— musings

thoughts from an engineer with an MBA

Home   About

Mon 9th July, 2018

General

Leave a comment

Edit

More money does not equal more life

Executive Summary

Everyone's heard the maxim that money cannot buy happiness, but one might expect it to contribute to a longer life. However, while this may be true at the individual level in a private-healthcare economy, it does not hold true at the macro-economic level.

Using life-expectancy figures from the World Health Organisation (WHO) alongside GDP figures from the World Bank, we can show that citizens of high-GDP countries do not necessarily enjoy longer lives than citizens of low-GDP countries.

Overall, we shall show that it is access to quality healthcare (e.g. nationalised vs privatised healthcare) alongside progressive taxation for social funding rather than raw GDP that contributes to higher life expectancies.

What exactly are we looking at?

We are comparing and contrasting GDP and life-expectancy figures for 6 different countries between the years of 2000-2015:

> Chile
> China
> Germany
> Mexico
> United States of America
> Zimbabwe

Gross Domestic Product (GDP) is defined as "the monetary value of all the finished goods and services produced within a country's borders in a specific time period". This value is typically used as an indicator of a country's economic health, as well as a way to gauge the standard of living (or even quality of life) in that country.

Life Expectancy at Birth in Years (LEABY) is defined as "how long, on average, a newborn can expect to live, if current death rates do not change". As stated by the OECD, equality, education standards, and access to quality health services are all factors that have a direct impact on life expectancy.

Please keep in mind that both of the above measurements are a single figure that represents an entire country. Therefore, they are blind to many factors such as wealth inequality, population size, social infrastructure, ownership of means of production, political corruption, cultural values, etc.

However, these figures do generate insights when compared with one another (especially from countries as varied as these), and these insights offer a good starting point for deeper discussion around why citizens of richer countries might not necessarily lead longer lives.

What does the data look like?

Violin Plot

The first figure that we shall look at is a violin plot of the life-expectancy distributions for each country. A violin plot displays both the distribution and probability density of data, via density plots to either side. The median value is indicated by a white dot on the centre line. The thicker part of the central black line displays the interquartile range (i.e. the middle 50%). This kind of plot is very useful for comparing distributions of data, rather than just looking at medians and error bars.
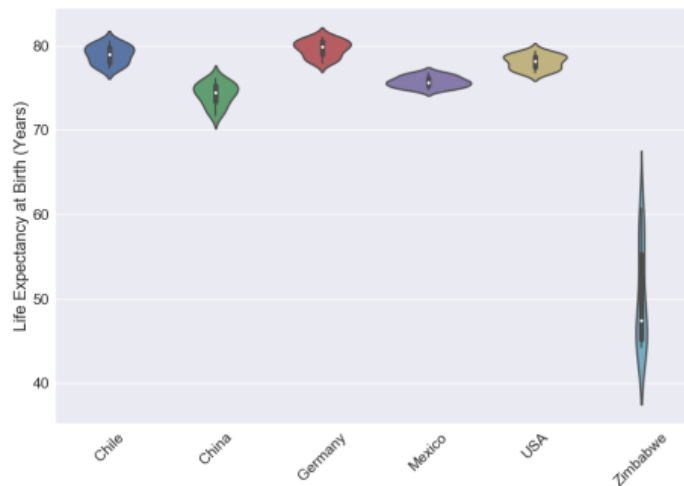
Fig. 1: Life Expectancy at Birth in Years for various Countries

This gives us an overview of the life expectancy distributions in each country over time. A longer 'violin' will indicate larger changes in life expectancy between 2000-2015. We can already see that Zimbabwe stands out from the others, with a far larger variance and distribution.

Scatter Plot

When checking for correlation between two variables, a scatter plot can help. In this case, we plot GDP as a function of life expectancy and check if a change in one leads to a change in the other.
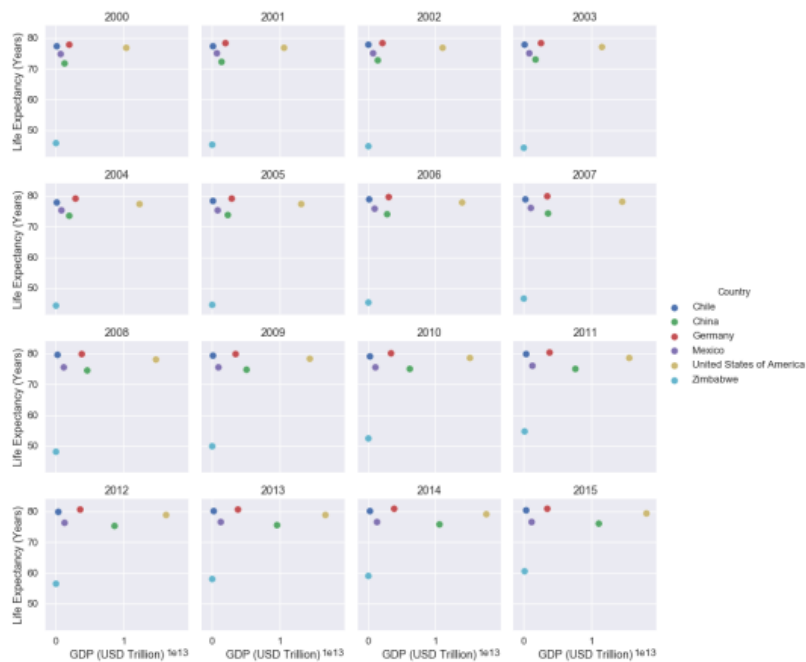

Fig. 2: Life Expectancy at Birth in various Countries as a function of GDP

We can see that, although the life expectancy in Zimbabwe is increasing over time, there is no noticeable corresponding increase in GDP. Similarly, while the GDP of both China and the USA increase rapidly (the dots move from left to right), there is only a minor increase in life expectancy.

Line Plot

The above correlation check can be more easily seen in a line plot, which will show the movement for each country over time.
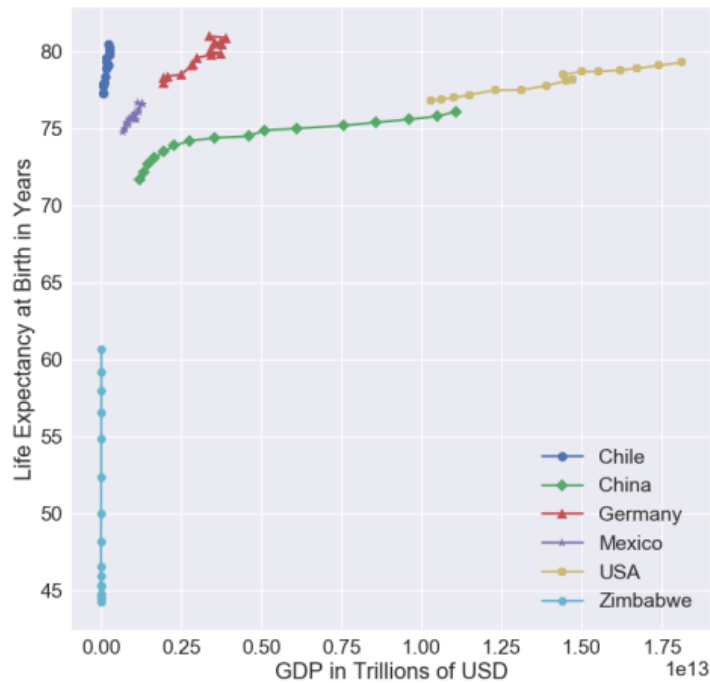
Fig. 3: Life Expectancy at Birth as a function of GDP over time (combined)

Germany and Mexico do display a positive correlation between GDP and life expectancy, with Germany's near-45-degree slope being a strong indicator. Both the USA and China also show a correlation, though not as severe.

However, the almost vertical lines for Zimbabwe and Chile indicate very little correlation between GDP and life expectancy, instead pointing to a potential worldwide increase in life expectancy (i.e. correlation, not causation).

This holds true if we plot the life expectancy over time. Line plots can help with visualising the rates of change of variables.
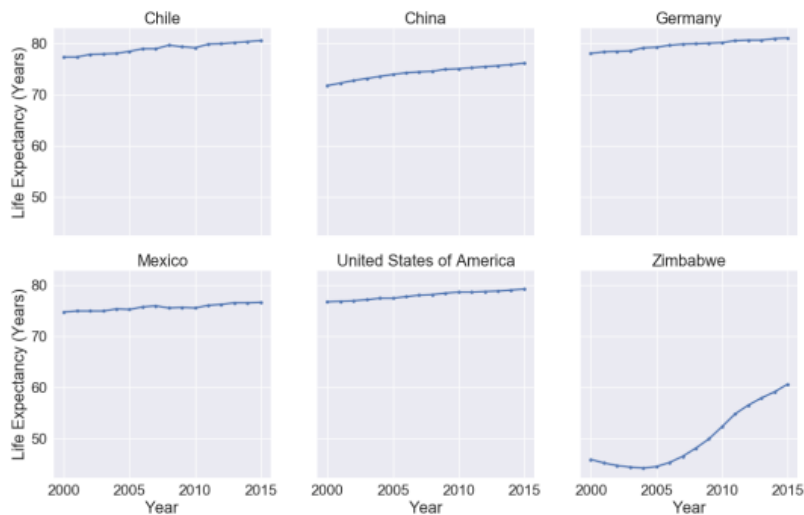

Fig. 4: Life Expectancy at Birth per Country over Time

In figure 4, we can see that all countries display an increase in life expectancies over time. Most are gradual, with Zimbabwe, an outlier, rising at a very rapid rate.
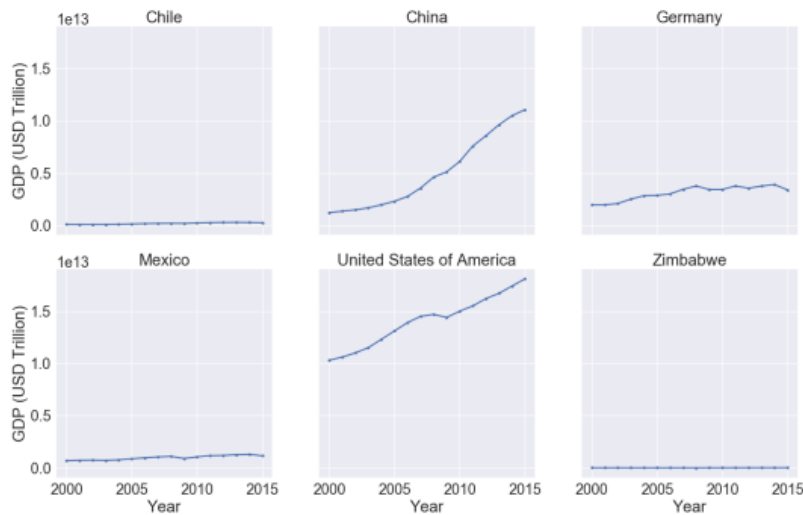
Fig. 5: GDP per Country over Time

However, the rates-of-change of GDP are not all gradual. For example, Zimbabwe's GDP does not seem to increase at all, while those of China and the USA increase rapidly.

NOTE: the GDP of both Chile and Zimbabwe are in the billions rather than trillions of USD, so any increases may be invisible given the scales on the above axes.

What do these graphs show us?

Zimbabwe

The standout part of the violin plot in figure 1 is the life expectancy in Zimbabwe. The median is not only far lower than the other five countries (mid-to-late 40s), but the distribution is far larger (mid-30s to late-60s).

Much of this may be due to structural (and political) problems in the country, where water pollution is rife due a combination of poor waste-management practices and mining, on which the country's economy depends. Large cholera outbreaks from contaminated food and water are not unheard of.

Moreover, while figure 4 makes it look as though the life-expectancy in Zimbabwe is climbing rapidly, it is really just correcting after a huge drop due to myriad factors such as HIV/AIDS, post-independence infighting, etc. The life expectancy had dropped from 61 years in 1985 to 44 years in 2002 (source: World Bank). It had once again reached 60 years in 2015, quite possibly due to a massive promotion of contraception in the country, and rising demand from the country's youth.

As mentioned initially, improvements in healthcare access contribute to a rise in life expectancy, as demonstrated by the lower incidence of HIV/AIDS coinciding with the rise in sex education and contraception availability. Funding for that access to healthcare would be easier to find if GDP were to rise, if any rise was put towards social reforms.

China & Mexico

Additionally, while China and Mexico both have a median value in the mid-70s, the distribution of ages in China is a lot broader (~70-77 years vs ~74-77 years). In fact, the median value in China is approximately the same as the lower bound in Mexico, indicating a higher probability of a longer life in Mexico than in China.

This larger distribution could be to do with various factors, and is quite possibly caused by larger economic inequality in China, where the top 1% owns a full third of the wealth. Inequality in China is further exacerbated along an urban-rural divide. More efficient access to services like quality healthcare is a factor of urban life, and would certainly play a part in the broader distribution of life expectancy in China.

While there is still a large public-private healthcare divide in China, 'Doctors on Wheels' have been bringing better healthcare to the rural areas of China since 2009, thus helping to bring up the overall life expectancy in the country. Such a program probably would not have been possible without the increases in GDP seen in recent times.

On top of this, Mexico has achieved universal health coverage of its citizens, granting healthcare to all, including those who cannot afford to go private. This public funding of healthcare exists side-by-side with private healthcare for those who can afford it (quite like the NHS/private model that exists in the UK).

Chile, Germany, & USA

The USA has a high (but not the highest) median life expectancy. However, the distribution curve does look almost bi-modal, indicating two peaks. This could indicate a class division, or a division

between those with better access to quality healthcare and those without.

And healthcare access really is a differentiating factor between these three countries. Chile was among the first countries in Latin America to introduce nationalised healthcare via mandatory salary deductions, and Germany has a multi-payer social healthcare system funded via progressive taxation (i.e. the more you earn, the more you contribute to the 'public' fund). Even in countries with such massively different GDPs from one another, it is possible to get healthcare no matter your level of income.

The USA, on the other hand, is unique among industrialised nations in having no right to healthcare for its citizens and no universal healthcare coverage. While the general infrastructure of the USA (assisted by a high GDP) can lead to longer life-spans (e.g. water treatment, access to clean food, etc.), the median life-expectancy may be depressed by the lack of affordable healthcare, or the inability to get clean water (e.g. in Flint, MI).

As we stated initially, access to quality healthcare is a major factor in life expectancy. However, "prohibitively high cost is the primary reason Americans give for problems accessing health care", implying that not all citizens can access healthcare.

Conclusion

While our data do not show any direct causal link between GDP and life expectancy, it cannot be denied that a higher GDP can indirectly lead to a higher life expectancy due to more money being present in the system.

That being said, the cultural and political values of a country play a major part in this.

As shown in both Chile and Germany, progressive taxation and mandatory contributions towards publicly-funded healthcare can directly bring about a high life expectancy, no matter what the GDP. Both Germany and Chile are collectivist societies, meaning that the 'group' (or state) looks after the citizens.

The USA has instead a very individualistic culture, meaning that citizens are expected to look after themselves or their immediate family only. Such a culture can and will contribute to rises in overall GDP, but will also prevent socialist ideas such as universal healthcare from gaining traction. Indeed, 'socialism' is feared in the USA, quite often due to confusing 'socialism' with 'communism'. This mindset does, however, seem to be changing among the younger generations in the USA.

It would be very interesting to perform similar studies on more granular data, such as 'GNI per capita' instead of GDP, broken down along lines such as household income or even race. Such socioeconomic weighting would allow us to get a clearer picture of any inequality that may skew the results one way or another.

Share this:

🐦 Twitter   📘 Facebook

Reblog   Like

Be the first to like this.

Related

Marketing the Engineers
In "Engineering"

'The Expert' does not display the right kind of expertise
In "Business Practices"

Kanban Methods
In "Productivity"

← **Previous post**

Leave a Reply

Enter your comment here...

This site uses Akismet to reduce spam. Learn how your comment data is processed.

Blog at WordPress.com.

← **Previous post**

Leave a Reply

Enter your comment here...

This site uses Akismet to reduce spam. Learn how your comment data is processed.