UNEMPLOYMENT AND HOUSEHOLD DEBT

A PRACTICAL EXAMPLE

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Unemployment and Household debt: A Practical Example

Abstract:

In the previous literature, a theoretical correlation has been established in between household indebtedness and the unemployment rate. This study uses several forms of regressions and OECD data on the years 1995 – 2021 to see if this correlation exists in practice. After accounting for fixed effects, the correlation is deemed to be positive, thus reinforcing the previous literature. Further research is needed to find causal factors, possible reasons for which can be consumption reduction due to high debt obligations, decreased investment in human capital and diminished workers' bargaining power.

Keywords:

Unemployment, Household debt, Labor market, Debt overhang

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1. Introduction

Where previous studies have investigated the correlation between unemployment and household debt by applying different sorts of theoretical models, this paper instead aims to study the correlation in practice using datasets that includes information on household debt, unemployment rates, and other relevant economic variables for a sample of OECD countries over the period of 1995 – 2021. By doing so, we can get a more thoroughly understanding on how household debt and unemployment are correlated and what kind of real-world impact different debt levels have on unemployment.

Household debt has been a critical topic of research in economics for decades and thus, there are numbers of researchers that have examined the relationship between household debt and unemployment. However, a major part of the already existing literature builds their studies on theoretical models, where our empirical study is complementary to this work in that we are analysing the correlation between household debt and unemployment to see if our findings align with the theoretical predictions examined by previous literature, and thus this study can contribute with valuable insights.

2. Related literature

In their paper, "Household Debt Overhang and Unemployment", Donaldson, Piacentino and Thakor (2019) develop a theoretical model that shows how household debt overhang can constrain consumption, leading to a decline in aggregate demand and employment. The model also shows that the effects of the debt overhang can persist for an extended period, leading to long-term unemployment. Using data from the US between 1980 and 2010, the authors find a positive correlation where an increased household debt-to-income ratio led to higher unemployment rates.

Donaldson et al. (2019) explain their main results as a sort of negative spiral, all of them implying that high household debts leads to high unemployment rates. According to their model, indebted households are reluctant to bear the cost of working because they must use their wages to make repayments to the banks they borrowed from. Hence, firms must pay high wages to induce households to work. Thus, when households carry high levels of debt, this leads to a so-called *debt overhang problem*. Their second main result is that high levels of household debt lead firms to post fewer vacancies. This *vacancy post problem* is a result of the

debt overhang problem as firms must pay indebted workers higher wages, and thus they cannot afford to hire as many of them.

As a result of the vacancy posting effect, Donaldson et al. (2019) found that households are taking on an excessive amount of debt. This is due to a *household debt externality*, where households taking on more debt leads to a reduced likelihood of employment. Since unemployed households are likely to default on their debt, this increases the general default rate on all loans, including other banks' loans to other households as well. This means that when households take on debt, their borrowing has a negative effect also on other agents in the economy through the labor market.

Finally, the authors highlight the bank's beliefs about future employment, meaning that if banks believe that the rate of employment will be low, household default risk is high, and banks will require high face values of debt to offset this risk. This would lead to households having high debts, resulting in low employment due to the vacancy posting effect. In contrast, if banks believe that employment will be high, the risk of household default is low, and banks will instead require low face values of debt, and employment would indeed be high.

Moreover, Bethune, Rocheteau and Rupert (2015) also explore the impact of household debt on unemployment in their paper, "Aggregate Unemployment and Unsecured Debt". The authors develop a theoretical model that shows how household debt, specifically unsecured debt, can reduce workers' bargaining power, leading to higher unemployment. Under their baseline calibration, the rise in unsecured credit can account for approximately 70% of the decline in the long-term average unemployment rate. Similarly, Kehoe, Midrigan and Pastorini (2019) develop a theoretical model that shows how debt constraints can lead to unemployment by reducing households' investment in human capital. By studying the Great Recession, the authors found that the regions of the United States that experienced the largest declines in household debt also experienced the largest drops in consumption, employment, and wages.

In contrast to previously mentioned papers, Bernstein (2021) takes a different approach by analysing the relationship between negative home equity and household labor supply. The study provides a valuable contribution to the literature by examining the impact of household debt on labor supply from an empirical perspective rather than a theoretical perspective. While theoretical models can help explain the mechanisms through which household debt affects

unemployment, empirical studies like this one can provide valuable insights and findings into the actual impact of household debt on unemployment in real-life scenarios.

Bernstein (2021) addresses the issue of omitted variables affecting both house prices and labor levels and finds that instrumented negative home equity leads to an average reduction in household labor income of 2.2% to 5.6%, even when comparing households that bought their homes in the same region and year. According to the author, this reduction in labor income may be due to several reasons, such as housing lock, financial distress, household debt overhang problem, wealth effects, and declines in housing wealth associated with lower innovation among workers.

Housing lock is a factor that limits employment opportunities due to reduced mobility. When households have negative home equity, they cannot move to other regions because they would incur losses from selling their homes, which limits their ability to pursue employment opportunities outside of their current region. Financial distress is another factor that reduces household labor supply. Households with reduced financial stability are much more likely to experience financial distress given an income or liquidity shock, which can lead to a decrease in labor supply.

Bernstein (2021) also notes that households may engage in "strategic default" when they have negative home equity, as the seizing of the home is less than the loan. This can reduce productivity due to stress, time, and energy spent dealing with the financial consequences of defaulting on a loan. Additionally, the household debt overhang problem can lead to reduced labor supply, as households with high levels of debt are reluctant to bear the cost of working because they must use their wages to make repayments to the banks they borrowed from. The debt overhang problem is a recurring concept through the literature and undoubtedly seem to have a strong positive correlation with high unemployment rates.

Finally, Bernstein (2021) highlights the collateral channel and entrepreneurship. Due to information asymmetries between banks and entrepreneurs, collateral value from positive home equity is a critical driver of the entry and success of entrepreneurs and small business development. Thus, when households have negative home equity, they may be less likely to start their own businesses or engage in entrepreneurial activity, which can limit labor supply and entrepreneurship opportunities.

To conclude, the existing literature has long debated the relationship between household debt and unemployment. However, prior studies have predominantly focused on developing theoretical models to predict the correlation between the two variables, which has been found to be positive. This study, on the other hand, uses empirical data to examine the relationship between household debt and unemployment rates in different countries over several years. Thus, investigating whether the findings in previous studies using theoretical models, are also applicable in practice. Through this study, we aim to better comprehend the dynamics of the labor market in the context of household indebtedness and thus complement the previous literature with valuable insights.

The structure of this study is that first the introduction and related literature is presented. After which more depth is put into the method used. Subsequently the results are presented and further analysed in the discussion segment.

3. Method

This study employs both single and multiple linear regression models to investigate the relationships between various economic variables and the dependent variable, the unemployment rate for OECD countries.

Single linear regression models are used to analyse the relationship between unemployment rate and household debt for. These follow the structure of:

$$Unemployment\ rate_i = \alpha_i + \beta_1 * Household\ debt_i + \varepsilon_i$$

After which a one-year time lag is implemented on the unemployment rate, to account for time needed for the effects to take place. With the time-lag, a new lagged model is implemented with the following function:

$$Unemployment\ rate_{i(n+1)} = \alpha_i + \beta_1 * Household\ debt_i + \varepsilon_i$$

The models with using a one-year time lag will be called classified as lagged dataset and the model without that time lag are classified as original dataset.

Multiple linear regression models are then employed to assess the combined effect of several predictors on the dependent variable, allowing for an understanding of how these variables interact and influence the unemployment rate simultaneously.

First, a regular multiple linear regression is done with the following variables:

$$Unemployment\ rate_i = \alpha_i + \beta_1 * Household\ debt_i + \beta_2 * GDP\ per\ capita_i + \beta_3 * Average\ wage_i + \beta_4 * House\ costs_i + \beta_5 * Household\ net\ worth_i + \beta_6 * Household\ savings_i + \varepsilon_i$$

With the time-lag, the new lagged model is implemented with the following function:

$$Unemployment\ rate_{i(n+1)} = \alpha_i + \beta_1 * Household\ debt_i + \beta_2 * GDP\ per\ capita_i + \beta_3 * Average\ wage_i + \beta_4 * House\ costs_i + \beta_5 * Household\ net\ worth_i + \beta_6 * Household\ savings_i + \varepsilon_i$$

We then incorporate fixed effects models for both the lagged and original in the multiple linear regression models. Fixed effects models account for unobserved heterogeneity across panel units, in this case, the different locations and times. These models control for any time-invariant characteristics of each location, allowing for a more accurate estimation of the relationships between the predictors and the dependent variable.

The analysis subsequently involves the use of Pooled Ordinary Least Squares (OLS) regression models for both the lagged and original models. Pooled OLS models assume that the observations are independent and identically distributed (i.i.d.) and do not account for any potential panel structure in the data.

To assess the potential multicollinearity among the predictors, Variance Inflation Factor (VIF) is calculated for each predictor in the multiple regression models.

Finally, the explanatory power of the models is assessed using R-squared values and F-statistics. R-squared values indicate the proportion of the variation in the dependent variable

that can be explained by the predictors in the model. The F-statistics are used to determine the statistical significance of a model, where a value above 1 is seen as the threshold for statistical significance in this study. Both the R-squared and F-statistic are calculated for all regression models.

Using all these regressions, an analysis is made on which ones has the highest degree of conviction and thus should represent reality. After which they are compared to the correlation between unemployment and household debt as per the previous literature on the subject.

3. 1. Data Description and Validation

All data being used in the analysis have been obtained from the Organisation for Economic Co-operation and Development (OECD), an intergovernmental economic organization that compiles and publishes a diverse range of economic, social, and environmental indicators for its member countries and other economies. The OECD database offers various advantages and disadvantages concerning the examination of the relationship between unemployment and different predictor variables.

One of the main advantages of using OECD data is its extensive coverage of economic and social indicators across many countries. This enabled us to obtain a more diverse and representative sample, facilitating an examination of patterns and relationships across various contexts and settings. Additionally, the data is regularly updated, ensuring that our analysis incorporates the most current available information.

Another reason to why we chose to collect data from the OECD is its reliability and credibility. The organization is renowned for its rigorous methodology and data quality standards, ensuring that the data is accurate, consistent, and comparable across countries. This level of reliability is fundamental to the validity and generalizability of our findings.

Moreover, the OECD's comprehensive documentation and metadata promote a better comprehension of the data, its limitations, and the context in which the indicators were collected. This transparency assisted us in making informed decisions regarding the appropriateness of the data for our analysis and allows for a more thorough interpretation of the results. For example, this analysis employs unemployment rates, for which OECD uses the

same definition of unemployment across countries as opposed to using national definitions which can differ significantly (OECD 2023). Using this uniform definition improves international comparability greatly.

However, using OECD data has some drawbacks. One potential limitation is the presence of missing data or gaps in the time series for specific indicators. This can be especially problematic when working with panel data or conducting longitudinal analyses, as it may lead to biased estimates and reduce the analysis's power. Additionally, some variables may not be obtainable at the desired level of granularity, such as regional or local levels, which could limit the ability to capture more nuanced relationships between the variables of interest.

To mitigate this, we have chosen to omit some variables due to the availability of a long enough time series, Gini coefficients and poverty rates are two examples of variables being removed because of data availability. Thus, all the variables used in this study has data available for a minimum of 90% of the location and time datapoints used.

Furthermore, it is critical to consider the potential for endogeneity or reverse causality when utilizing OECD data. While the organization provides a wealth of information on various economic and social indicators, it does not always account for the complex interplay between these variables. For instance, high unemployment rates may lead to changes in some predictor variables, rather than the other way around. To mitigate this, several types of regression has been used to support the findings, including a fixed effect-model and a Pooled OLS-model.

Another thing to consider is the member countries of the OECD for which data is collected. As the OECD is not a worldwide organisation, the composition of member states can affect the results. Data is mostly collected on member states, which are mostly richer countries based in the global west. For this reason, it is important not to make a conclusion on the relationship between unemployment rate and household debt on a global level when this data is used, but rather as an indication for similar, more developed economies as those of the OECD members. A table of the countries used in our data can be found in Appendix 1.

4. Results

4. 1. Simple Linear Regression

Table 1 Single linear regression of Unemployment and Household debt

	Dataset	
Variable	**Original**	**Lagged**
Constant	9.5853***	9.7873***
	(0.2733)	(0.2826)
Household Debt	-0.0160***	-0.0171***
	(0.0021)	(0.0022)
Beta values, Standard errors in parenthesis *, ** and *** represent 90%, 95% and 99% significance respectively		
Observations	813	779
R-squared	0.06486	0.07317
Adjusted R-squared	0.06371	0.07198
F-statistic	56.39	61.5

A single linear regression of the dependent variable *Unemployment* and the independent variable *Household debt*. Data from OECD on the years 1995-2021 and using both the original data and an additional regression using a one-year time lag on the unemployment rate.

As shown in Table 1, In both the original and the lagged dataset, there is a statistically significant (at 99% significance) correlation between *Unemployment* and *Household debt* levels. This correlation is, however, contrary to previous research, a negative correlation as opposed to a positive one. For every one unit increase in the household debt level, the unemployment level is expected to decrease with -0.016% and -0.0171% according to the original data and lagged data respectively.

Based on the R-squared figures, household debt explains 6.5% and 7.3% of the unemployment rate in the original and lagged model respectively. These figures can be determined at a statistically significant level, given the high F-statistic of 56.39 and 61.5 the respective models.

4. 2. Adding dependent variables

For the multiple linear regression, several new possible explanatory dependent variables are introduced. A single linear regression is done for each variable, the validity of which is displayed in Table 2.

Table 2 R-squared values for a single linear regression on each variable

	Dataset	
Variable	**Original**	**Lagged**
Household debt	0.065	0.073
GDP per capita	0.125	0.120
Average wage	0.138	0.149
House cost	0.005	0.008
Household net worth	0.041	0.040
Household savings	0.095	0.137
R-squared values		

A single linear regression model between the dependent variable *Unemployment* and each of the independent variables specified. Using data from OECD on the years 1995-2021.

Long term unemployment was originally added as a sanity check, and unsurprisingly correlated highly with the unemployment rate. In addition, country inequality in the form of a Gini-coefficient and country poverty rates were originally added to the model but was subsequently removed due to a lack of sufficient datapoints in the observed time periods and countries. In figures 1-6 a scatter plot with regression line is presented for *Unemployment* and each of the introduced independent variables.

Figure 1

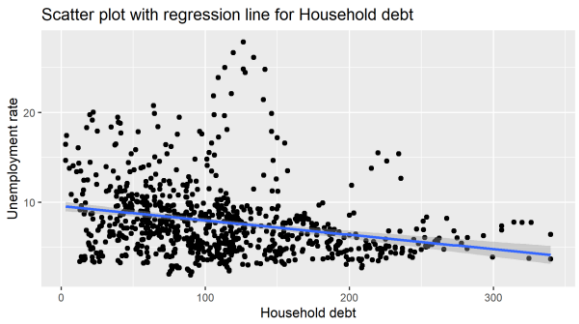


Figure 2

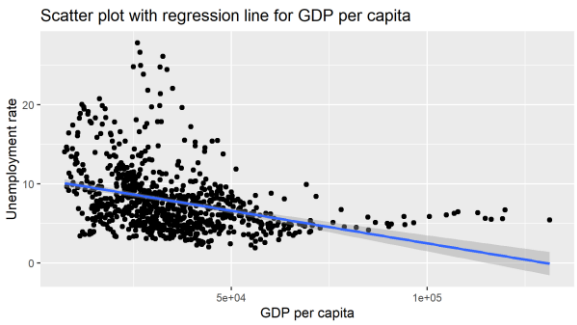
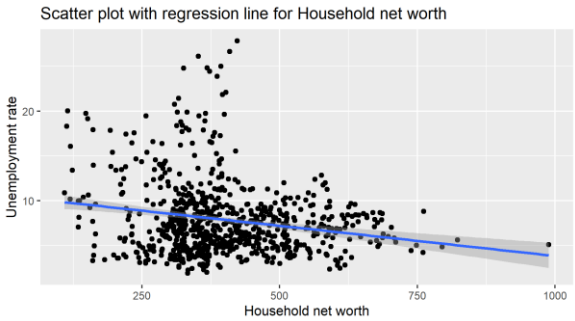


Figure 3



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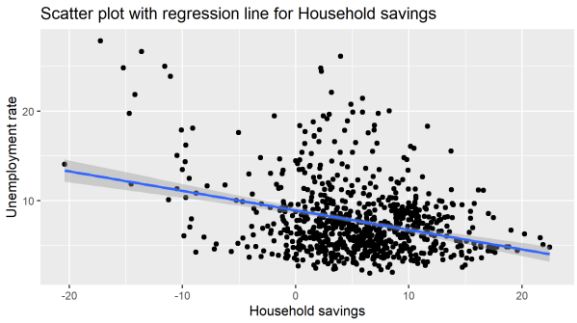


Figure 3

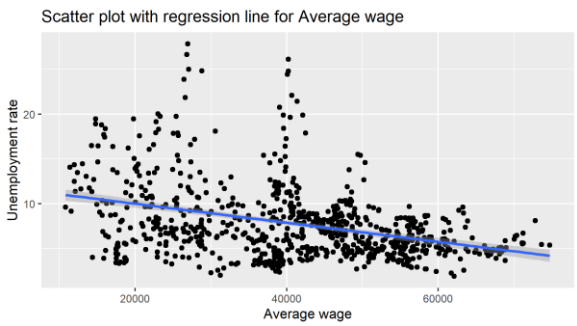
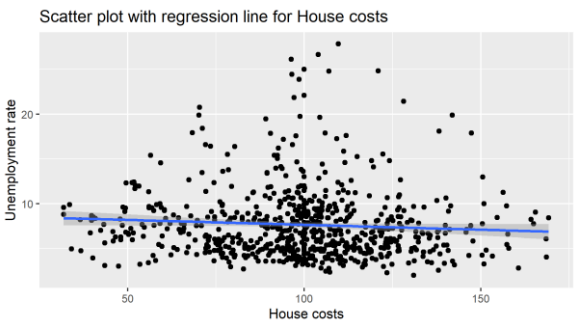


Figure 1



4.3. Multiple linear regression

Table 3 Multiple linear regression results for all regression models

	Model					
Variable	**Multiple linear regression**		**Pooled OLS model**		**Fixed effects model**	
	Original	**Lagged**	**Original**	**Lagged**	**Original**	**Lagged**
Constant	11.8100*** (0.8314)	12.5300*** (0.8392)	11.5490*** (0.8561)	12.5340*** (0,8392)		
Household debt	-0.0116*** (0.0032)	-0.0149*** (0.0032)	-0.0107*** (0.0032)	-0.0149*** (0.0031)	0.0606*** (0.0048)	0.0424*** (0.0050)
GDP per capita	0.0000** (0.0000)	0.0000 (0.0000)	0.0000* (0.0000)	0.0000 (0.0000)	0.0000** (0.0000)	0.0000 (0.0000)
Average wage	0.0000 (0.0000)	0.0000* (0.0000)	0.0000 (0.0000)	0.0000* (0.0000)	-0.0001 (0.0000)	-0.0001* (0.0001)
House costs	-0.0073 (0.0066)	-0.0136** (0.0067)	-0.0053 (0.0068)	-0.0136** (0.0067)	-0.0896*** (0.0059)	-0.0933*** (0.0062)
Household net worth	0.0030* (0.0016)	0.0047*** (0.0015)	0.0031** (0.0016)	0.0047*** (0.0015)	0.0085*** (0.0020)	0.0123*** (0.0021)
Household savings	-0.2308*** (0.0301)	-0.2855*** (0.0297)	-0.2361*** (0.0303)	-0.2855*** (0.0297)	0.0991*** (0.0253)	-0.0184 (0.0263)
Beta values, with Standard Errors in parenthesis *, ** and *** represent 90%, 95% and 99% significance respectively						
Observations	609	609	609	609	609	609
R -squared	0.1879	0.2444	0.1913	0.2444	0.3739	0.3707
Adjusted R -squared	0.1801	0.2369	0.1832	0.2369	0.3368	0.3335
F-statistic	23.88	32.46	23.73	32.46	57.13	56.37

Multiple linear regression models for the dependent variable *Unemployment* and the dependent variables specified. Data from OECD on the years 1995 – 2021. Using both the original datasets and a one-year lag on *Unemployment.* Fixed effects done based on Year and Country.

4. 3. 1. Original Multiple Linear Regression

As seen in Table 3, in the original dataset, there is a statistically significant correlation between the *Unemployment* and the independent variables *Household debt* and *Household savings.* These variables are statistically significant at a 99% significance, with *GDP per capita* at 95% significance and *Household net worth* at a lower 90% significance.

Household debt has a negative correlation with *Unemployment* in this model where every one unit increase in *Household debt* corresponds to a -0.0116% change in *Unemployment.*

The model in total is statistically significant, with an F-value of 23.88 well above the threshold of 1 needed for significance. The R-Squared value of 0.1879 implies these dependent variables in conjunction account for 18.79% of the changes in unemployment rate.

4. 3. 2. Lagged Multiple Linear Regression

For the lagged multiple linear regression in Table 3 there is a statistically significant correlation between the dependent variable *Unemployment* and the independent variables *Household debt*, *Household savings* and *Household net worth* at 99% significance, with *Average wage* and *House costs* being statistically significant at a lower level of 90%.

The difference between the lagged and original data is that in the lagged data all variables except *GDP per capita* shows a statistically significant correlation, whereas in the original data *GDP per capita* is one of four statistically significant variables.

As in the original model, *Unemployment* and *Household debt* is still negatively correlated, even more so as each predicted one-unit increase in *Household debt* here implies a -0.0149% decrease in *Unemployment*. To be compared with -0.0116% in the original model.

The lagged model is also wholistically statistically significant, with an F-value of 32.46 well above the threshold of 1 needed for significance. The R-Squared value of 0.2444 implies these dependent variables in conjunction account for 24.44% of the changes in unemployment rate, again above the 18.44% in the original model.

4. 4. Pooled OLS Model

4. 4. 1. Original Pooled OLS Model

A way to account for time effects is through a pooled OLS-model, as seen in Table 3.
In the original Pooled OLS model, the main studied correlation between *Unemployment* and *Household debt* is negative. The negative correlation is -0.0107, meaning that every one unit increase in *Household debt* should lead to a -0.0107% decrease in *Unemployment*.

A statistically significant correlation with the dependent variable *Unemployment* exists for the independent variables *Household debt*, *Household savings*, *Household net worth* and *GDP per capita* at a 99% significance.

For the original Pooled OLS model, the explanatory value is high as the F-value is 23.73 and the R-squared value is 0.1913.

4. 4. 2. Lagged Pooled OLS Model

As seen in Table 3, for the lagged Pooled OLS model the results are similar to the original Pooled OLS model. The variables displaying statistical significance in relation to the dependent variable *Unemployment* are *Household debt*, *Household net worth*, *Household saving*, *House costs* and *Average wages* at a 99% significance.

As in the original Pooled OLS model, the correlation between *Unemployment* and *Household debt* in the lagged model is negative, to a higher degree than in the original model. Here the correlation is -0.0149, to be compared with -0.0107 in the original model.

For the lagged Pooled OLS-model in general, the R-squared value of 0.2444 and F-statistic of 32.46 are higher than in the original Pooled OLS model, where they are 0.1913 and 23.73 respectively, meaning that the lagged model has a higher explanatory value.

4. 5. Fixed Effects

4. 5. 1. Original Fixed Effects Model

As seen in Table 3, after accounting for the fixed effects based on time (year) and location (country), there is a statistically significant correlation between dependent variable *Unemployment* and the dependent variables *Household debt*, *Household savings*, *Household net worth* and *House costs* at 99% significance, with *GDP per capita* being statistically significant at a lower level of 90% significance.

In comparison to the original multiple linear regression model, the correlation between *Unemployment* and *Household debt* is positive, substantiating the claim made by Donaldson, et. al. (2019). Instead of the previous negative correlation of -0.0116 the original fixed effects

model displays a positive correlation of 0.0606, meaning that each one unit increase in *Household debt* should mean a 0.0606% increase in the unemployment rate. This can be compared to the original Pooled OLS model where the corresponding correlation is a positive one of -0.0107.

The original fixed effects model is also wholistically statistically significant, with an F-value of 57.12 well above the threshold of 1 needed for significance. The R-Squared value of 0.3739 implies these dependent variables in conjunction account for 37.39% of the changes in unemployment rate, to be compared with 18.79% in the original multiple linear regression model and 19.13 % in the original Pooled OLS model.

This means that the original fixed effects model is statistically significant at a higher degree and has a significantly larger explanatory value than the original multiple linear regression model and original Pooled OLS model.

4. 5. 2. Lagged Fixed Effects Model

As seen in Table 3, for the lagged model with fixed effects there is a statistically significant correlation between dependent variable *Unemployment* and the dependent variables *Household debt*, *Household net worth* and *House costs* at a 99% significance, with *GDP per capita* being statistically significant at a lower level of 90% significance.

The correlation between unemployment and household debt in the fixed effects lagged model is positive. Instead of the previous negative correlation of -0.0149 in the lagged multiple linear regression model it is now a positive correlation of 0.0424, meaning that each one unit increase in *Household debt* should mean a 0.0424% increase in the unemployment rate.

The lagged fixed effects model is also wholistically statistically significant, with an F-value of 56.36 well above the threshold of 1 needed for significance. The R-Squared value of 0.37074 implies these dependent variables in conjunction account for 37.074% of the changes *Unemployment*, to be compared with 24.44% in the lagged Pooled OLS model.

As with in the original data, the lagged fixed effects model has the highest statistical significance and explanatory of all lagged regressions done.

4. 6. Multicollinearity

Table 3 VIF values for original and lagged datasets

	Dataset	
Variable	**Original**	**Lagged**
Household debt	1.785221	1.779654
GDP per capita	2.506046	2.526071
Average wage	3.963616	4.008222
House cost	1.223023	1.202172
Household net worth	1.785102	1.778425
Household savings	1.276339	1.275933

VIF values have been calculated on both datasets used in the linear regressions to check for multicollinearity. Data from OECD on the years 1995 – 2021.

The Variance Inflation Factor (VIF) values provided are used to assess multicollinearity in the multiple linear regression model, in other words checking if two or more independent variables are highly correlated, which can lead to unreliable and unstable estimates of the regression coefficients. In this study, we consider VIF values exceeding 10 are indicative of high multicollinearity, while values below 5 are considered acceptable.

As seen in Table 3, the VIF values for all independent variables are below 5, suggesting that multicollinearity is not a significant issue. This means that the independent variables are not highly correlated with each other, and the estimates of the regression coefficients should be more reliable.

For both the original model and the lagged model, no statistically significant correlation can be found when comparing the variables household debt and household savings with each other, meaning these inputs are separate.

5. Discussion

5. 1. Choosing the Right Regression

The main relationship studied is between the unemployment rate and household debt. The correlation between these two variables varies significantly depending on what regression model is used.

Table 4 Multiple linear regressions for Unemployment and Household debt

	Model					
Variable	**Multiple linear regression**		**Fixed effects model**		**Pooled OLS model**	
	Original	Lagged	Original	Lagged	Original	Lagged
Constant	11.8100*** (0.8314)	12.5300*** (0.8392)			11.5490*** (0.8561)	12.5340*** (0,8392)
Household debt	-0.0116*** (0.0032)	-0.0149*** (0.0032)	0.0606*** (0.0048)	0.0424*** (0.0050)	-0.0107*** (0.0032)	-0.0149*** (0.0031)

Multiple linear regression models for the dependent variable *Unemployment* and the independent variable *Household debt*. Data from OECD on the years 1995 – 2021. Using both the original datasets and a one-year lag on *Unemployment*. Fixed effects done based on Year and Country.

Most relevant is the change in direction on the correlations. As seen in Table 4, for all regressions not accounting for time (year) or location (country) effects the correlation is negative, meaning that an increase in household debt levels is expected to decrease the unemployment rate. This goes against the previous research, mainly the theoretical basis put forward by Donaldson et. al. (2019)

Given this, it is of value to look at why the correlations can differ to such a degree, mainly why the fixed effects model leads to a change in direction of the correlation.

This difference could arise due to several factors. When fixed effects are included, the regression accounts for unobserved time-invariant characteristics that could be influencing the relationship between the two variables. There are three factors that can lead to this change, omitted variable bias, confounding factors and within-group or between-group variation.

5. 1. 1. Omitted Variable Bias

In the model without fixed effects, the relationship between *Unemployment* and *Household debt* could be biased due to omitted variables. This is when a relevant variable is left out of a regression model, and this omitted variable is correlated with both the dependent variable and the independent variable.

For instance, let's assume there is a time-invariant variable, such as the political climate, institutional quality, or economic policy in the dataset that affects both *Unemployment* and *Household debt*. If this variable is not included in the model, it could lead to an inaccurate estimate of the relationship between our studied variables. When fixed effects are included, the model accounts for these time-invariant factors, thus potentially reversing the sign of the correlation if the omitted variables were causing a false relationship. Meaning that the fixed effects model should have a higher potency than the original multiple linear regression.

However, the fixed effects model may still suffer from omitted variable bias if there are time-varying unobserved factors that affect both the dependent and independent variables. Thus, time-invariant unobserved factors, those that don't change over time, can be accounted for, but unobserved factors that are time-variant may still bias the outcome.

5. 1. 2. Confounding Factors

Confounding factors are variables that are correlated with both the dependent variable and the independent variable and can affect the observed relationship between them. In the model without fixed effects, the correlation between the *Unemployment* and *Household debt* might be influenced by these confounding factors, which could be what leads to a different relationship than when fixed effects are included.

For example, consider a confounding factor such as the level of economic development that affects both variables. This factor might be negatively correlated with *Unemployment* and positively correlated with *Household debt*. In the multiple linear regression model without fixed effects, the relationship between the two variables could therefore be negatively biased due to this confounding factor. However, when fixed effects are included, the model can control for these confounding factors, and the true relationship between the variables might be revealed

as different from the initial model. In this case, the previously negative correlation becomes positive.

5. 1. 3. Within-Group and Between-Group Variation

The difference in the correlation in the two models could also stem from the way each model handles within-group and between-group variations. The fixed effects model focuses on the within-group variation, which refers to how the variables change within each group (country and year) over time. In contrast, the model without fixed effects considers both within-group and between-group variations.

The relationship between *Unemployment* and *Household debt* might be different when considering within-group variation compared to between-group variation. For example, within a country, a higher unemployment rate might be associated with higher household debt due to some country-specific factors. However, when comparing between countries, this relationship might not hold or could even be reversed due to differences in other factors like culture, regulations, or economic structures.

Fixed effects models rely on within-group variation to estimate the relationship between the variables. As a result, the estimates are specific to the group-level variation and may not generalize to other groups or the overall population. Thus, the generalizability can be limited. However, in this study it is the within-group variation is essential to consider as the variables are compared at a country-level. Thus, given the structure of this study, the correlation given by fixed effects model is preferred.

5. 1. 4. Why fixed effects?

In this type of analysis, it is essential to consider fixed effects because they help account for unobserved time-invariant characteristics that may affect the relationship between the dependent and independent variables (Farkas 2005). Including fixed effects in the model allows for the control of these unobserved factors. This is particularly important where repeated observations are collected over time for the same countries.

By including fixed effects, the focus is put on within-group variation, effectively eliminating the influence of unobserved heterogeneity and providing a more accurate assessment of the causal relationships between the variables. The inclusion of fixed effects in the analysis

strengthens the validity of the results by accounting for potential biases and confounding factors, ultimately leading to more reliable conclusions.

The issues mitigated by the fixed effects model leads to the conclusion that the fixed effects model is the one most likely to be consistent with the real correlation out of all the regressions done in his study. Thus, the correlation between the unemployment rate and household debt is deemed to be positive, as is the case both in the original and lagged fixed effects models.

5. 2. Comparison with previous literature

The relationship between household debt and unemployment is complex, with several potential channels of transmission through which household debt can affect labor market outcomes. By exploring these channels, we can gain a deeper understanding of the mechanisms at play and better comprehend the dynamics of the labor market in the context of household indebtedness and can thus better understand the results presented in this study.

One of the channels through which household debt can impact unemployment is by constraining consumption. When households are heavily indebted, they may be forced to cut back on consumption to meet their debt obligations. This reduction in consumption can lead to a decline in aggregate demand for goods and services, causing firms to scale back production. Consequently, firms may reduce their labor force, leading to increased unemployment. Although this could be a probable cause for the positive correlation, it is not used as a main way of explaining the positive corelation in previous studies. This could be examined further using demand aggregates such as consumer confidence, but that is outside the scope of this study.

Another potential channel is that household debt can also affect unemployment through its impact on human capital investment. According to Kehoe et al. (2019), debt constraints can lead to reduced investment in human capital by households. When households are heavily indebted, they may have limited resources available to invest in education and skills development. As a result, the labor force may become less skilled and less adaptable to changes in the labor market, leading to higher unemployment rates. In this scenario, the negative effect of household debt on human capital investment translates into a higher unemployment rate. To study this implication, one could include a figure for the level of investments in human capital

made by households, or an analogous figure such as the rate of older workers reskilling at university. The willingness to reskill can also be influenced by the political system and cultural norms of the country, which could be the basis for further research.

Another potential channel through which household debt can influence unemployment is by affecting workers' bargaining power. As noted by Bethune et al. (2015), households with high levels of unsecured debt may experience reduced bargaining power in the labor market. Heavily indebted workers may be more willing to accept lower wages or less favorable working conditions to secure employment and meet their debt obligations. This can result in a downward pressure on wages and working conditions, making it more difficult for unemployed individuals to find suitable jobs, thereby increasing the overall unemployment rate.

Negative home equity, as examined by Bernstein (2021), can also play a role in influencing labor supply decisions. Households with negative home equity, where the value of their home is less than the outstanding mortgage balance, may be more likely to increase their labor supply to mitigate the financial strain of their debt. This can include taking on additional jobs, working longer hours, or accepting lower-paying positions. While this can initially help households manage their debt burden, it may also lead to labor market saturation and increased competition for available jobs, further exacerbating the unemployment problem. In the paper, Bernstein et. al. also mentions how a higher debt burden can lead to less willingness to work due to a higher percentage rate of their wages going into servicing said debt. This is a possible causality, but one that can be difficult to measure.

5. 3. Implications

It is worth noting that the impact of household debt on unemployment may be amplified or mitigated by macroeconomic factors and government policies. For example, during periods of economic growth, the negative effects of household debt on unemployment may be less pronounced, as increased demand for goods and services can offset the reduction in consumption caused by indebted households. Conversely, during an economic downturn, the impact of household debt on unemployment may be more severe, as falling demand for goods and services exacerbates the decline in consumption associated with high levels of household debt.

Government policies may also play a role in shaping the relationship between household debt and unemployment. For instance, policies aimed at promoting financial stability and responsible lending practices can help prevent excessive household indebtedness, reducing the potential negative effects on the labor market. Assuming causality, targeting household debt should be a way to mitigate a higher unemployment rate. Meaning that policies such as stricter loan requirements that limit the access to higher risk loans can be strived for in a higher unemployment environment. Additionally, government interventions in the labor market, such as job training programs, unemployment benefits, or reskilling subsidies, can influence the overall unemployment rate.

To bear in mind in the scenario of limiting loan access in search of a lower unemployment rate is the possibility of investment rates going down due to less access to capital. How the access to loans can affect the unemployment rates would be a good starting point for further research, which can then lead to an added conclusion of how government policy can be shaped, given a clearer picture of the net benefit of stricter loan requirements.

Moreover, targeted policies aimed at alleviating household debt burdens, such as debt relief programs, mortgage refinancing options, or income-based repayment plans for student loans, can help households manage their debt more effectively. By reducing the strain of household indebtedness. This can, apart from reducing the unemployment rates, also increase overall consumption leading to positive overall economic effects.

In the case of debt relief, one should also consider the mental factors of alleviating household debt. Although immediately lessening the debt, it may create an expectation of this to happen again in the future, leading to an unwanted increase in the debt levels. Also, if the structural problems causing higher debts are not mitigated, a debt relief program might just be a temporary fix to a more structural and permanent problem. However, mitigating the factors leading to higher debt could be worthwhile as it, according to the results of this study, decreases unemployment. There is evidence in the previous literature supporting debt relief as a measure to mitigate unemployment rates, as Dobbie, Goldsmith-Pinkham and Auclert (2019) studied debt forgiveness during the Great Recession and found that states with more generous bankruptcy policies had a significantly smaller declines in unemployment.

Furthermore, investing in education and skill development programs can help address the human capital investment channel through which household debt impacts unemployment. By providing resources and opportunities for individuals to acquire new skills and enhance their employability, governments and educational institutions can contribute to creating a more resilient and adaptable labor force. In the sense that higher debt levels may decrease willingness to invest in human capital, a targeted policy on this specific issue can have a large impact. Examples of specific policies would be free college education for in-demand occupations or subsidized reskilling programs for older workers.

It is important to also consider the potential heterogeneous effects of household debt on different segments of the population. For example, the impact of household debt on unemployment may be more pronounced among lower-income households or those with lower levels of education. Understanding these differences can help policymakers design more targeted interventions to address the specific needs of vulnerable populations and ensure that the benefits of policy interventions are equitably distributed.

In general, this type of heterogeneity has not been discussed in this study as the country-wide effects have been studied. Adding that analysis could help in forming more a targeted policy and finding the causality that causes the correlation to be true.

In general, our finding of a positive correlation between household debt and unemployment rates highlights the importance of understanding the various channels through which household indebtedness can affect labor market outcomes. The potential mechanisms include consumption reduction, worker bargaining power, human capital investment, and negative home equity. Further studying these mechanisms can increase our understanding of how these two variables affects each other.

Moreover, the interplay between household debt, macroeconomic factors, and government policies highlights the need for a comprehensive and coordinated approach to managing household indebtedness. This may involve efforts to promote financial stability, responsible lending practices, targeted debt relief programs, investments in education and skill development, and labor market interventions aimed at enhancing worker bargaining power and improving overall employment prospects. By adopting such a multifaceted approach,

policymakers can contribute to mitigating the negative consequences of household debt on unemployment and fostering a more resilient and inclusive labor market.

6. Conclusion

In examining the relationship between household debt and unemployment, the findings of this study first suggested a negative correlation between *Unemployment* and *Household debt*, but after controlling for fixed effects, the correlation was found to be positive. This result aligns with existing literature, reinforcing the prevailing theory underlined by Donaldson, Piacentino, and Thakor (2019) that higher levels of household debt contribute to increased unemployment rates.

The study does not include an analysis on the further causality of this correlation, but shows some possible explanations prevalent in previous literature, including consumption reduction due to high debt obligations, decreased investment in human capital and diminished workers' bargaining power. Each of these channels is a potential pathway through which household debt can affect labor market outcomes, and they can collectively underscore the multi-dimensional impact of household debt on unemployment rates.

In sum, the conclusions drawn from this research enhance our understanding of the correlation between household debt and unemployment by providing a real-world observed relationship to a previously theoretical model. The study's findings corroborate existing literature by demonstrating the positive correlation between these two variables when accounting for fixed effects. However, the causality can be studied further and points to the need for future research to disaggregate and explore the possible explanations for this correlation in greater depth. By doing so, we can better comprehend the dynamics of the labor market in the context of household indebtedness and thereby generate insights that can inform more effective policy interventions.

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Appendix 1: Countries used in Datasets

Australia
Austria
Belgium
Canada
Chile
Colombia
Czech Republic
Denmark
Estonia
Finland
France
Germany
Great Britain
Greece
Hungary
Ireland
Italy
Japan
Latvia
Lithuania
Luxembourg
Mexico
The Netherlands
New Zealand
Norway
Poland
Portugal
Slovakia
Slovenia
South Korea
Spain
Switzerland
Sweden
United States