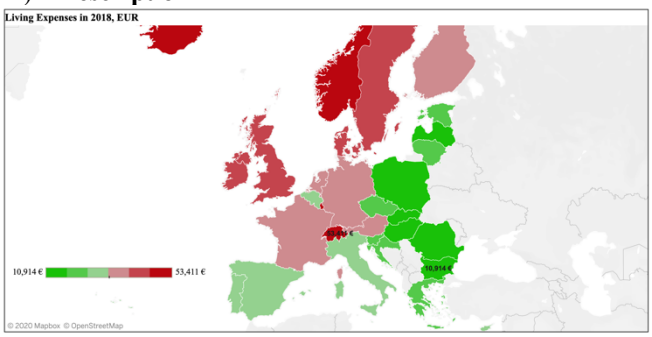

Figure 1. 1st visualisation, Living Expenses in 2018

Choropleth Map (Europe) shows total living expenses (EUR) in every European country in 2018. The chosen colour palette is green and red saturation where green shows countries with the lower living expenses, red - higher living expenses. I am including a tool to select countries' shapes in the map and it will show the required amount to live, along with the name.

2) **Justification**:

Choropleth map[10] is suitable for starting a narrative to give a clear, quick picture how living expenses are distributed and to show all the countries I want. Colours[13] representing in more clear way (people see red as expenses and green as revenue). It is more readable for a viewer and interaction gives further information if audience is interested

in particular country. Since there are 31 countries, a map could look as a big mess, so there are no values on the countries' shape, to not confuse viewer [12]. Colours represents key data, that countries from the same region normally have similar colours (means similar living expenses).

3) **Narrative Design Patterns**:

This visualisation is using **Exploration** pattern. Viewers can interact with a map to display different attributes of data depicting the countries' living expenses.

4) **Strengths and Weaknesses**:

Strengths: Choropleth map easy to understand and shows spatial distribution of data [16].

Weaknesses: Difficult to distinguish between different shade or false impression on abrupt change at the boundaries of shaded units [17].

5) **Improvements**:

. Put big dots on small countries (as Malta) to have a better view to select them.

B. Yearly Living Expeses, EUR (2009-2018)

1) **Description**:

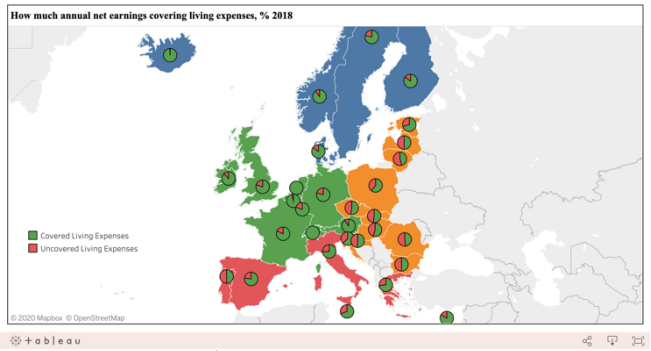

Figure 2. 2nd visualisation, average annual net earnings vs Living expenses

Pie charts in Map shows which part of living expenses covers average annual net earnings by %. Additionally, countries from the same region of Europe have the same colour:

West – Green:

Austria, Belgium, Ireland, France, Luxembourg, Netherlands, Switzerland

North – Blue:

Denmark, Norway, Finland

South – Red:

Greece, Italy, Cyprus, Malta, Portugal

East – Orange:

Poland, Bulgaria, Czechia, Estonia, Croatia, Latvia, Hungary, Romania, Slovenia, Slovakia.

Map has interaction to be selected to see pure numbers of average annual net earnings with living expenses. Pies have interaction to see percentages values.

2) **Justification**:

Colours in the map [10] is suitable for narrative to give idea how countries divided into regions. Pie charts helps to see for audience if a country in general is expensive/cheap (even for locals) or only for foreigners, as well their similarities between countries from the same regions. Since every countries' salaries and living costs correlated separately, pie charts represents accurate situation in every country. Additionally, it does not take a lot of space and fits in the map. Using traditional colours of covered (green), uncovered (red) and black border of pie charts to separate colours[13] from the countries' colour, to not confuse viewer. The key data in this graph is to divide Europe by regions and to show if expensive country means expensive for the locals.

3) **Narrative Design Patterns**:

This visualisation is using **Exploration and Compare** narrative design patterns. Viewer can interact with a map, to see to see equality of covered living expenses by earnings in different countries, different regions.

4) **Strengths and Weaknesses**

Strengths: Pie charts gives clear comparison with different objects[15]. Map improves a comparison in more clear way by diving countries in regions.

Weaknesses: Hard to compare two datasets, the total represented by pie charts is unknown [15].

5) **Improvements**:

Change size of pie charts regarding the amount of earnings.

C. Yearly Living Expeses, EUR (2009-2018)

1) **Description**:

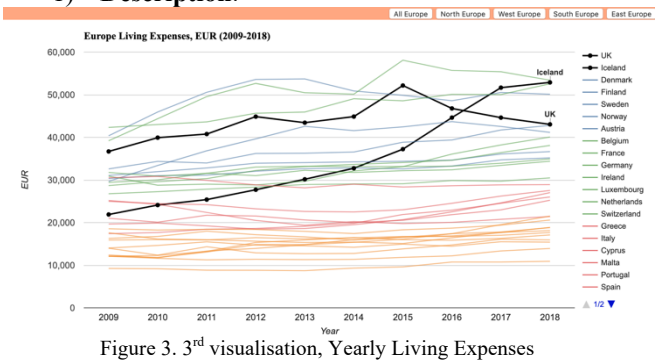

Figure 3. 3rd visualisation, Yearly Living Expenses

Line Chart, shows how the living expenses in EUR (y axis) to live in different countries changed, between 2009 - 2018 (x axis). Countries from the same region of Europe have the same colour as in 2nd visualisation. One country with highly increasing and decreasing slopes are covered in black:*United Kingdom (decreasing), Iceland (increasing)*.

Buttons in top right filters the regions. Additionally, all the lines have interaction to be selected in the visualisation and see further information (Country, Year, Living Expenses).

2) **Justification**:

Line chart is suitable for narrative to give idea how living expenses change in every country by time series[14] and what might be a trend according to the data. Filtering regions [9, composition] will give evidence how countries with the same tendency changed for the past years. It helps to see what might be a trend. For example, countries in

black stands out as Iceland highly surpass United Kingdom, which was more expensive in the past. To avoid confusion, chart has buttons to filter the graph between regions. In the default section "button – All Europe" countries not in black have opacity 60% to highlight countries in black while keeping background [11]. Additionally, countries using the same colour as in previous visualisation, easier to follow[13]. Countries with the same colour gives more key data how familiar living expenses were in the past. Countries in black have names in the end which helps them to stand out.

3) **Narrative Design Patterns**:

This visualisation is using **Compare** narrative design pattern. Visualisation compares multiple datasets through over time, which helps to see equality of living expenses.

4) **Strengths and Weaknesses**

Strengths: Times series for 31 countries hard to represent, region filters solve this problem by separating countries and helps to compare different groups[14].

Weaknesses: Too many lines with the same values can confuse if you want to check individual value.

5) **Improvements**:

Chart could have an average European living expenses, it could help to see compare which countries in general have lower and higher living expenses than average European.

D. Cost Distribution, %

1) **Description**:

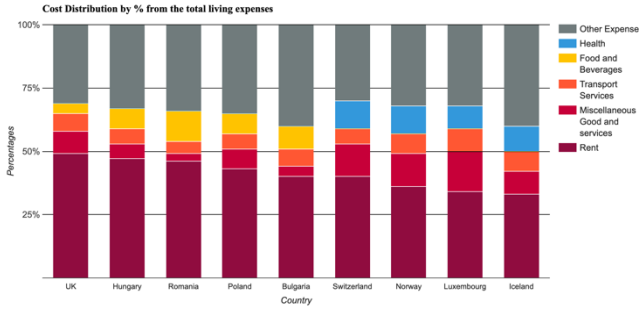

Figure 4. 4th visualisation, Cost Distribution, %

Stacked Columns (100%) shows how each variable of expenses is distributed among living costs (in total 100%). **9 stacked column charts** next to each other taking 4 most expensive and least countries with countries coloured in the black (named in x axis) from the 3rd visualisation. The stacked column shows 5 groups of expenses (4 with the major proportion, 1 rest of expenses). The cost have same colour in every bar. Bars have interaction to be selected and see further information (country, cost, proportion of cost).

2) **Justification**:

Horizontal 100% Stacked Bar helps for my narrative to compare [9] cost distribution between countries with different level of expenses. All stacked columns have the same colour palette (red – expenses) to make easier follow cost distribution. The darker red is, the more money is spent (higher proportion), while grey is not important, so the colour gives understanding as non-important for the analysis. Slices are sorted by the highest proportion of biggest slice (rent), it helps to easier track comparison between countries together with similar colour palette[13]. Four bars have different slice (variable), so it is covered by a blue to stand out from the rest as non-traditional. Grey colour filters not significant part

3) **Narrative Design Pattern**:

This visualisation is using **Compare** pattern. Visualisation helps, to see equality of costs distributions in different countries with different level of living expenses.

4) **Strengths and Weaknesses**:

Strengths: Large categories divided into smaller and their relationship of each other.

Weaknesses: Columns with the highest distance from the Y axis, does not have a quick picture of value. Harder to compare each segment to other.

5) **Improvements**:

To add additional stacked bar which has option to change a country which viewer wants or to put average European cost distribution.

E. Total Living Expeses, EUR (2020-2040)

1) **Description**:

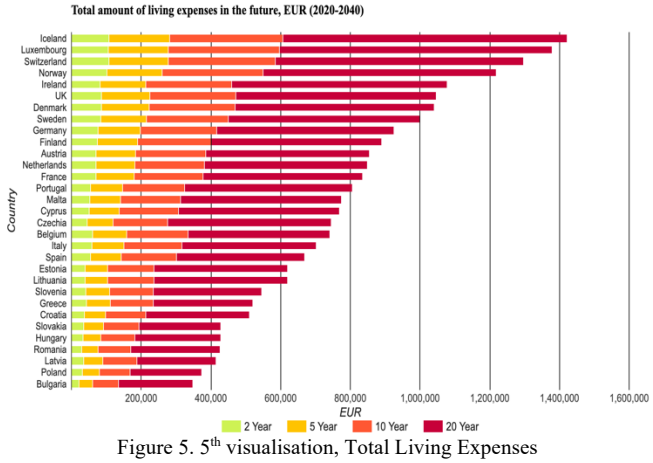

Figure 5. 5th visualisation, Total Living Expenses

Stacked Bar visualise how total living expenses are distributed in every European country in period (2020-2040), Total Amount in EUR (x axis), Country (y axis). Color palette describes period, darker colour - more expensive (longer period up to 20 Year).

Visualisation has an option to select a stacked bar and tooltip will show all the further information (country, required total amount to live for different periods).

2) **Justification**:

Vertical Stacked Bar helps to compare [9] a lot of countries by total amount of living expenses. Additionally, it helps to divide total amount by periods to compare living expenses. To have evidence, chart has interactivity to select a bar chart gives further information for all the periods. It easier to compare pure numbers and avoid bias. Since the

data is related to living costs, colours have more similar palette[13], while the darker colour sympathizes for higher costs and higher period, to avoid confusion. Vertical stacked bar filters for audience which countries require more or less for example 1 million EUR or to retire for 10 years. It gives key countries, in which they might be interested

3) **Narrative Design Patterns**:

The chosen visualisation using **Compare** pattern. It helps for audience to make a point about equalities how much money requires in different countries for different periods.

4) **Strengths and Weaknesses**:

Strengths: Large categories divided into smaller and what relationship on each part has on total sum. Easy to filter countries to have a better view, comparison.

Weaknesses: Harder to compare each segment to other.

5) **Improvements**:

European total living expenses could be added as additional stacked bar to instantly filter other countries who are below or above.

IV. Conclusion

Countries from the same European region have more similar living expenses since 2009, while North and West Europe are more expensive. Countries with higher living expenses covering living expenses easier. Countries with lower living costs are more expensive to live for the locals. The most expensive are: Iceland, Luxembourg, Switzerland, least expensive: Bulgaria, Romania, Poland. The highest proportion of living expenses is Rent. More expensive countries proportionally spending more money on personal wants. With 800K EUR budget would be enough to live in the whole East and South Europe for the rest of 20 years. 1.5mln EUR is enough to live in the whole Europe for 20 years.

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