The Effect of Value-Added Tax on Household Consumption: Evidence from 21 European Union Countries

Proma Paromita, Andrew Lee Sterling
Group F
Instructor- Dr. Dohyeong Kim
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Abstract

The Value-added Tax (VAT) system has prevailed in the European for several years. Recently, many countries in the European union are rapidly growing. One of the major contributors to this growth is household consumption. Therefore, this paper aims to study the effect of VAT on household consumption using 21 countries from the European Union from 2007-2019. Using panel data fixed effects, the results show that an increase in VAT decreases household consumption.

Introduction

The European Union (EU) has established the Value-added Tax for a very long time. It was first harmonized throughout EU countries in 1977 (Tax Foundation, 2021). The European Union established VAT so that they could have 1 transparent market throughout Europe (European Commission, 2021). Since, the member countries have maintained a strong VAT system among the countries. The EU law states that each member country should have a minimum of 15 percent VAT rate (European Commission, 2021). Even though VAT rate varies among countries, VAT is a stable source of government revenue for most of the member countries. In the EU majority of the goods produced and sold have VAT imposed on them. Only exports are outside the scope of VAT. On the other hand, household consumption is a key component of the GDP for majority of the EU economies. The intuition behind consumption tax is that such type of tax indirectly affects household's income. Hence, it is not as harmful as direct tax. However, VAT does affect the prices of goods and services directly and through that channel affects household's consumption. Therefore, it is crucial to understand how VAT and household consumption interact. Understanding the relationship between these two important components would help policymakers make effective decisions. Thus, this paper aims to study the effect of VAT rates on household consumption in 21 European Union countries from 2007-2019. Applying fixed effects regression, the paper finds evidence that increase in VAT rate decreases the growth in household consumption.

Value-Added Tax

Value-added tax (VAT) is a consumption tax that is placed every time value is added to goods and services. It is popular among countries because it is a convenient source for government revenue (OECD, 2020). The difference with sales tax is that sales tax is only applied in the final stage. There are various advantage and disadvantages of VAT. VAT does not discourage individuals from working as the tax is not imposed on income. However, VAT is a regressive tax and the burden falls on poor people. Moreover, VAT increases cost of production for firms and leads to increased price levels. In spite of that, many policymakers argue that VAT helps to generate more revenue, which boosts GDP and offsets the costs. The following diagram depicts the situation in the market if VAT is increased.

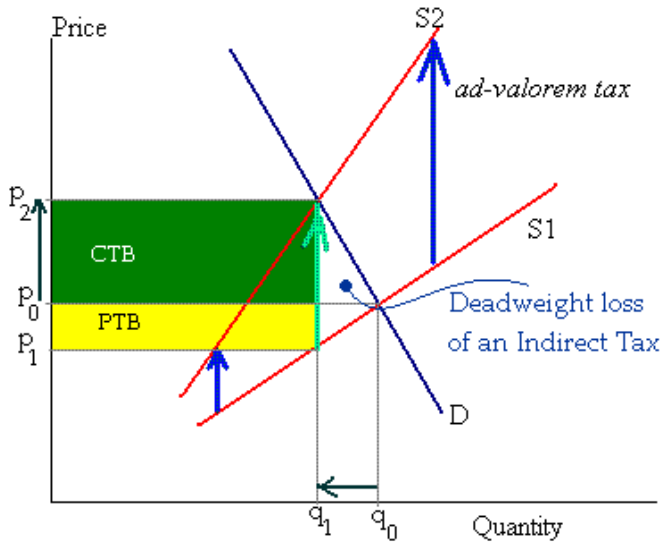

Fig 1: Effect of an increase in VAT rate Source: Anghel (2008)

Fig 1 shows the effect of an increase in VAT rate on consumers and producers' tax burden. As VAT shifts the supply curve to the left, prices increase and quantities decrease. The tax burden of consumers as measured by the area CTB, increases compared to the tax burden of the producers (PTB).

Household Consumption

GDP is calculated from the expenditure side using the following equation

GDP = Consumption + Investment + Government expenditure + Net export

Consumption includes household consumption and is a major component of GDP. Household consumption comprises of about 60 percent of total GDP on average (OECD, 2018).

Despite the fact that VAT increases the burden on consumers, VAT is still predominantly used in many countries all over the world. It is also noticed that emerging economies in Europe have increased their VAT rate. Also, such emerging economies are dependent on private consumption to boost GDP. Therefore, it is interesting and informative to study the effects that VAT has on household consumption.

Literature Review

The literature is very rich regarding the effect of VAT. Barrell & Weale (2009) finds that reduction in VAT from 17.5 to 15 percent increases consumption by less than 1 percent. Andrikopoulos et al., (1993) estimates the short-run effect of VAT on consumer price index and allocation of consumption expenditure; the study finds that VAT increases CPI and changes the allocation of consumption expenditure. Akhmadeev et al., (2019) uses evidence from Russia to show that increase in VAT would decrease firms' profits if firms are unable to increase prices and VAT would increase price level if firms could keep a certain portion of their profits. Miki (2011) includes 14 developed countries in the study and finds that aggregate consumption and economic growth increases when increase in VAT is announced and they decrease after the policy has been implemented. Carare & Danninger (2008) states that VAT hike of 2007 in Germany played a small role in inflation; it was mostly due to lack of competition in the market. Benzarti & Carloni (2019) concludes that the VAT cut in sit-down restaurants in France benefited the firm owners the most and the consumers the least. Studies have also been conducted on developing countries. Onaolapo &Fasina (2014) finds that in Nigeria VAT increases revenue for the government. Smith et al,. (2011) states that in Bangladesh VAT revenue generation has become stagnant due to lack of monitoring, lack of awareness and small number of VAT taxpayers. Lastly, Bird & Gendron (2006) does a thorough literature review and draws the conclusion that imposing VAT would be favorable to developing countries.

It is observed that VAT is still an issue that requires further research. Therefore, this paper contributes to the literature by providing the effects of VAT on household consumption utilizing recent data from 2007-2019 for 21 European Union countries.

Data

In this study data from 21 EU countries ranging from 2007-2019 is included. The countries selected include both developed and emerging economies. Data has been sourced from the World Development Indicator (WDI) database from world bank and from OECD tax database. Table 1 shows the countries included and the average VAT rate of the countries.

The following variables are included in the study:

Household Consumption Growth – This is the annual percentage growth in household consumption in constant 2010 US Dollars. Household consumption includes expenditure on durable goods by resident households and expenditure on services such as health, leisure, etc. This is the dependent variable.

Vat rate – This is the main independent variable. Vat rate measures the value –added tax imposed by the government in a certain country. A negative coefficient is expected because vat makes goods and services expensive. This might discourage households from consuming more.

Country	Average VAT % (2007-2019)
Bulgaria	20
Croatia	24
Cyprus	17.2
Czech Republic	20.3
Estonia	19.7
Finland	23.3
France	19.8
Germany	19
Greece	22.3
Hungary	25.5
Ireland	22.3
Italy	21.1
Latvia	20.7
Lithuania	20.4
Malta	18
Poland	22.7
Portugal	22.2
Romania	21.4
Slovakia	19.7
Slovenia	21.1
Spain	19.2

Table 1: VAT rates in the 21 EU countries

Income tax rate- It measures the tax rate imposed on income. If income tax rate increases, then households would have lower disposable income. Hence, they might spend less. So, a negative coefficient is expected.

GDP per capita growth – This measures the percentage growth in GDP per individual in an economy. GDP is measured in constant 2010 US Dollars. The expected coefficient is positive because increase in GDP per capita means more income for households and increased ability to spend.

Interest rate – It is the real interest rate that measures the cost of borrowing and benefit of lending. As interest rate increases, borrowing becomes expensive. As a result, household consumption would decrease.

Inflation rate – This measures the growth in the GDP deflator. GDP deflator is calculated by dividing nominal GDP by real GDP. An increase in the growth of the GDP deflator would mean an increase in price level. Increase in price level would discourage consumption. Therefore, a negative coefficient is expected.

Government expenditure growth - This variable measures the percentage growth in government expenditure. Government expenditure includes spending on public goods and services such as education, infrastructure, etc. A positive coefficient is expected as such expenditures promote household consumption.

Unemployment – This measures the percentage of the labor force who are unemployed. A negative coefficient is expected as unemployment lowers income and that might lead to lower consumption.

Elderly population (%) – This measures the percentage of people over 65. Elderly population has the potential to affect household consumption in both the directions. Therefore, the expected coefficient is ambiguous.

Fig 1 shows that there was an overall drop in the average growth in the household consumption during the 2008 crisis in the sample countries. But after that there is an increasing slope. Average VAT rate has been increasing sharply till 2016. After that the slope has become somewhat constant. Income tax seems to be increasing sharply in the resent years. Average interest, unemployment and inflation rate has a decreasing slope. The percentage of population above 65 is rising steadily.

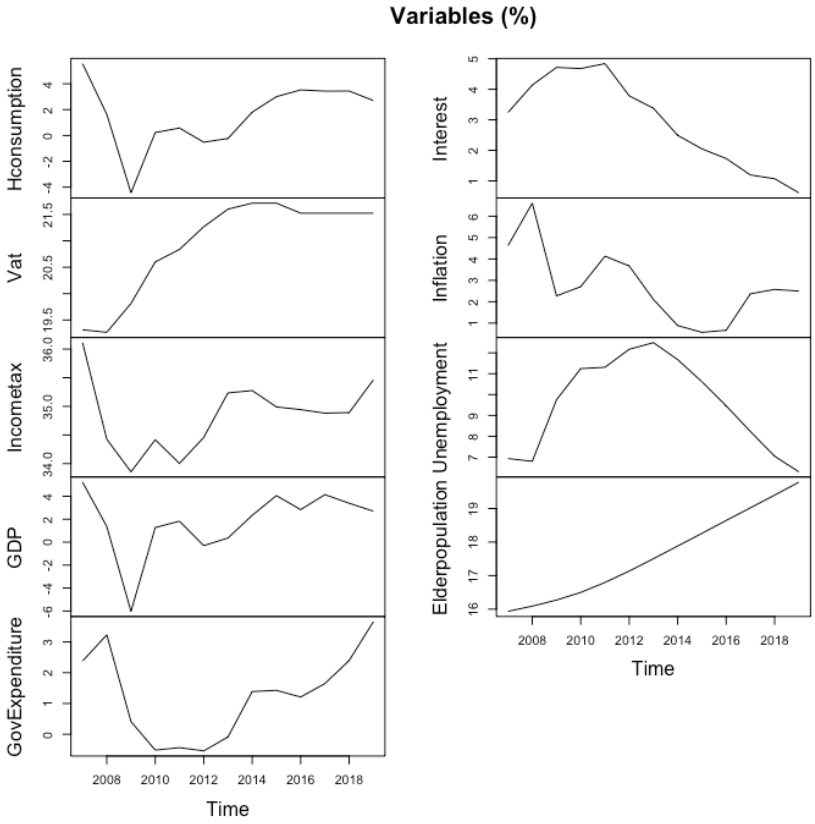

Fig 1 : Variables included in the study (Average values through 2007-2019)

Table 2 shows the descriptive statistics of the variables.

Variable	Mean	Max	Min	Std. deviation
Household Consump. growth (%)	1.59	15.53	-16.49	3.92
Vat rate (%)	20.94	27	15	2.33
Income Tax Rate (%)	34.84	56.5	10	14.2
GDP growth (%)	1.78	23.98	-14.26	4.04
Interest rate (%)	2.91	13.75	-4.1	2.87
Inflation rate (%)	2.74	19.08	-4.47	3.93
Government Exp. growth (%)	1.24	14.2	-9.98	3.05
Unemployment (%)	9.54	27.47	2.01	4.81
Elderly population (%)	17.63	23.01	10.65	2.79

Table 2: Descriptive statistics

Methodology

To estimate the effect of VAT on household consumption, a series of models are tested. First, the pooled OLS model is estimated. Next, fixed effect and random effect models are estimated. The suitable most model is selected and is adjusted for heteroscedasticity and autocorrelation. Statistical software R is used for the analysis.

Pooled OLS Estimator

The pooled OLS estimator coefficients are consistent and unbiased if the unobserved heterogeneity is uncorrelated with the observed regressors.

Fixed Effect model

Fixed effect model takes into account any unobservable variables that are constant over time but varies within individuals. It is assumed that all the unobservable variables that could potentially affect both the dependent and independent variables do not vary over time. Fixed effect model controls for all time-invariant characteristics which helps to address omitted variable bias.

Random Effect model

This model assumes that the unobserved heterogeneity is uncorrelated with the observed variables. It is assumed that the differences between individuals are random and they are drawn randomly from a distribution with constant parameters. Random effect model includes time-invariant characteristics.

The Augmented Dickey-Fuller (ADF) test shows that all the variables are stationary. After all the 3 models (OLS Pooled, Fixed, Random) are estimated, the Hausman test has a p-value lower than 0.05 and that shows the Fixed effect model is preferred to the Random model. This is because the unobserved heterogeneity is correlated with the variables. The F-test has a p-value less than 0.05, which means Fixed effect model is also suitable compared to the pooled OLS estimates.

The following fixed effect model is estimated:

$$HCgrowth_{it} = \beta_1 Vat_{it} + \beta_2 Incometax_{it} + \beta_3 GDPgrowth_{it+} + \beta_4 Govexp_{it} + \beta_5 Interest_{it} + \beta_6 Inflation_{it} + \beta_7 Unemployment_{it} + \beta_8 Elderpop_{it} + \alpha_i + \mu_{it}$$

Where i represents country and t represents year. α_i is the intercept term which measures heterogeneity across countries. μ_{it} is the error term. HCgrowth is the dependent variable which represents the percent growth in household consumption. β_1 is the coefficient that the paper is primarily interested in.

However, the Breusch-Godfrey test indicates the presence of serial correlation and the Breusch-Pagan test has evidence for heteroscedasticity in the Fixed effect model. To tackle this, the coefficients are adjusted for both serial correlation and heteroscedasticity using the arellano method and that makes the standard errors robust.

Results

Dependent variable: Growth in Household Consumption (%)

	Estimate	Std. Error	Pr(>|t|)
Vat rate	-0.2862*	0.138	0.0394
Income tax rate	-0.0124	0.035	0.7270
GDP growth	0.70***	0.128	1.263e-07
Gov exp growth	0.036	0.061	0.551
Interest rate	-0.259**	0.086	0.0029
Inflation rate	-0.2326**	0.085	0.007079
Unemployment rate	-0.1266*	0.0506	0.013
Elderly population	-0.1401	0.1707	0.4126
R-Squared: 0.70195			
F-statistics: 71.83			
Residual Sum of Squares: 1072.3			
Number of Observations: 273			

Table 3: Fixed Effect model

Table 3 summarizes the results from the fixed effect regression. A 1 percent increase in the vat rate decreases the growth in household consumption by 0.28 percent overtime, on average per country holding other variables constant and controlling for country and year fixed effects. The coefficient is significant at the 5 percent level. Also, a 1 percent increase in GDP per capita growth leads to a 0.7 unit increase in the growth of household consumption on average per country, controlling for other variables and country and year fixed effects. An increase in the interest rate by 1 percent reduces the growth in household consumption by 0.259 percent and a 1 percent increase in inflation reduces the growth in household consumption by 0.2326 percent overtime, on average per country, while holding other variables and country, year effects constant. Moreover, an increase in unemployment by 1 percent reduces the growth in household consumption by 0.126 percent, holding other variables and country and tear effects constant. All these coefficients are statistically significant. Income tax has negative coefficient and government expenditure growth has positive coefficient, but they are not statistically significant. Lastly, an increase in the percentage of elderly population decreases the growth of household consumption. However, the coefficient is not statistically significant.

Discussion

Increase in the VAT rate reduces household consumption as observed in the previous literature. The results make sense because VAT increases the prices of goods and services and this demotivates households to consume more. Benkovskis et al.,(2014) finds evidence that an increase in VAT rate in Latvia is strongly passed towards consumers (esp. for food), whereas a tax reduction weakly passes through to the consumers. Individuals are rational beings who maximize their benefits. If prices of certain products increase they would try to shift to the next best alternative. For goods with inelastic demand such as food, people are unable to shift to substitutes. As a result, they reduce their quantity consumed due to the price hikes. It is also important to understand that the reduction in household expenditure is not the sole reason to consider when determining VAT rates. With strong regulation, VAT has the possibility to earn more revenue. Tagkalakis (2014) shows that in Greece VAT revenue contributed to economic growth due to strict regulation. If GDP is increased, then it would most likely increase household's disposable income. An increase in income might help to offset the effects of price rise from VAT. Jiang (2014) concludes that increase in value-added tax has improved production efficiency in China. In the end, it is up to the policymakers to judge how VAT is affecting the economy and what measures should be taken accordingly.

Should the United States apply VAT?

When considering whether or not the United States should adopt a VAT as part of its tax structure, it is first required to discuss the massive amount of political capital needed to pass such a law. As much of the political discourse and controversy currently taking place in the American government has to do with comparatively minute changes in preexisting corporate taxes, it may at first seem as if it would be wildly unpopular to implement any other type of tax, especially when much of it would be shouldered by the lay consumer at face value (Gallup, 2021); considering the vast amount of debate concerning taxation in the Clinton and Bush administrations had to do with changes in income taxes (Ruffing, K., & Friedman, J, 2013), and the ire that any proposed increases were met with, this only bolsters its hypothetical unfavourability.

Furthermore, the United States has never passed any form of a VAT or Consumption Tax though there have been limited efforts to in recent years; H.R. 1040 in the 110th Congress [2007] (Burgess, M. C., 2007) proposed a flat 17% tax on business expenditures, though they would be returned to the businesses as corporate tax credits in the next fiscal year (stalled as of 2009), H.R. 4159 in the 116th Congress [2017] (Riggleman, D., 2019) proposed a variable rate "Product Tax" to be paid by businesses (died in the House in 2017), and H.R. 1081 in the 116th Congress [2019] (Smith, C. H., 2021) which was a proposed consumption tax on companies who bought land containing water that was previously under the control of the Land and Water Conservation Fund (signed into law

in 2020 under H.R. 1957, without the proposed tax); that being said there have been no consumption taxes proposed that would affect the standard American consumer.

The first rebuttal may be to point out that most states (bar Alaska, Delaware, Montana, New Hampshire and Oregon) or counties levy a Sales Tax, ranging from 2.9% to 7.25% (Cammenga, J., 2021), yet it's important to remember that VAT applies on every level of consumption while Sales Tax is only levied on the retail level on the consumer; that being said Sales Tax is in most all circumstances used by the state or county in which it is collected to bolster local public goods, as opposed to VAT which is collected at the federal level. A good parallel for a hypothetical VAT system on top of a preexisting Sales Tax structure in the United States is Canada, which has a Provincial Sales Tax (i.e. Sales Tax) and a Goods and Services Tax (VAT), implemented in 1991 at a flat 5% rate. Studies on Canadian VAT rates have shown that they can safely coexist with Provincial Sales Taxes, with little to no impact on consumer spending (Gouvernement du Canada, 2020) – they also instituted certain safeguards for VAT as to be non-applicable for certain necessities like groceries, drugs, and rent, or rather offering tax rebates for these necessities. In 2018 alone, Canada's GST accounted for 14% of all federal tax revenue, amounting to approximately $8 billion [USD] (OECD, 2020).

That being said, any presumptive conclusions about the effect of VAT on household consumption in the United States based on EU economies must take into account that tax structures within the U.S. and EU member states are wildly different (Asen, E., 2021). Save the fact that EU member states tend to have much wider tax bases, with a number of taxes levied on companies outside of a broad Corporate tax for example, EU countries also have a long history with VAT with many Western and Central European countries adopting some form of a VAT during the mid-1960's. Any further suppositions about the widespread efficacy of VAT in the United States, based on EU countries, must keep this wide breadth of dissimilarities in mind.

Conclusion

This paper studies the effect of value-added tax (VAT) on household consumption in 21 European Union countries between 2007-2019. The paper contributes to the literature by using recent data to understand the current effect of VAT on household expenditure. Applying fixed effect model, the paper finds that an increase in the VAT rate decreases growth in household consumption overtime on average per country, while controlling for income tax rate, GDP per capita growth, government expenditure growth, interest rate, inflation rate, unemployment rate and percentage, elderly population, country and year fixed effects. The result of the paper is limited to the variables and the countries considered in the study. Increasing or decreasing VAT rate not only depends on household consumption, but also on other factors such as government revenue and overall production in the economy. Therefore, policymakers need to make informed decision when charging VAT rates. Should VAT be introduced in the United States depends on several economic

and demographic factors. The EU stands as an example of successful VAT implementation through strong regulations.

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Appendix

Dependent Variable – Household consumption growth

	Estimate	Std. Error	Pr(>|t|)
Vat rate	-0.0705	0.064	0.272
Income tax rate	-0.0314**	0.010	0.0023
GDP growth	0.696***	0.036	2.2e-07
Gov exp growth	0.060	0.052	0.247
Interest rate	-0.151**	0.052	0.0039
Inflation rate	-0.0019	0.041	0.962
Unemployment rate	-0.075*	0.032	0.0227
Elderly population	0.0967	0.055	0.080
R-Squared: 0.69965			
F-statistics: 76.87			
Residual Sum of Squares: 1257			
Number of Observations: 273			

Table 4 : Pooled OLS model

Dependent variable – Household consumption growth

	Estimate	Std. Error	Pr(>|t|)
Vat rate	-0.087	0.068	0.1021
Income tax rate	-0.031	0.011	0.0044
GDP growth	0.695***	0.0368	2.2e-16
Gov exp growth	0.057	0.052	0.269
Interest rate	-0.161**	0.053	0.0025
Inflation rate	-0.01	0.043	0.718
Unemployment rate	-0.078*	0.0344	0.022
Elderly population	0.084	0.059	0.152
R-Squared: 0.6969			
Chi squared: 607.037			
Residual Sum of Squares: 1236.4			
Number of Observations: 273			

Table 5: Random effect model

Hausman Test (Fixed vs Random)
Chi squared: 23.572
p-value: 0.002702

Table 6: Hausman Test

F Test (Fixed vs OLS pooled)
F: 2.1011
p-value: 0.00475

Table 7: Chow F-Test

F Test (Fixed vs Time Fixed Effect)
F: 2.2215
p-value: 0.01156

Table 8: F-test

Lagrange Multiplier Test –Time Effects
Chi squared: 1.1535
p-value: 0.2828

Table 9: LM Test

Variable	Lag	t-statistic	p-value
Household consumption	2	-7.5135	0.01
Vat rate	2	-4.8876	0.01
Income tax rate	2	-3.8586	0.016
GDP growth	2	-7.3495	0.01
Gov exp growth	2	-8.2543	0.01
Interest rate	2	-6.6559	0.01
Inflation rate	2	-4.4403	0.01
Unemployment rate	2	-6.2017	0.01
Elderly population	2	-4.5896	0.01

Table 10: Augmented Dickey-Fuller Test for Stationarity

Breusch-Pagan Test –Heteroscedasticity
BP: 194.58
p-value: 2.2e-16

Table 11: Breusch-Pagan Test

Breusch-Godfrey – Serial Correlation Test
Chi squared: 24.214
p-value: 0.02922

Table 12: Breusch-Godfrey Test

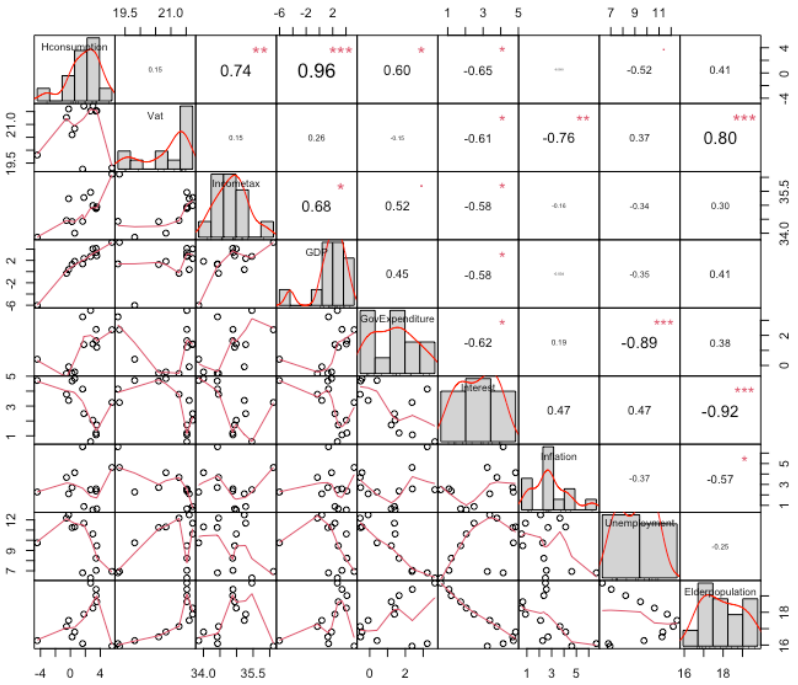

Fig 2: Correlation Matrix

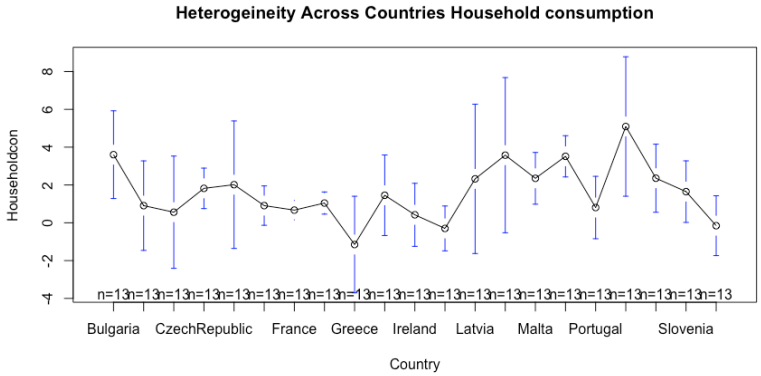

Fig 3 : Heterogeineity across countries of growth in household consumption

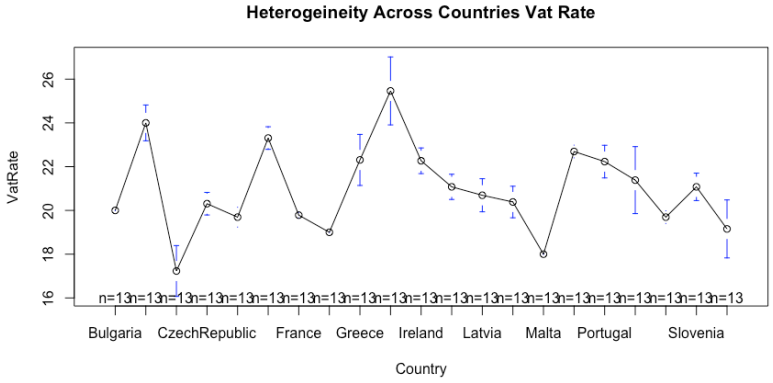

Fig 4: Heterogeneity across countries of VAT rate