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Forecasting Methods for Big Data Using Machine Learning with Medical Data

Term Paper

Forecasting Life Expectancy and Economic Performance via Agricultural Institutions

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1. Introduction

Forecasting is hard. How do you know if your model will predict the next big thing? There are many ways a model can fail. For this reason, I decided to create a panel regression. A panel regression allows one to look at the model from a more intuitive point of view. Especially if the content being analyzed is economic data. In this seminar paper, health, corruption, and meat consumption statistics were collected to run a panel regression as an attempt to predict or forecast the life expectancy and life quality of countries.

First, the importance of institutions in the everyday economy of citizens is determined. This is done to establish a foreground as well as determine the interactivity between legislature/government and the well-being of citizens. Then the relationship between meat consumption and health is established. Then the data is analyzed resulting in meat and corruption influencing the life expectancy and quality of life of citizens. Finally, using examples from the United States, it is established that one can forecast the wellbeing of citizens by the level of corruption in the food industry that exists. In this case, one way to improve the wellbeing of the world would be to reduce the corruption in the food industry, leading to healthier and more productive citizens.

2. Literature Review

Meat consumption has a significant influence in the average life expectancy that citizens have. In Europe and North America, low meat consumption increases life expectancy by about four years in Europe and North America (Singh, Sabaté & Fraser 2003). While in Germany, there is a fifteen year average increase in life expectancy when a citizen never smokes, maintains an optimal BMI, and consumes a low level of meat in comparison to consumers that smoke, do not maintain an optimal BMI, and maintain an higher level of meat consumption throughout their lives (Li, Hüsing & Kaaks, 2014). For this reason, the consumption of animal products, and the other effects that agriculture has on our economy should be included in the general welfare equation. Since meat is something demanded in the market, the demand can change and be manipulated.

Incentives drive our daily decisions. Corruption should therefore be understood as an underlying incentive to absorb profits from susceptible agents in which the corrupted has a financial incentive to do so (Holmberg & Rothstein 2011: 3). In the case of this paper, corruption can be viewed as causing the average consumer to be surrounded by highly incentivizing

institutions or procedures like habits to purchase all kinds of animal products beyond what is healthy or economically productive. Since the producers have a high incentive to either reduce the prices, add addictive substances, or produce confusing advertising messages about the effects of animal products in the human body, one can predict that the agricultural institutions have already been corrupted in favor and that reorganizing these institutions would lead to positive welfare effects with large spillovers.

Corruption of institutions pave the way for future corruption since wealthy elites have a high incentive to use lobbying, bribery, and extralegal forces to invest in their political power which translates into higher personal economic power for the wealthy individual and can offset the effectiveness of other institutions (Acemoglu and Robinson 2008:287). Assuming there are negative health effects from the consumption of animal products, the corruption of high level food and agricultural industries by wealthy elites would cause the premature deaths of millions of Americans while at the same time placing the costs of the consumption of meat on the average taxpayer, rather than on the wealthy elites that created the incentives for the average consumers to consumer to consume more animal products than what was historically the average level. Not only does the average citizen face a premature death while bearing the cost of consumption for others, the wealthy elites are effectively reducing the power of other institutions to work effectively. One example of this is the opportunity cost of reducing funding for research and development because of the artificially high costs of the consumption of meat.

Corruption costs the world $1000 billion per year and decreases growth via decreases in investments, decreases international trade, decreases amount of public investment and increases instability and uncertainty (de Vaal & Ebben 2011). Specifically in the US, if congressional committees would cease to receive money from agricultural companies and interest groups, it is estimated that consumers and tax-payers would benefit while adding an extra five and a half billion in 2000 inflation adjusted dollars (Lopez 2001:1). While it is not the aim of the paper to judge the level of corruption for agricultural companies and organizations, it is assume that there is certainly a massive market for corruption in the agricultural industry since for every dollar invested in congressional committees returns on average of 2000 dollars in subsidies or policy transfers for the industry (Lopez 2001:7).

The root cause of poverty in Africa is poor quality institutions (Asongu, 2015:8). This is because corruption has a causal function in the state of well-being in a country (Holmberg & Rothstein 2011: 4). Adding to the feedback loop function of institutions, incentives drive our daily

decisions. Corruption should therefore be understood as an underlying incentive to absorb profits from susceptible agents in which the corrupted has a financial incentive to do so (Holmberg & Rothstein 2011: 3). Hence, one of the greatest obstacles preventing developing nations from developing their economy is farm subsidies since they encourage overproduction which in turn leads to food prices below the cost of productions (Borders & Burnett 2006:1). This prevents suppliers of developing nations from achieving a competitive edge in the world market, thus reducing their intertemporal ability to develop which adds to the feedback loop function of decreasing wellbeing all over the affected country.

In terms of quality of life, meat consumption affects overall greenhouse gas production from meat production in Europe by 30% (Petrovic et al. 2015:235). Additionally, bodies of water are acidified and negatively affected while using up an incredibly inefficient amount of resources to produce one unit of meat (Djekic 2015:63). Quality of life can therefore be improved by reducing the amount of meat consumed to provide a cleaner environment that citizens want to enjoy more.

Previous research between life expectancy and GDP have resulted in unexpected results. Researchers noted that a 1 percent increase in life expectancy leads to a 1.7 - 2 percent increase in population, but that there is little effect on total GDP and consequently, the large increase in life expectancy does not raise income per capita (Acemoglu & Johnson 2007: 925). Therefore in this seminar paper, it was important to change the aim about the overall effect of corruption and agricultural institutions on the economy and life expectancy. Although higher life expectancy goals are generally an international aim, it is important to add that it is not economically sound when claiming higher life expectancy to be the causal force in low income per capita nations. However, assessing the state of important institutions as the causal fact for both life expectancy and economy is the key to understanding why GDP and life expectancy have less than spectacular results.

One major reason why health economists have not studied the impact of quality of institutions on health facts is due to the lack of intra-country comparable data (Holmberg & Rothstein 2011: 5 - 6). For this reason, the research in this seminar paper is important since it incorports a general index of corruption in countries that use the same variables. Additionally, the use of this index system is superior to GDP per capita data since variables like these can have great variation in infant mortality and life expectancy rates when comparing poor countries with poor countries and rich countries with rich countries (Holmberg & Rothstein 2011: 6).

In choosing these points as the way to design the analysis, the effects of corruption and consumption of meat on life expectancy provide more understandable results as to why corrupted agricultural institutions decrease economic vitality and life expectancy.

3. Data

The data is composed of three different datasets sourced from Kaggle. For all the sources of data, I organised the data to account for which countries have complete information over the years that are being analyzed. For the meat consumption data, I combined the levels of meat consumption to reduce the final amount of explanatory variables being used. Countries were analyzed over a period of less than ten years.

The corruption data is provided by Transparency International as part of their Corruption Perceptions Index. Each country is ranked by a certain level of perception of corruption over time based on economic data from various reputable sources like the World Bank. Rank/score is determined by datasets capturing levels of "bribery, diversion of public funds, prevalence of officials using public office for private gain without facing consequences, ability of governments to contain corruption and enforce effective integrity mechanisms in the public sector, red tape and excessive bureaucratic burden which may increase opportunities for corruptions, meritocratic versus nepotistic appointments in the civil service, effective criminal prosecution for corrupt officials, adequate laws on financial disclosure and conflict of interest prevention for public officials, legal protections for whistleblowers, journalists, and investigators when they are reporting cases of bribery and corruption, state capture by narrow vested interests, access of civil society to information on public affairs" (*2020 - CPI - Transparency.Org*, n.d.).

The meat consumption data is composed of meat consumption levels from different animals. I combined the categories of meat to consist of one general level of meat consumption in order to reduce the amount of variables for the regression. (*Worldwide Meat Consumption | Kaggle*, n.d.). The health statistics data is sourced originally from the world health organisation. Many of the variables contained in the statistics were filtered out (*World Health Statistics 2020|Complete|Geo-Analysis | Kaggle*, n.d.).

4. Method

To determine the effects on life expectancy from corruption and meat consumption for all countries, a panel regression was used alongside other economic variables. The economic variables included are natural death rate, health expenditure per capita, literacy rate of adults, out of pocket health expenditure, public spending on education, rural population percentage, and unemployment percentage. These are used to avoid the omitted variable bias. The hypothesis is if there are negative effects from increasing consumption in meat and in higher corruption, there are corrupted institutions that hint at the possibility of food institutions that can be corrupted and cause a large percentage of the population to decrease their life expectancy and their potential. A Hausman test is used to determine the use of the random effects panel regression.

5. Results

PanelOLS Estimation Summary

Dep. Variable:	Life expectancy at birth, total (years)	R-squared:	0.9232
Estimator:	PanelOLS	R-squared (Between):	-48.061
No. Observations:	246	R-squared (Within):	0.9232
Date:	Mon, Sep 06 2021	R-squared (Overall):	-1.8565
Time:	07:27:31	Log-likelihood	-841.82
Cov. Estimator:	Unadjusted		
		F-statistic:	261.88
Entities:	41	P-value	0.0000
Avg Obs:	6.0000	Distribution:	F(9,196)
Min Obs:	6.0000		
Max Obs:	6.0000	F-statistic (robust):	261.88
		P-value	0.0000
Time periods:	6	Distribution:	F(9,196)
Avg Obs:	41.000		
Min Obs:	41.000		
Max Obs:	41.000		

Parameter Estimates

	Parameter	Std. Err.	T-stat	P-value	Lower CI	Upper CI
const	3.1640	34.276	0.0923	0.9265	-64.434	70.762
kg_cap_meat	-1.1377	0.3367	-3.3790	0.0009	-1.8017	-0.4737
Death rate, crude (per 1,000 people)	3.1005	0.4795	6.4665	0.0000	2.1549	4.0461
Health expenditure per capita (current US$)	0.0072	0.0008	9.5008	0.0000	0.0057	0.0087
Literacy rate, adult total (% of people ages 15 and above)	-0.0453	0.0188	-2.4129	0.0167	-0.0824	-0.0083
Out-of-pocket health expenditure (% of total expenditure on health)	0.7215	0.0675	10.696	0.0000	0.5885	0.8546
Public spending on education, total (% of GDP)	0.6956	0.3045	2.2844	0.0234	0.0951	1.2961
Rural population (% of total population)	0.7652	0.7170	1.0671	0.2872	-0.6489	2.1793
Unemployment, total (% of total labor force)	0.7406	0.3040	2.4361	0.0157	0.1410	1.3402
corruption_perception	0.4586	0.2403	1.9080	0.0579	-0.0154	0.9325

F-test for Poolability: 15.519
P-value: 0.0000
Distribution: F(40,196)

Included effects: Entity

Figure 1. - Panel OLS Regression Results (Random Effects)

The results of the F-test indicate the significance of the equation as a whole. The R-squared is 92%, which indicates the fullness of the variables. The economic variables are each significant at

the 95% level, except for the rural population. Establishing these baseline variables in the equation does a remarkable job at reducing bias and noise by increasing the R-squared value. Health expenditure per capita, public spending on education, and out-of-pocket health expenditure are all not only significant, they indicate the effects of institutions on life expectancy. Corruption, which is significant at about the 94% or 93% level, is determined to influence the life expectancy in which corruption decreases, the country experiences higher life expectancies. Lastly, the increasing consumption of meat decreases the life expectancy by one year per increase in kilogram per capita.

6. Discussion

To forecast the life expectancy of countries, it is therefore important to include general economic variables, the general state of health institutions by the percentage of GDP spent on healthcare, and the level of corruption. Since corruption is exceptionally good at destroying institutions, it can be claimed that this level of corruption and increase in the level of meat consumption has negative external costs to the rest of the world via subsidies, as previously mentioned.

Meat consumption not only directly impacts life expectancy, but also the quality of life that one has. As a result, the quality of life for everyone is affected when meat consumption is high. Because of corruption in agricultural institutions, environmental institutions and tax laws are corrupted and cannot function properly, further reducing both quality of life and life expectancy.

7. Conclusion

The point of this seminar paper is to show the simultaneous effects of corruption and meat consumption on life expectancy. It can be predicted that a reduction in corruption within the agricultural industry would increase the economic performance domestically and internationally. Though meat consumption is a causal factor in reducing life expectancy, the effects are also indirect. Indirect effects include corrupted institutions of all kinds, and reduced quality of life for countries competing in the agricultural industry. The environment is negatively affected causing reducing the quality of natural resources.

Citizens, wanting to create a better future for themselves and for citizens of other countries can do so by reducing the meat that they consume. This is a relatively simple adjustment that every

citizen can make to improve the quality of life on a significant level domestically and internationally.

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