

Czech University of Life Sciences Prague

Faculty of Economics and Management

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Diploma Thesis

**U.S. Federal Student Loan Policies Effect on Economic
Growth**

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

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Economics and Management

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Thesis title

U.S. Federal Student Loan Policies effect on Economic Growth

Objectives of thesis

Student loans in the USA is one of the highest consumer debts with over a trillion dollar deficit. Many policy makers are discussing how to appease and make changes to the current state of federal student loans in the USA. The main aim of this research will be to analyze and explain how factors of federal student loans effect economic situation. To explore and be familiar with current federal student loan policies with proposed federal student loans to be able to determine the strengths and weaknesses. These are the partial aims:

1. To describe the effect of student loans on GDP
2. What is the relationship between student loan debt and economic growth
3. To describe educational policy and why it is important to economic growth.
4. To know the different student loan policies proposed and their economic outcomes.
5. To look at the effectiveness of the current student loan policy in comparison to different possible solutions using statistical and theoretical findings.

Methodology

The thesis will be divided into three parts.

The first part is a theoretical one and is based on literature search. It defines the current state of knowledge in the field of students loans. In this part, articles, books, researches and different electronic resources will be used to provide information. Methodologically, this part of the thesis will be the analysis of documents.

The second part will rely on the theoretical part and it is the key component of the thesis. An econometric analysis will be created by using secondary data to create an one-model econometric analysis to show the relationship between federal student loans on GDP.

Using the findings from the econometric model will be used with theoretical framework to be able to compare current student loan policies proposed and discussed in the latest political campaigns.

The proposed extent of the thesis

60 – 80 pages

Keywords

USA, Federal Student Loans, GDP, Education, Consumer Debt

Recommended information sources

BAUM, S., MA, J., PENDER, M., and LIBASSI, C.J. (2019). Trends in Student Aid 2019. CollegeBoard, 01469–066, 36.

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Voon, Jensine, "An Analysis on the Growth of Student Loans and its Implications on the U.S. Economy" (2016). Honors Theses. 2780.

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Declaration

I declare that I have worked on my diploma thesis titled "U.S. Federal Student Loan Policies Effect on Economic Growth" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break any copyrights.

In Prague on 30. 3. 2021

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U.S. Federal Student Loan Policies Effect on Economic Growth

Abstract

The purpose of this research is to be able to determine the relationship between U.S. federal student loans and economic growth through higher education policies and what policy is the best economically. This is done through an econometric model using GDP as the dependent variable and average tuition and fees, default rates, interest rates, total federal student loans and consumer price index as the independent variables. Raw data was taken for the time series of 1989-2019 and the sample population is for full time undergraduate students. This validation of the model was used to be able to do a comparative analysis of several policies recently proposed to be able to determine which federal student loan policy is the best for economic growth. From this research, it is concluded that the best student loan policy is to include cancellation or forgiveness of student loans along with making education more affordable and student aid more streamlined for consumers to bring about the best human capital to help boost the economy.

Keywords: Federal Student Loans, United States of America, Higher Education Policy, Economic Growth, Education, GDP, Debt, Default

Dopad federální politiky studentských půjček na ekonomický růst

Abstrakt

Účelem tohoto výzkumu je být schopen určit vztah mezi federálními studentskými půjčkami v USA a ekonomickým růstem prostřednictvím politik vysokoškolského vzdělávání a toho, která politika je ekonomicky nejlepší. To se děje prostřednictvím ekonometrického modelu využívajícího HDP jako závislou proměnnou a průměrné školné a poplatky, výchozí sazby, úrokové sazby, celkové federální studentské půjčky a index spotřebitelských cen jako nezávislé proměnné. Byla zpracována hrubá data pro časové řady 1989–2019 a vzorek populace je určen pro vysokoškolské studenty na plný úvazek. Toto ověření modelu bylo použito, aby bylo možné provést srovnávací analýzu několika nedávno navržených politik, aby bylo možné určit, která federální politika půjček studentů je nejlepší pro ekonomický růst. Z tohoto výzkumu vyplývá, že nejlepší politikou studentských půjček je zahrnout zrušení nebo odpuštění studentských půjček spolu s cenově dostupnějším vzděláváním a efektivnější studentskou pomocí pro spotřebitele s cílem získat nejlepší lidský kapitál, který pomůže podpořit ekonomiku.

Klíčová slova: Federální studentské půjčky, Spojené státy americké, politika vysokoškolského vzdělávání, ekonomický růst, vzdělávání, HDP, dluh, default

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1 Introduction

Federal student loans has become the topic of conversation in the U.S. as the deficits continue to grow, and there were many plans discussed during the 2020 Presidential election. Many politicians, government entities, and NGOs prepare for the possible shifts in policies. With the current student loan crisis and economic impact of COVID-19 pandemic, it will be imperative to explore how the United States will decide on new policies or reforms to help accommodate student consumers and how the student loan crisis will be addressed. With the new record high of \$1.6 trillion in consumer federal student loan debt, it has surpassed credit card debt as the highest consumer debt in the US. liberal candidates in the 2020 election have pitched different forms of student loan forgiveness and alternative reliefs for student borrowers. It is unknown what the future policies will be and how they will affect the US economy. This research will dive into the overall impact of these different policies for federally backed student loan forgiveness and reforms to know the most optimal option for the USA economy and student consumers.

With knowing this is currently happening in the economy, it is interesting to know how student loans effects economic growth, the foundational theories behind some of the policy making, and the outcomes for borrowers. Previous research has been done to show how policies will be in the future and how student loans programs can continue to develop. With the rising costs of higher education, default rates, and the growing national student loan deficit it is important to know how these factors influence the economy and how these factors are taken into consideration during policy proposals. This will be the basis of this research. An econometric analysis of student loans on GDP will be assessed and used to do a policy analysis of the SIMPLE and PROSPER Act, Student Loan Debt Relief Act, and “Get on Your Feet” Bill recently proposed to be able to get a better understanding of why student loan policy is important and its economic implications.

2 Objectives and Methodology

2.1 Objectives

The aims of this research will be to analyse and explain how factors of federal student loans effect economic growth. To explore and be familiar with current federal student loan policies with proposed federal student loans to be able to determine the strengths and weaknesses.

A few different policies, including current policies, will be assessed, and examining the effects on borrowers and the federal government Department of Education. It is my belief that policies around federal student loan forgiveness and cancellation will have a better outcome on GDP and the federal student loan debt crisis as seen through the relationship of federal loans on GDP. This is the focus of what is hoped for in the results of the applied methodology.

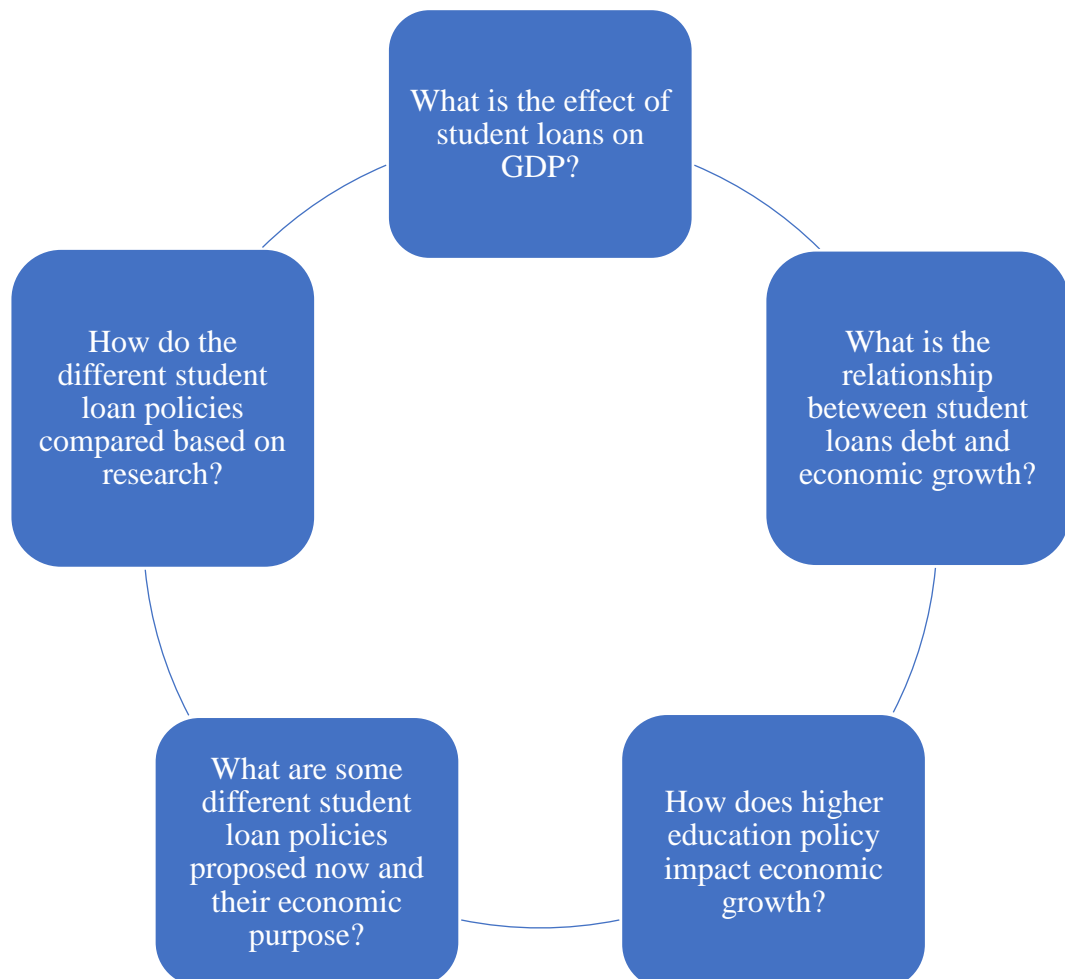
The contents of this thesis will first introduce the current economic issue around student loans in the United States, a literature review of past research around the topic, an econometric model to determine the effects of federal student loans on GDP, and a policy analysis to justify the best possibility as solution for this phenomenon.

2.2 Methodology

The diploma thesis can be divided into four parts. The first part is theoretical one and includes literature review that is based on analysis of documents. The second part represents author's own research through econometric analysis, the third is a policy analysis, and the last part concludes all findings.

The thesis will cover raw data from period 1989-2019. It will be used because of the time series of data available. This period covers multiple reauthorizations of the Higher Education Act.

The applied methodology will help to answer the following research questions:



A review of literature will include a survey of literature about U.S. Federal Student Loan policies and programs, Higher Education theories in policies, and basic knowledge about the federal student loan system.

An econometric analysis will be created by using secondary data to create a multiple regression analysis to show the relationship between federal student loans on GDP. Using data that will represent traditional full-time public 4-year university and college undergraduate students. Variables includes default rates, interest rates and costs of attendance, total undergraduate student loans, and consumer price index. Secondary data will used from agencies like Department of Education, National Center for Education Statistics, Congressional Budget Office, and CollegeBoard.

Some data is excluded for parts of the period, because of the data sources availability of raw data. There will be included the time periods and research information regarding data for each variable in the methodology. Gretl software and excel were used to create and test the model using the data found from the secondary sources. More information about the strength and validity of the data will be included in the results.

The Gauss-Markov theorem will be used to verify the parameters of the model.

Linear Model

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

Then to further the analysis, a critical evaluation of the chosen student loan policies will be completed using knowledge from the literature review and the regression analysis. The policy analysis will determine how and if the policies address the variables from the model and what type of theoretical approach from literature. The most optimal choice will be determined and lastly the conclusions will be drawn.

3 Literature Review

3.1 U.S. Federal Student Loans and Higher Education Policy Defined

Federal student loans are loans given and backed by the government to help aid in the cost of higher education. These loans are different than private loans that comes from banks and other financial institutions. The money you borrow must be paid back at a fixed interest rate. In the US, the Department of Education (ED) is the lender of the loan, which lenders pay back through loan servicing companies, such as Navient or Nelnet. There are different types of loans for different types of borrowers. For example, need-based loans, loans for parents, and loans for graduate students are available.

Higher education policy can be defined as the governmental policies created to regulate, organize, and fund postsecondary education institutions. Educational policies are aligned to values in the society in which they serve. There are four main actors to student aid policy in the US: the federal government, state governments, educational institutions, and the students. On the Department of Education official website, they cover their role for education. Established in the 1860s, the ED now is a federal agency that missions is to improve education system and provide access. It expresses how education is a state and local level initiative, with a general federal support. There are different theoretical approaches to education policy creation such as, managerial, welfarism, and pluralistic.

The managerial approach to policy uses a socio-political scope to focus on leadership within educational institutions as what drives solution to organizational problems (Thrupp and Willmont, 2003). This approach came about with the shift to marketization of education that pushes the focus on the performance and productivity of education institutional managers (LeGrand, 1990). This is different from the welfarism approach that have the focus on the policy outcomes on the people impacted through governmental assistance. It focuses on making policies that will have positive economic outcomes for the people, so it is seen as an investment in human capital. This approach can be problematic in times where there is economic crisis but pushes for educational investments also increases for the push of productivity in the labour market. A pluralist view can be said to combine both the managerial and welfarism approach, using government to manage the different societal interests (Bell and Stevenson, 2006).

It can be said that the approach to educational policy shapes the framework to the outcome of the goals and objectives to be able to improve the system. Perna in 2019 describes federal student loan policy as one that „should be to encourage students to enrol and complete a high-quality educational program by enabling students to obtain the financial resources needed to pay college costs, without producing too great a loan repayment burden “. (Perna, 2019)

3.2 Higher Education Policy in the U.S.

3.2.1 Structure and Actors

It is important to know the people that influence and are influenced by higher education policy in the US. There are a few main agents and actors involved from a national to individual level. First, there is the **Federal Government**, which houses its higher education policies under the **Federal Department of Education (ED)**. The role of the ED is to help fund higher education, protect student and educational civil rights, and contribute to research and development. More governmental support and decision making is done on a **State level**.

It is different for each state on the institutional legislations and policies, academic improvements, and allocation of the federal and state funding for education. Each state board and legislators oversee its own universities and postsecondary education institutions. Each institution has its own rules and policies that follow federal and state regulations. These are the rules and policies set out for students and staff of the institution (Hems et al, 2019). On an individual level are students, parents, and taxpayers. Students then enrol in higher education programs, in which 86% of first-time, full-time degree/certificate-seeking undergraduate students take out federal aid on average as of 2018 (National Center for Education Statistics, 2020). This aid that comes from the ED is from tax dollars and governmental expenditures.

3.2.2 History of Higher Education Policy

The history of higher education policy was done in research by Gladieux in 1995 and Fuller in 2014. The start of the United States federal involvement in providing aid to students was in 1862 and 1890 with the **Morrill Acts**. This legislation helped to build more educational institutions during this time where sectors of agriculture and technology needed

more growth. Moving forward to more modern times, in 1944 the **Serviceman Readjustment Act**, also known as the **GI Bill**, gave federal assistance to veterans after serving in World War I and II. Just as with the Morrill Acts, the GI Bill used education as a socio-political tool to advance technology in the country along with the idea of federal scholarship based on merit or need. This trend in boosting the idea of utilizing education for the advancement of national need continued with the 1958 **National Defence Education Act**. After Soviet launch of Sputnik in 1957, graduate fellowships were made available for students focusing on sciences, math, engineering, and other related fields. This act gave low interest loans for college student which included loan cancellation for students who were to become teachers.

The next pivotal wave of legislation providing student aid was in 1965 with the **Higher Education Act (HEA)**. A major component of the HEA was Title IV that was the first federal law that was commitment to making more fair opportunities for students in need through need-tested grants and access to education, like Talent Search and the Educational Opportunity Grants Programs. These grants were offered to colleges to give this aid to students. Title IV also introduce the College Work-Study Program to give employment to students in need. In addition, the Guaranteed Student Loan (GSL) to reduce the pressure of education costs of the middle-class students and families and providing a tax credit for it.

The loan program was expected to be a cost efficient for the government to provide aid without relying heavily on the Federal Treasury. Reauthorization of the HEA continued over the next few decades, and in 1968 the Trio program was started to bring together three different initiatives, Special Services for Disadvantaged Students, Upward Bound, and Talent Search, to be able to further educational opportunities. The 1972 reauthorization set precedent to give aid directly to students with the intention to provide more opportunities to more students of different backgrounds. The new edition to the act also included new terminology from “postsecondary education” to “higher education” to create more inclusivity to those who choose other educational programs outside of 4-year university.

During this time, the Nixon Administration proposed **Basic Educational Opportunity Grants** to replace three of the student aids programs: EOG, NDSL, and Work-Study. Congress did not pass this proposal but crated the Basic Grants Program (now known as Pell Grants) to set foundation for students to apply directly from the federal government. It first

initiated a maximum of \$1,400 to help students aid costs and campus-based programs (e.g., TRIO) would provide supplemental aid. State Student Incentive Grants to match federal thrusts to add to the grant programs and needs of the students. The Student Loan Marketing Association, best known as Sallie Mae, is publicly chartered private corporation that started as a government student loan servicing entity to increase capital available in the GSL Program. This created a pushed for federal incentives towards states establishing loan guaranteed agencies by 1976. Congress then two years later passed the **Middle-Income Student Assistance Act (MISAA)** that gave an opportunity for a basic grant based on parental income to help with the perceived ‘middle-income squeeze’. But to help with broadening eligibility of student receiving aid, democrats and the Carter administration had a counterproposal to open subsidized loans to any students regardless of income or financial need. By 1979, Congress amended the HEA to give banks fair and providential rate of return on guaranteed student loans by backing them with Treasury Bill rates.

The following year supplemental borrowing for parents of dependent students and independent student was introduced. With the start of the **Reagan administration**, conservative leaning thrusts of budgetary cuts to social programs were faced and governmental loan eligibility and student financial support were trimmed. There was push back of this change up to 1986, but no changes were made, and federal borrowing ceilings were increased that create a reliance on loans. This changed what was once grant reliant funding to loan based funding. It was through 1987-1990 that Congress made changes help reduce defaults and other negative effects of the loan volume surge that occurred after the reauthorization in 1986.

After Clinton became president in 1990, his administration attempted to tackle the increasing student loan debt after the policies made in the Reagan presidency. **Clinton directed tax relief credit** for tuition payments, direct lending programs, AmeriCorps serving organizations, and program-based funding like Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR-UP) and Hope Scholarship Tax Credit. At this time, the government’s aims were to reduce the dependence of federal loans for students and switch back to more grant-based funding, however this was failed attempts because of the prosperity in the economy after the Cold War it was a risk of creating inflation influx. Instead of having the entitled Pell Grant Program expand, the ceilings for federal student loan borrowing increased which included the roll out of the Parent Loan (PLUS) program.

This program established in 1992 allowed parents to borrow on behalf of the student at an uncapped amount but up to the total cost of attendance minus the other financial aid the student receives. This new legislation also included unsubsidized loans that was not need-based, or income based to fight the middle-income squeeze.

To streamline the multiple programs, loan consolidation options were made available to borrowers and the creation of the **Free Application for Federal Student AID** (commonly known as FAFSA). To streamline the multiple programs, loan consolidation options were made available to borrowers and the creation of the Free Application for Federal Student AID (commonly known as FAFSA). Congress also decided to attempt to give loans through Department of Education rather than by the guaranteed loans through private banks through the Omnibus Budget Reconciliation Act of 1993. However, it was not completely executed until 2010 during the Obama administration. Nowadays, there are only two types of student loans: Department of Education federal loans and loans through private lenders. (Gladieux, 1995.; Fuller, 2014.,)

3.2.3 Higher Education Policy and Economic Growth

Higher education policies have two faces or approaches to national economic growth through human capital and neoliberalism ideologies. Higher education policies help foster economic growth through providing more skilled and knowledgeable human capital to give back to sectors by providing innovation and technological advancement. On the other hand, there are many studies that show strong evidence of the shift to neoliberal approach to higher education policies in the US through market-oriented focus and little governmental interference in the economy (Saunders, 2010). An understanding of these theories implicated in policy will further the understanding the economic outcomes and their relationship.

Human capital theory is best described by an economist who helped shape the ideology, Theodore Schultz:

“Although it is obvious that people acquire useful skills and knowledge, it is not obvious that these skills and knowledge are a form of capital, that this capital is in substantial part a product of deliberate investment, that it has grown in Western societies at a much faster rate than conventional (nonhuman) capital, and that its growth may well be the most distinctive feature of the economic system. It has been widely observed that increases in national output

have been large compared with the increases of land, man-hours, and physical reproducible capital. Investment in human capital is probably the major explanation for this difference “(Schultz, 1961).

This theory is adapted in education policy to promote decreasing in poverty and stimulate economic growth, as seen on the War on Poverty. This event help to shift the federal government’s responsibility to be an investor into higher education as an economical agenda (Holden & Biddle, 2017).

Conversely, the **neoliberalism approach** to education policy focuses on market-oriented and laissez-faire federal government intervention to the economic implications of the policy enacted. It focuses on the multilevel implications of socioeconomic ideas and policies in higher education. With waves of state and federal cuts to higher education, the capitalization of higher education spread the responsibility of investing and funding to all actors, from the government, institutions, and students. This supports the idea that neoliberalism is not simply about the capitalist-driven reconstruction the education market, but the idea is also about the how influence and conversation over higher education that happens on each level. This shift in ideology was seen through the Bayh-Dole and National Cooperative Research through privatization of federal funded research done at universities and special anti-trust regulations to protect this switch to making the higher education institutions more profit-focused. Neoliberalism privatising and marketization can be tied to the increases in tuition costs for students, making them another major investor into higher education. (Saunders, 2010; Macrine, 2016).

The **relationship between government expenditures on higher education and economic growth** should be in examined based on the foundations of human capital theory. Yakita did a study on the effects of government educational subsidies on economic growth. The study used multiple generations to show human-capital accumulation, and it founded that increases in government subsidies to private-education debt can have a negative effect on future generations and on economic growth. The study founded that there was no significant Pareto effect improvement with subsidy policy. (Yakita, 2004) This study shows that there can be issues if there is too many colleges educated labours in the market that can lead to overemployment and underemployment. Government subsidies to higher education

is not necessarily optimal for long-term economic growth, however, did conclude that time-dependent subsidies could be beneficial under the best policy.

Human capital and neoliberalism have synergy in the capitalistic approach to higher education policies in the US, but they have some differences. Human capital theory raises the role of responsibility to increase economic growth on a macroeconomic on the federal government, through supplying aid and funding for higher education. However, neoliberalism approach emphasizes on investment in education to be profited and the responsibility to fund education should be spread out through all actors in education. These policies are demonstrated in the current federal student aid programs. Grants, scholarships, and other forms of aid to students and institutions is the government's investment in human capital. However, the rising cost of attendance and federal student loans and other aid spreads the responsibility to states, institutions, and students to cover the rest of costs, but can have social and economic benefits in being able to control increase future incomes and value-added. It is important to policymaking to be able to know when to implement both ideologies to create optimal economic growth for the government and the public. These ideologies set the foundation of education policies for the two different socio-political orientations and how policymakers come up with the framework for these proposals in student loan policy.

3.2.4 Value and Demand for Higher Education

It is important to note the role of value of higher education in evaluating how effective policies will be for students. Higher education has been a driver for development towards creating a knowledge-based economy. Some sectors, however, have an overload of educated graduates where the demand is no longer as heavy as other sectors. Johnstone and Marcucci questions if the burden of the cost of education should rely on governments and taxes or on students and parents. This need for educated workers in the labour force not only gives benefits to the individual, but also to the society they serve through innovation, technology, and increases to productivity. Marginson in 2016 found that there is a positive trend in higher participation of higher education worldwide. It is described a universal desire for social betterment in pursuing higher education, however there are limitations to how much can be beneficial to each person using education to thrust themselves into better socioeconomic statuses. (Johnstone and Marcucci, 2010; Marginson, 2016)

Building on this concept, in USA culture there is this perceived social status of pursuing and obtaining higher education and that the individual would have a better chance of having higher earning potential, jobs opportunities, and better quality of life. Tomlinson (2017) did a critical analysis on the value of education in terms of its marketization. It concludes that higher education must be marketized to promote a “greater good’ ideology and personal investment in the labour market through the principle of commensuration. These findings match those of Psacharopoulos and Patrinos (2018) that discuss the concept of rate of return on educational investment and describes it as the value of lifetime earnings of the individual to the net present value of costs of education. (Tomlinson, 2017; Psacharopoulos and Patrinos, 2018)

Figure 1 How America Values College



Source: College Parent of America, 2018

Holden and Biddle (2017) performed a review of why the concept of human capital influenced education policy. They expanded on two ideas, with one being that human capital in education could help to reduced poverty and bring higher economic growth and the other being the influence and power that comes with the perceived national economic strength and global competitiveness. This research also points out how the government assumed its role of responsibility to funding educational policies that would yield for the betterment of individuals using a welfarism approach to the overall economic growth after establishing the War on Poverty. (Holden and Biddle, 2017)

3.3 Federal Student Loans in the U.S.

3.3.1 Federal Student Aid and Free Application for Federal Student Aid

The Department of Education official website for Federal Student Aid (FSA) is where students find information about federal aid, Free Application for Federal Student Aid (FAFSA) application, and all information about federal aid programs. The site outlines the follow as the types of federal aid currently offered: Grants that include Pell Grants, Federal Supplemental Educational Opportunity Grants (FSEOG), Teacher Education Assistance for College and Higher Education (TEACH) Grants, and Iraq and Afghanistan Service Grants. Scholarships that come from private or third-party sources. Work-Study Jobs allows students to earn money to pay for school.

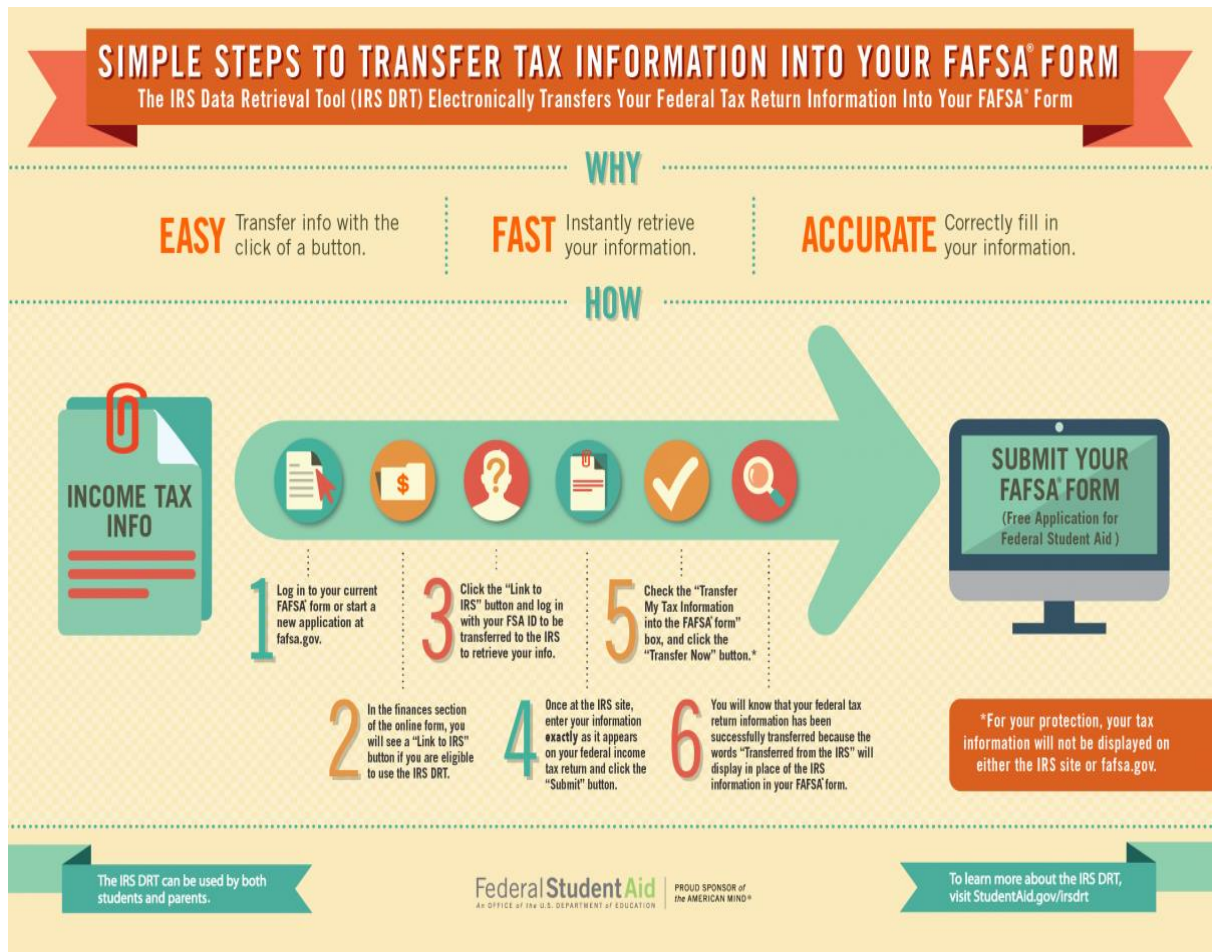
Figure 2 Federal Student Aid Programs

Program	Program Information	Annual Award Amount (subject to change)
Federal Pell Grant	For undergraduates with financial need who have not earned bachelor's or professional degrees. For details and updates, visit StudentAid.gov/pell-grant .	Amounts can change annually. For the 2020–21 award year, the award amount is up to \$6,345.
Federal Supplemental Educational Opportunity Grant (FSEOG)	For undergraduates with exceptional financial need; Federal Pell Grant recipients take priority; funds depend on availability at school. For details and updates, visit StudentAid.gov/fseog .	Up to \$4,000.
Teacher Education Assistance for College and Higher Education (TEACH) Grant	For undergraduate, postbaccalaureate, and graduate students who are completing or plan to complete course work needed to begin a career in teaching. To receive a TEACH Grant, a student must agree to teach for four years in a high-need field at an elementary school, secondary school, or educational service agency that serves low-income families. If a student doesn't complete the teaching service requirement, all TEACH Grants the student received will be converted to a Direct Unsubsidized Loan that must be repaid, with interest. For details and updates, visit StudentAid.gov/teach .	Up to \$4,000.
Iraq and Afghanistan Service Grant	For undergraduate students who are not Pell-eligible and whose parent or guardian died as a result of military service in Iraq or Afghanistan after the events of 9/11. For details and updates, visit StudentAid.gov/iraq-afghanistan .	The grant award can be equal to the maximum Federal Pell Grant amount (see above) but cannot exceed your cost of attending school.
Federal Work-Study	For undergraduate and graduate students; part-time jobs can be on campus or off campus. Money is earned while attending school. Our total work-study award depends on when you apply, your level or financial need, and your school's funding level. For details and updates, visit StudentAid.gov/workstudy .	No annual minimum or maximum amounts
Direct Subsidized Loan	For undergraduate students who have financial need; U.S. Department of Education generally pays interest while the student is in school and during certain other periods; a student must be enrolled at least half-time. Interest rates for new Direct Subsidized Loans can change every year. Loans made to undergraduate students during the 2020–21 award year have a fixed interest rate of at 2.75% for the life of the loan. For details and updates, visit StudentAid.gov/sub-unsib .	Up to \$5,500 depending on grade level.
Direct Unsubsidized Loan	For undergraduate and graduate or professional students; the borrower is responsible for interest during all periods; a student must be enrolled at least half-time; financial need is not required. Interest rates for new Direct Unsubsidized Loans can change every year. Loans made to undergraduate students during the 2020–21 award year have a fixed interest rate of 2.75% for the life of the loan. Loans made to graduate or professional students during the 2020–21 award year have the rate fixed at 4.30% for the life of the loan. For details and updates, visit StudentAid.gov/sub-unsib .	Up to \$20,500 (less any subsidized amounts received for same period), depending on grade level and dependency status.
Direct PLUS Loan	For parents of dependent undergraduate students and for graduate or professional students; the borrower is responsible for interest during all periods; a student must be enrolled at least half-time; financial need is not required; the borrower must not have an adverse credit history. Interest rates for new Direct PLUS Loans can change every year. Loans made during the 2020–21 award year have a fixed interest rate of at 5.30% for the life of the loan. For details and updates, visit StudentAid.gov/plus .	Maximum amount is the cost of attendance minus any other financial aid received.

Source: Federal Student Aid, 2020

Students can apply directly through the Federal Student Aid website, which gives the process and the lists the information needed. Students can use their income and their dependents income to be able to calculate financial need. The application is made available every October for students to be able to apply for aid for the following school year.

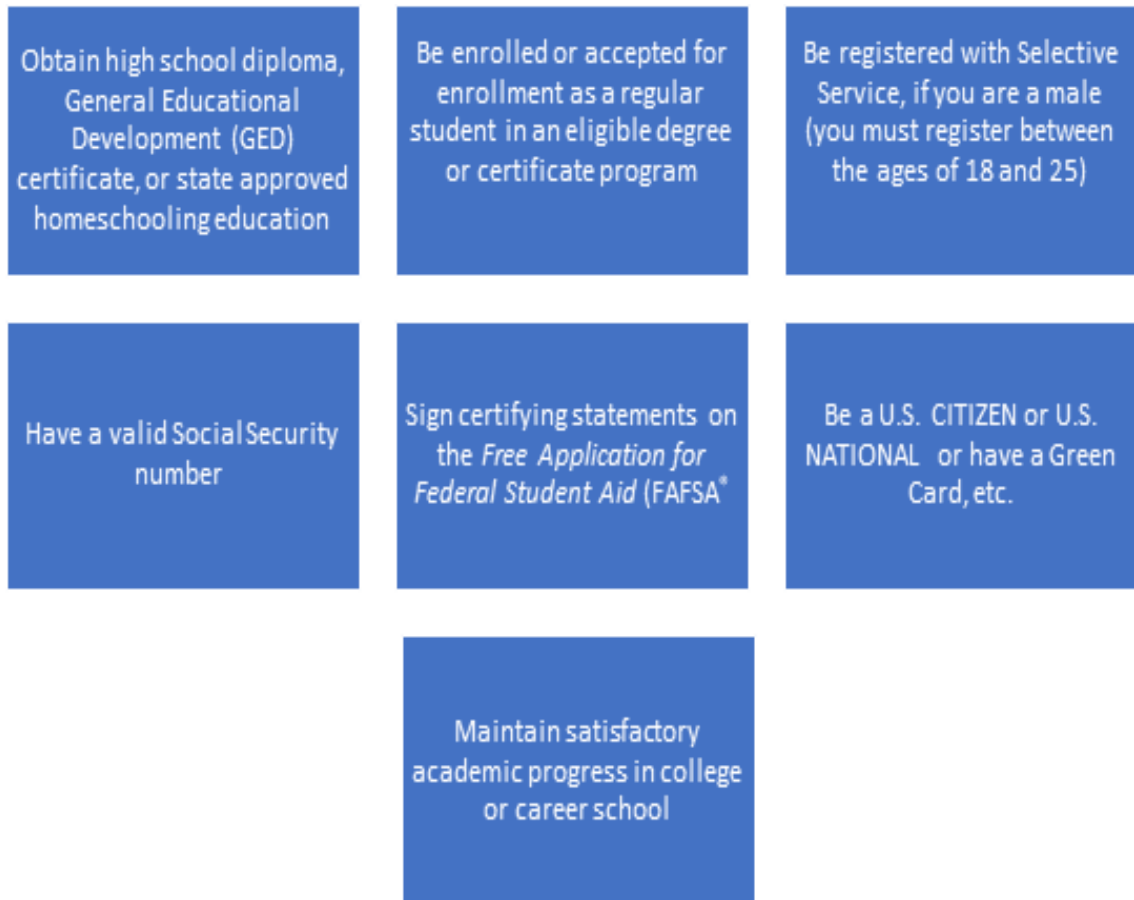
Figure 3 Simple Steps To Transfer Tax Information Into Your FAFSA Form



Source: U.S. Department of Education, (2016)

It is important to note how students can apply for aid the process of the application. The application is available online to fill out. The application will ask for all demographic and income information through the creation of the FSA ID on the website which is used to log in and create an account. A Student Aid Report (SAR) is generated to calculate the Estimated Family Contribution (EFC) that shows aid eligibility. Once the student accepts the aid package, they will sign the Master Promissory Note (MPN): a legal document in which you promise to repay your loan(s) and any accrued interest and fees to the U.S. Department of Education. Challenges to the transparency of the FAFSA application, EFC, and the effectiveness of the financial aid given on the cost of education have been shown through the need for new methods of making the FAFSA application more simplified, this could help with student's knowledge of their eligibility for aid and student financial planning to pay for higher education. In Figure 4, are the eligibility for filling a FAFSA application. (Scott-Clayton, 2017)

Figure 4 FAFSA Eligibility



Source: Author's own creation based on information from Student Financial Aid, 2020

3.3.2 Federal Student Loan Program

The U.S. Department of Education's federal student loan program is the William D. Ford Federal Direct Loan (Direct Loan) Program. Under this program, the U.S. Department of Education is your lender. There are four types of Direct Loans available:

- Direct Subsidized Loans are loans made to eligible undergraduate students who demonstrate financial need to help cover the costs of higher education at a college or career school. These loans are subsidized by the government paying the costs of interest while you are enrolled in school.
- Direct Unsubsidized Loans are loans made to eligible undergraduate, graduate, and professional students, but eligibility is not based on financial need. These loans accrue interest over the whole life of the loan.
- Direct PLUS Loans are loans made to graduate or professional students and parents of dependent undergraduate students to help pay for education expenses not covered

by other financial aid. Eligibility is not based on financial need, but a credit check is required. Borrowers who have an adverse credit history must meet additional requirements to qualify.

- Direct Consolidation Loans allow you to combine all your eligible federal student loans into a single loan with a single loan servicer.
- The Federal Perkins Loan Program provided money for college or career school for students with financial need.
- Also, additional types of aid like Aid for Military Families, Aid for International Study, and Aid and Other Resources from the Federal Government.

(Federal Student Aid, 2020)

More data is available to show how many students take out these types of student loan aid in the latest annual report by the College Board, data was used to find the trends in Student Aid and their data found:

- “In 2018-19, undergraduate students received an average of \$15,210 per FTE student in financial aid: \$9,520 in grants, \$4,410 in federal loans, \$1,210 in education tax credits, and \$70 in Federal Work-Study (FWS).”
- “In 2018-19, 33% of federal aid was based on students’ financial circumstances—a decline from 91% in 1988-89 and 58% in 1998-99. The introduction of unsubsidized student loans and education tax credits, followed by PLUS loans for parents and graduate students and the Post-9/11 GI Bill, outweighed increases in Pell Grants and smaller need-based programs.”
- “Pell Grant expenditures rose from \$21.0 billion (in 2018 dollars) in 2008-09 to \$41.2 billion in 2010-11 but declined to \$28.2 billion by 2018-19.”
- “As of March 2019, 55% of borrowers with outstanding education debt owed less than \$20,000; 43% of the outstanding federal education loan debt was held by the 10% of borrowers owing \$80,000 or more.”

(Baum et al., 2019)

3.3.3 Repayment Plans

In addition, the Federal Student Aid website online the different repayment plans under the Federal Family Education Loan (FFEL) Program: Standard Repayment Plan, Graduated Repayment Plan, Extended Repayment, Revised Pay As You Earn Repayment Plan (REPAYE), Income Based Repayment Plan (IBR), Income-Contingent Repayment Plan (ICR), and Income-Sensitive Repayment. (Federal Student Aid, 2020)

Figure 5 Federal Student Loan Repayment Plans

	PAYE (PAY AS YOU EARN)	IBR INCOME-BASED REPAYMENT		ICR INCOME-CONTINGENT REPAYMENT
		New borrowers* on or after July 1, 2014	NOT new borrowers* on or after July 1, 2014	
WHO QUALIFIES?	Eligibility depends on when you received your loans and your debt-to-income ratio	Eligibility depends on when you received your loans and your debt-to-income ratio	Eligibility depends on your debt-to-income ratio	No initial income eligibility requirement
PAYMENTS GENERALLY EQUAL TO:	10% of your discretionary income**	10% of your discretionary income**	15% of your discretionary income**	20% of your discretionary income or a payment based on loan debt and income, whichever is less
FORGIVES ANY REMAINING BALANCE AFTER:	20 Years of qualifying repayment	20 Years of qualifying repayment	25 Years of qualifying repayment	25 Years of qualifying repayment

* You are considered a new borrower if you have no outstanding balance on Direct Loan or Federal Family Education Loan (FFEL) program loan when you receive a Direct Loan or FFEL Program loan on or after the specified date.
 ** Payments will never be more than the 10-year Standard Repayment Plan amount.

Federal Student Aid | PROUD SPONSOR of the AMERICAN MIND®
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Source: Federal Student Aid, 2020

The Federal Student Aid website also includes a loan repayment calculator, so that borrowers can understand the different payment plans for their individual loan account. Another point of transparency for borrowers to be able to calculate their debt and repayments.

Figure 6 Repayment Calculator

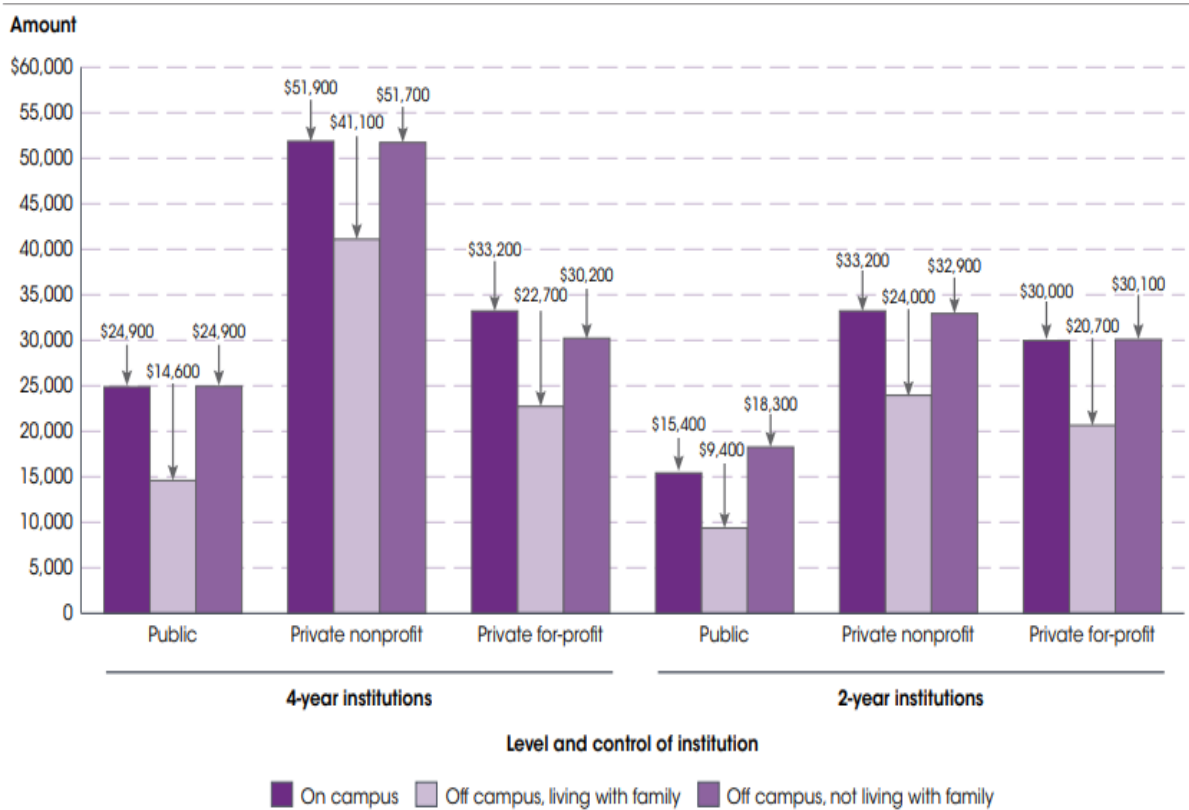


Source: Federal Student Aid, 2020

3.3.4 Tuition Fees and Expenses

It is no secret the increasing cost of education in USA. The Department of Education defines the cost of attendance (COA), as “the estimate of tuition and fees, cost of room and board (or living expenses), cost of books, supplies, transportation, loan fees, and miscellaneous expenses “(Figure 7). A lot of research is taken of the trends in the rising cost of higher education.

Figure 7 Average total cost of attending degree-granting institutions for first-time, full-time undergraduate students, by level and control of institution and student living arrangement: Academic year 2018–19

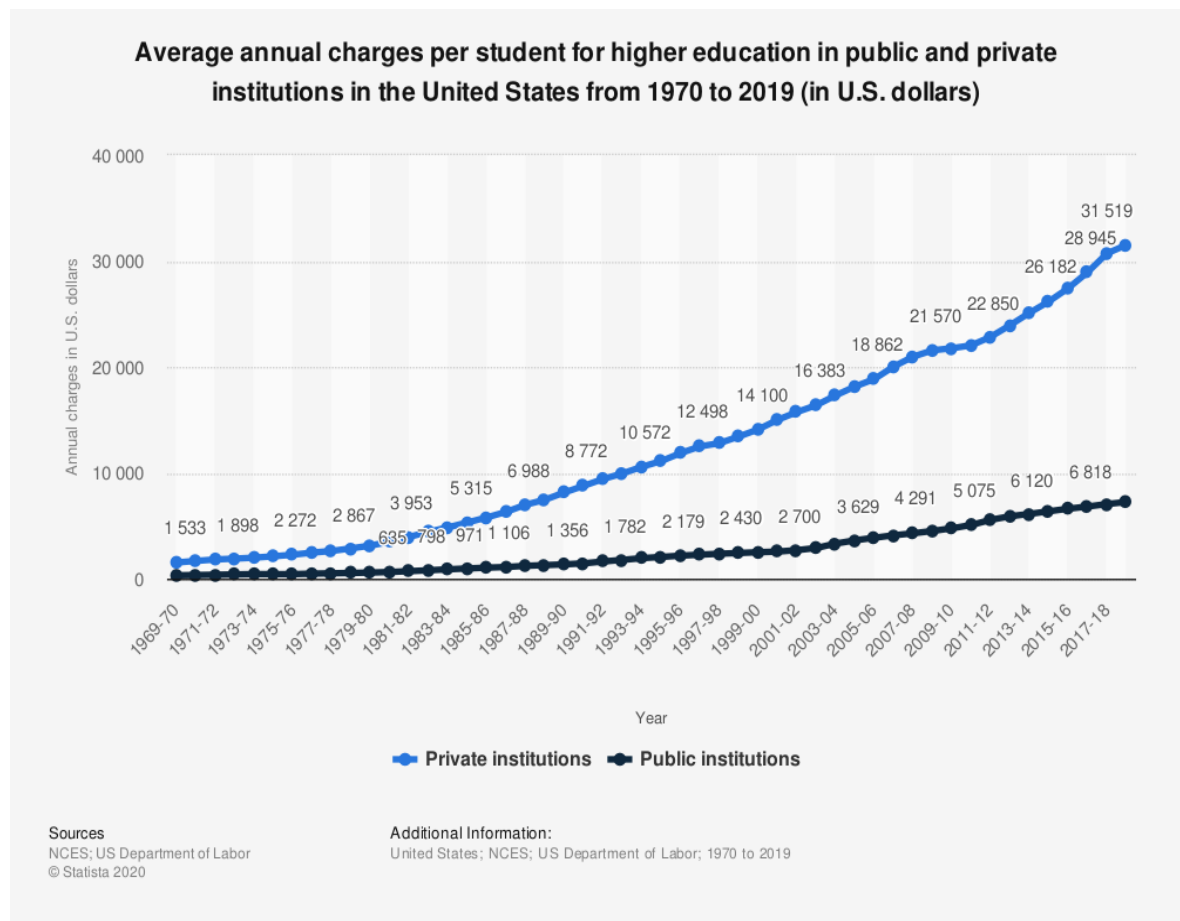


NOTE: The total cost of attending a postsecondary institution includes tuition and required fees, books and supplies, and the average cost for room, board, and other expenses. Tuition and fees at public institutions are the lower of either in-district or in-state tuition and fees. Excludes students who have already attended another postsecondary institution or who began their studies on a part-time basis. Data are weighted by the number of students at the institution who were awarded Title IV aid. Title IV aid includes grant aid, work-study aid, and loan aid. Although rounded numbers are displayed, the figures are based on unrounded data.

Source: National Center for Education Statistics, 2020

Center on Budget and Policy Priorities to explore how state funding cuts to higher education can affect the quality and affordability at public institutions. After the Great Recession in 2007, public institutions began to increase tuition and cover the costs of the state budget cuts to their funding. In addition, funding for student programs, courses, employment, and services were cut which influence the quality of these institutions as the price for the students increase. From 2007 to 2015, data on tuition showed that average annual tuition costs to students increased by 33%. This research makes the point that the tuition costs for students are increasing at a faster rate than annual income growth, which can have negative effects for low-income families to send their students to school. (Mitchell et al., 2016) This concludes that it is time to reinvest in higher education through quality and affordability and the importance of increasing human capital.

Figure 8 Average annual charges per student for higher education (1970-2019)



Source: Statistica, 2020

Many students are borrowing more than the recommended amounts of loans and can beg the question whether it is worth it to invest in higher education, because of the debt burden. Harrast in 2004 did a study that for that the many different variables of student's demographics relate to knowing the student debt that they accrue. Although the findings from this research was only examining one university, it shows how high debt levels negatively affect the lives of student borrowers after they graduate from a postsecondary education program. The cost of tuition and education is increasing, so this research suggest that students can alleviate their debt burden by the things they can control selecting an institution that is lower in costs, raising their GPA, and minimizing the amount of semesters spent in school. All these options can be used to decrease the amount of loans needed and maybe able to help the student to be eligible for other forms of aid. (Harrast, 2004)

3.3.5 Student Loan Default

A review of literature on federal student loan defaults was done to examine what factors were significant. (Gross et al., 2009) found that default was more likely the more a student borrows and that the issue is mainly caused by the federal policies in place. The review explains that although student loans are given to help aid for costs of education, its purpose was to give access to all backgrounds of students, so it would be counterintuitive to deny student loans to those who may be considered "high risk" borrowers. It can be challenged whether policies should lean more on grant aid instead of loans as the primary source of aid, as before this shift to increasing loan caps.

Gross et al. (2010) reviewed 41 research studies published on student loan default between years 1978-2007. The following is a summary of their results on predictors of student loan default:

- "Program completion is the most important predictor of default across institutions, with default rates historically much higher for non-completers than for completers (14% vs. 2%)."
- "Students with continuous enrolment who take and complete more credit hours and graduate on time have lower rates of default. Those who graduate on time also tend to borrow less, all else equal."
- "Higher standardized test scores prior to enrolment are associated with a lower risk of default, as are higher high-school GPAs, both of which indicate better college

preparation. The field or program of study selected by the student also influences default rates via both the amount borrowed and subsequent post-graduate earnings.”

- “Student personal income following graduation is a key determinant of default, with lower default rates associated with higher incomes and higher default rates associated with unemployment.” “Students perceive student loan debt negatively as the ratio of monthly payment to income increases. Borrowing more overall is associated with a higher risk of default, and a monthly payment to income ratio more than 8% is considered to be a burden, except for graduate students, for whom borrowing more is often associated with higher incomes and is inversely related to default.”
- “Students not attending four-year colleges are more likely to have low incomes, come from racial/ethnic minority groups, and to borrow relatively more in relation to labour market outcomes. Each of these factors is associated with higher default rates and with feelings of being more burdened by debt, as well as with the point of view that educational benefits may not have exceeded the costs.”
- “Default rates tend to be higher for students with dependents, students who are widowed/separated/divorced, and those who have lower levels of financial support from family members. The likelihood of default also increases with borrower age, all else equal, possibly because of other financial obligations and higher accrued amounts of student debt. Moreover, Black students tend to be more likely to default than White students who have similar labour market outcomes.”
- “The relationship of grant aid to student loan default is mixed, because receiving grant aid can reduce the cost of college attendance but is also correlated with greater financial need.”
- “Default rates are not a precise indicator of institutional quality, because they reflect student body characteristics in addition to institutional characteristics.”

(Riley, 2020)

Knowing that the purpose of the ED is to increase educational access and productivity, it would be controversial to have a more subjective manner to offer student loans. It is to be discussed the other factors around default rates, such as COA. (Looney and Yannelis, 2015) researched federal student loan default during the period of 1999-2014 and found that student loan defaults are correlated to increases in the rates of college attendance and borrowing among non-traditional low-income borrowers, because of the labour market demands.

Within the increased demand for a knowledge-based economy, students are taking on more debt to be able to afford higher education to thrust themselves into better positions in the job market.

It is to be explored which ways to find solution to default rates for student borrowers. (Perna, 2017) It was summarized that policymakers can help defaulting borrowers through prompting the use of loan forbearance and deferment mechanisms and create better income-driven repayment options. It argues that the government should make it more transparent about the affordability of loans and really examine how much loan aid is too much or too little to help student cover the costs of higher education. This argument connects back to (Scott-Clayton, 2017) challenges the transparency of the FAFSA application and the affordability of higher education for students.

4 Econometric Analysis

4.1 Multiple Linear Regression Model

This model will express the linear relationship of GDP depending on tuition and fees, default rates, total federal student loans, subsidized interest rate, unsubsidized interest rates, and consumer price index (CPI). This multiple regression model is used to be able to show the relationship between the dependent variable (GDP) and each independent variable in the model through the regression parameters created in the estimated model. This model was implemented in this research to be able to determine the estimated parameters of the exogenous variables to the endogenous variable to determine the relationship and create the best, linear, unbiased estimate of this relationship.

Algebraic model

$$Y = f(X_1, X_2, X_3, \dots, X_n)$$

Economic model

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5$$

Econometric model with error term

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

4.2 Declaration of Variables

Table 1 Variables

Variable	Indicator
y	GDP
x ₁	Average Tuition and Fees (Undergraduate)
x ₂	Default Rates (Undergraduate)
x ₃	Total Federal Student Loans (Undergraduate)
x ₄	Subsidized Federal Student Loan Interest Rate (Undergraduate)
x ₅	Unsubsidized Federal Student Loan Interest Rate (Undergraduate)
x ₆	Consumer Price Index (CPI)

Log was taken of the indicated variables because the interest rates were in percentage. To make uniformed data form. Data table to show computation of this is in Appendix 2.

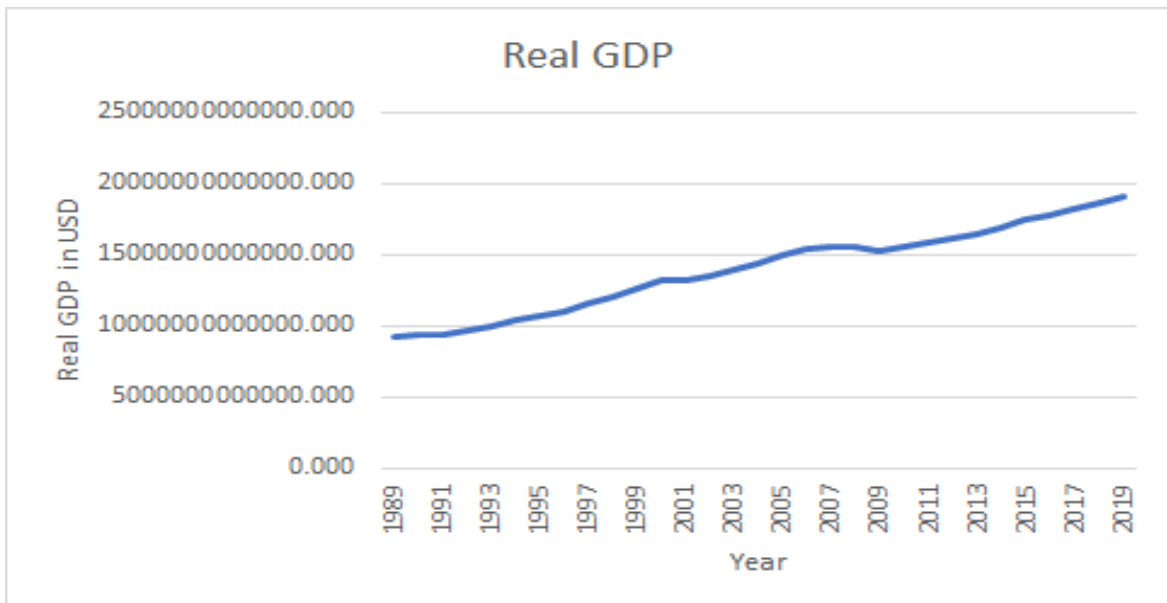
Table 2 Log Variables

Variable	Indicator
log y	GDP
log x ₁	Average Tuition and Fees (Undergraduate)
log x ₂	Default Rates (Undergraduate)
log x ₃	Total Federal Student Loans (Undergraduate)
x ₄	Subsidized Federal Student Loan Interest Rate (Undergraduate)
x ₅	Unsubsidized Federal Student Loan Interest Rate (Undergraduate)
log x ₆	Consumer Price Index (CPI)

4.2.1 Real GDP

Real GDP is an economic growth indicator that reflects the value of all products and services produced in an economy each year and is adjusted for inflation. It is important to include data that accounts or inflation to be able to have the view of the change of prices over the years.

Graph 1 Real GDP (1989-2019)



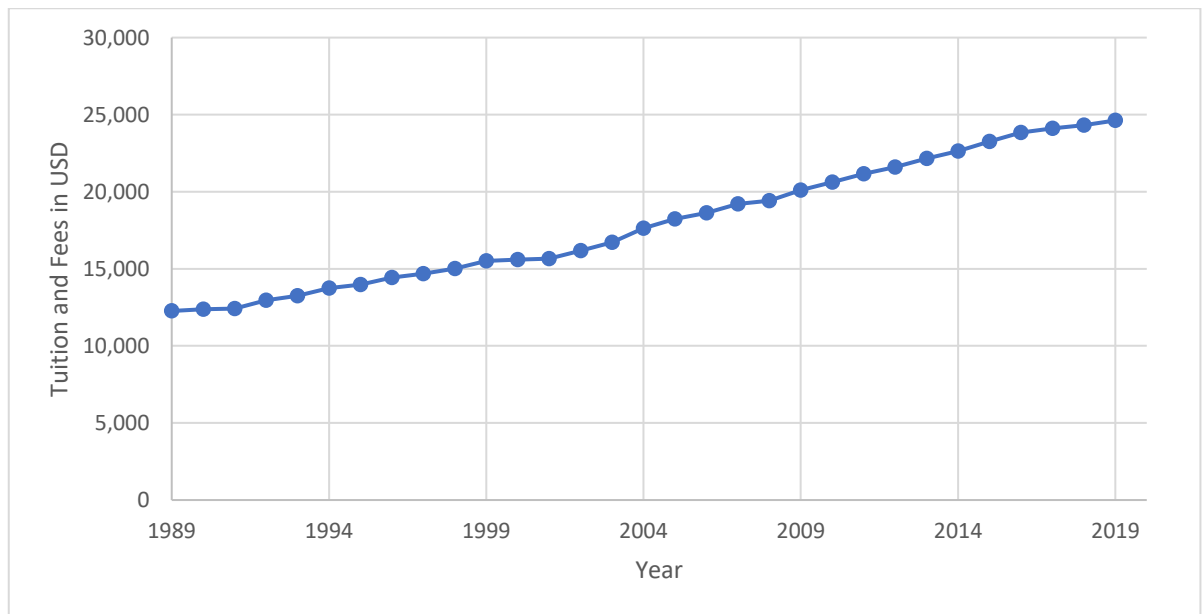
Source: Author's own contribution based on Federal Reserve Bank of St. Louis, 2020

Real GDP data was used from the Federal Reserve Bank of St. Louis. Their source of came from the U.S. Bureau of Economic Analysis. The units used from the source is average annual real GDP in billions of chained 2012 U.S. dollars, which means that the volume of the GDP is computed and chained together to over each year on January 1st to be able to account with all the volume adjusting for inflation. Time series used was from 1989-2019.

4.2.2 Tuition and Fees

Tuition, fees, and other costs of higher education must be included in the model, because it shows the price of college that students to pay to complete and can have effects on why student borrow or apply for aid. The data in this model represents average tuition and fees with room and board rates for full time undergraduate degree seeking postsecondary institutions.

Graph 2 Average Tuition and Fees (Undergraduate) (1989-2019)



Source: Author's own contribution based on National Center for Education Statistics, 2020

The data was used from the National Center for Education Statistics Digest of Education Statistics. An available time series from 1963 to 2019 using room and board estimates and constant dollars based on the CPI data from the Bureau of Labor Statistics meaning the cost is adjusted for inflation. The data shows the average tuition and fees are not adjusted for residency fees by using in-state tuition costs for public institutions.

4.2.3 Default Rates

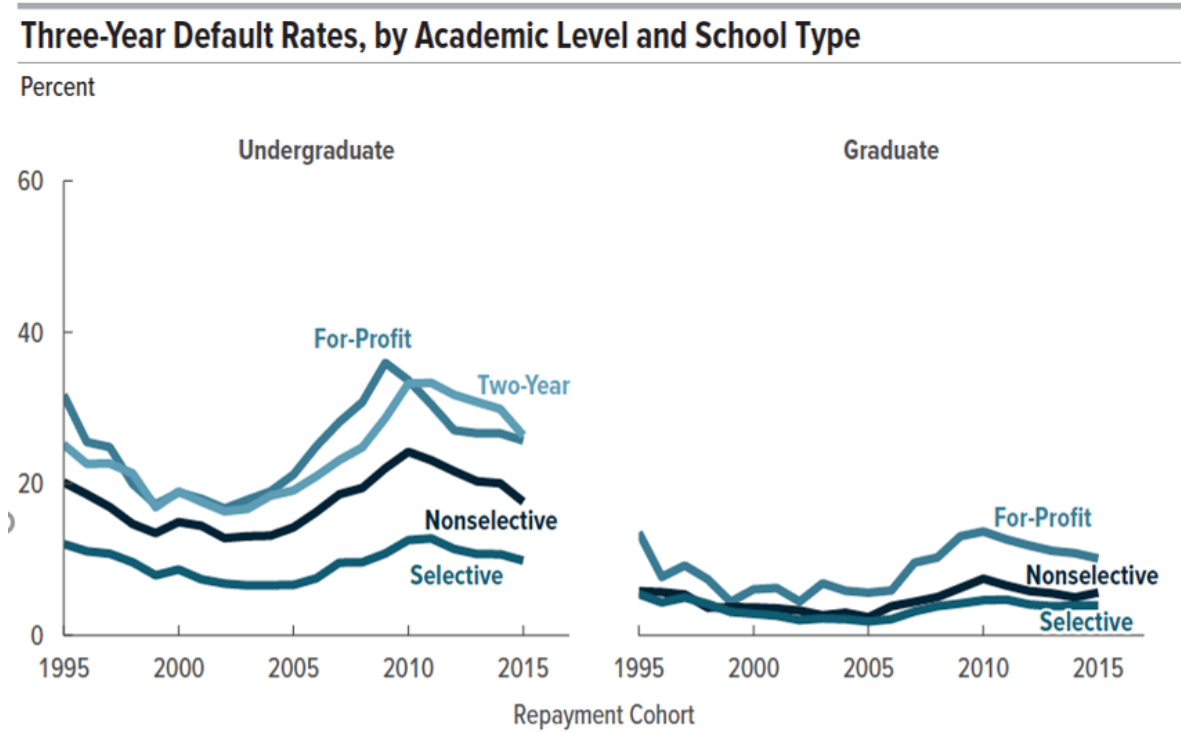
Default rates of federal student loans was important to include in the model because it shows how any student borrowers are not able to keep up with their payments. Default happens after 270 days of missed payments. It shows the degree of financial burden to the borrowers who are not able to pay, however there may be a lack of knowledge about repayment options that may help alleviate the default issues. The time series is from 1995 to 2015.

The Department of Education define cohort default rate as:

"A **cohort default rate** is the percentage of a school's borrowers who enter repayment on certain Federal Family Education Loan (FFEL) Program or William D. Ford Federal Direct Loan (Direct Loan) Program loans during a particular federal fiscal year (FY), October 1 to September 30, and default or meet other specified conditions prior to the end of the second following fiscal year. Please refer to the Cohort Default Rate Guide for a more in-depth description of cohort default rates and how the rates are calculated." (Federal Student Aid, 2020)

Data was taken from the Congressional Budget Office, using data from the Department of Education's National Student Loan Data System. Although the Department of Education does not provide separate default rates for undergraduate and graduate borrowers for each year, CBO's estimate of the average default rate is several percentage points higher than the default rates of the Department of Education reports. That is probably the result of differences in the way that CBO and the Department of Education define repayment cohorts.

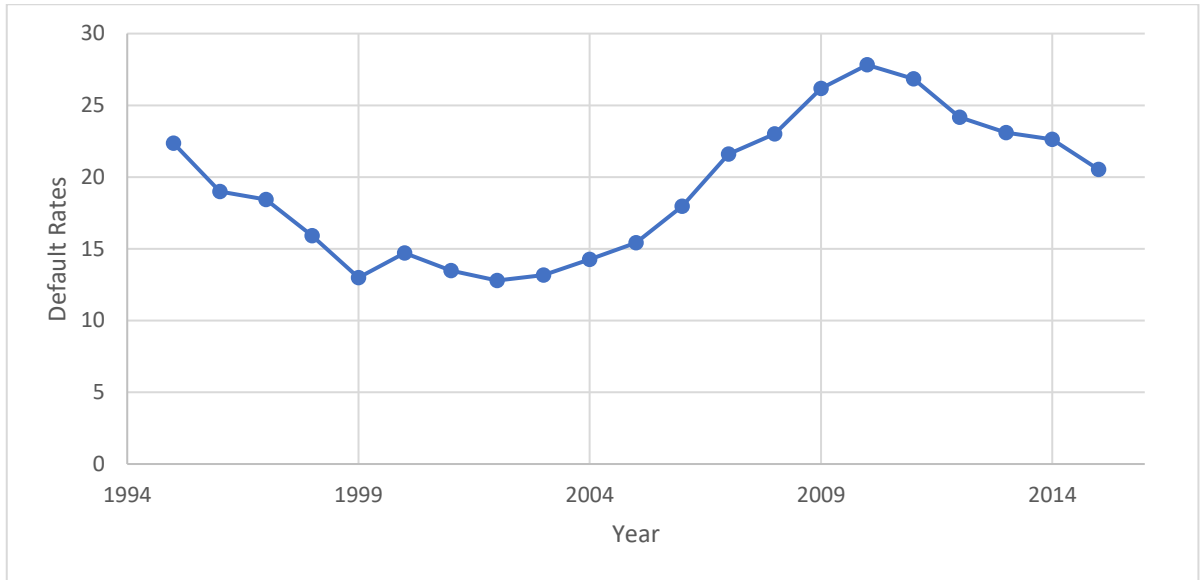
Figure 9 Three-Year Default Rates



Source: CBO, 2020

Figure 9 is a graph of the CBO's data that they have on three-year default rates from each segment of students. This shows the similar trend in the data as used in this model in Graph 3 of the data collected on from this source on all undergraduate FTE students. It is a good illustration of how many students and what type of students are entering into default.

Graph 3 Default Rates Share of Borrowers Who Default Within Three Years (1995-2015)

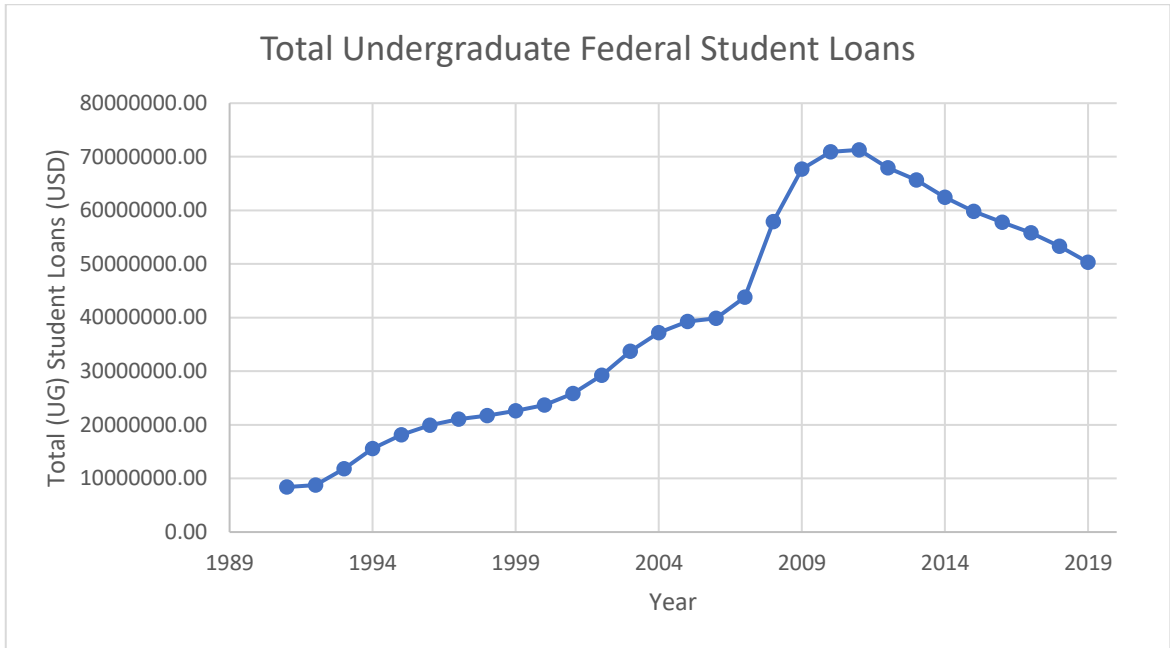


Source: Authors own contribution using CBO, 2020

4.2.4 Total Federal Student Loans

Total undergraduate federal student loans are taken into consideration in the model. This is necessary because it shows the volume of student loans borrowed. The sample of undergraduate student data is used to be consistent with other variables. The increasing volume is important to the student loan policy because it also coincides with how many loans the Department of Education is offering to borrowers and the amount of people who are taking out student loans. The total includes Perkins Subsidized and Unsubsidized Stafford Loans and Parent PLUS federal student loans for undergraduate students.

Graph 4 Total Undergraduate Federal Student Loans



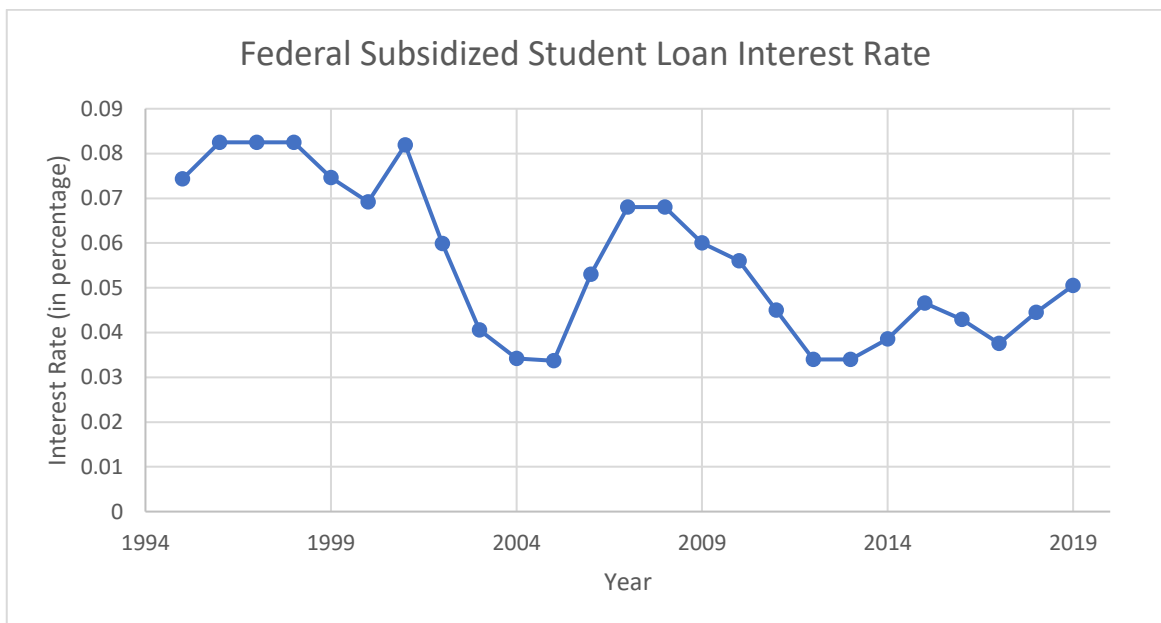
Source: Author's own contribution using CollegeBoard, 2020

Data for this variable was collected from CollegeBoard Trends in Student Aid report. The data from 2010 and before was taken from unpublished data requested from the U.S. Department of Education. After 2010, data were taken from the Federal Student Aid Data Center Title IV Program Volume Reports. The data is in current dollars in millions of USD. Time series is from 1990-1991 to 2019-2020 school years. Some rounding may occur in the table to make fit.

4.2.5 Subsidize and Unsubsidized Student Loan Interest Rates

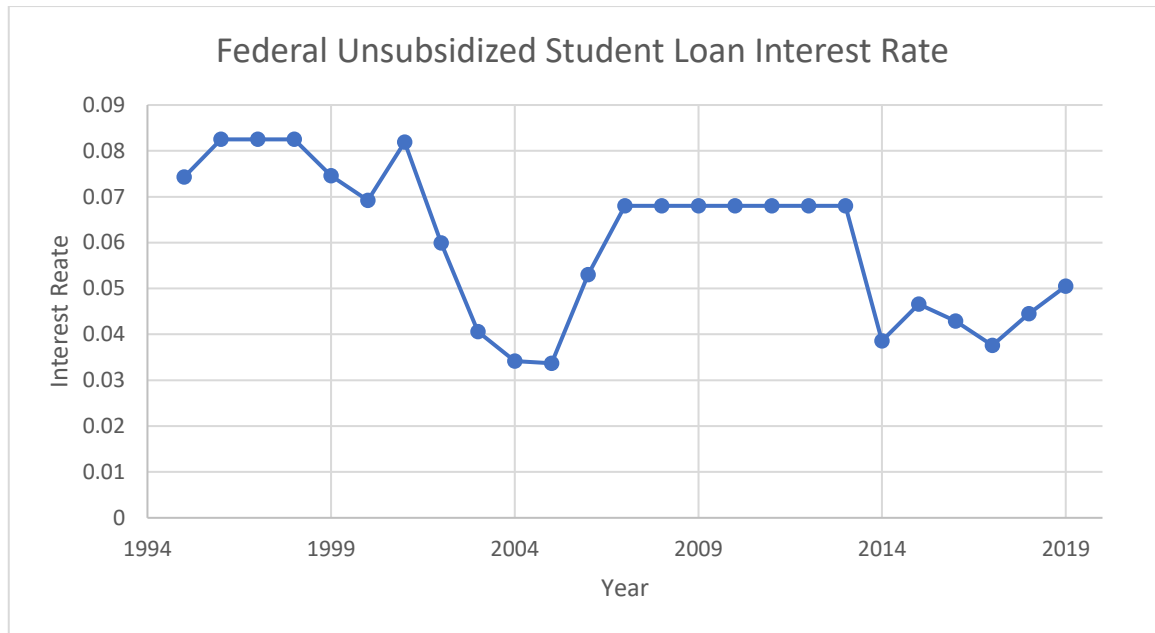
Interest rates are the way that lenders charge borrowers a percentage of the loan amount. Interest rates for federal student loans, subsidized and unsubsidized, are important to see how much the Department of Education are charging borrowers each year to take out student loans. The interest rate can vary from year to year. Unsubsidized loans are where the interest is accrued over the whole life of the loan. Subsidized loans are where the lender will not charge interest on the loan until the student graduates. It is important to note that not all borrowers qualify for subsidized loans and that rates for each type can vary year to year. The following are the figures to illustrate both types of interest rates.

Graph 5 Federal Subsidized Student Loan Interest Rate (1995-2019)



Source: Author's own contribution using CBO, 2020

Graph 6 Federal Unsubsidized Student Loan Interest Rate (1995-2019)



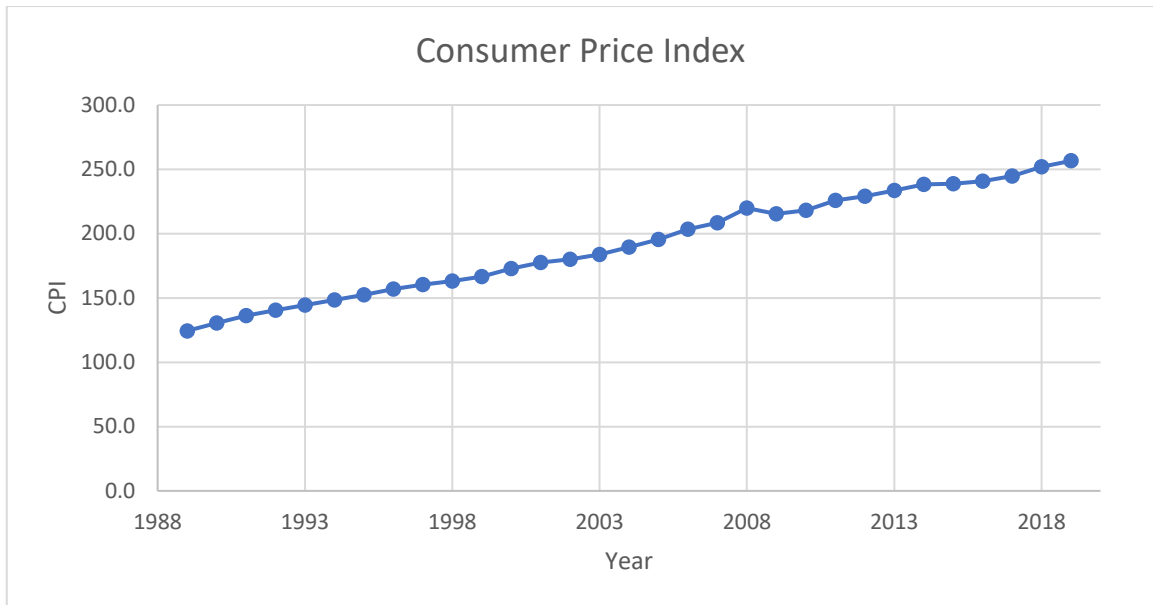
Source: Author's own contribution using CBO, 2020

Data for the interest rates are available on the Federal Student Aid website. This data, however, was collected from the Congressional Budget Office to be able to obtain a longer time series from 1995 to 2019. Interest rates are determined by Congress and the Department of Education each year and provided information to the borrowers. The interest rate are determined using 10- year treasury note.

4.2.6 Consumer Price Index

Consumer price index measures the change in individual consumer prices of goods and services over time which helps to determine inflation rates. This is important to include in the model to be able to see how inflation along with the other variables around student loans affect GDP in this case. Additionally, showing a measure the country's currency purchasing power, which is important to the member of an economy and with the prices of tuition and fees and with the interest rates and default rates to have this other variable to test this economic indicator to GDP. High CPI or increasing CPI means that the prices of goods are going up for consumers of the goods and services which can make it hard to maintain lifestyles. However, this can be good for business or the government, because the prices of goods and services can make for the increase in profits and other monetary growth.

Graph 7 Consumer Price Index (1990-2019)



Source: Author's own contribution using CBO, 2020

Data was used from the CollegeBoard Trends in Student Aid report with available time series of 1990-2019. This data is reflecting CPI in 2019 dollars yielding a constant dollar result and the data was taken from the Bureau of Labor Statistic, which uses CPI for all urban consumers that is the representation of 93% of the total population. The Bureau of Labor Statistics uses prices for goods and services and estimates by the Consumer Expenditure Survey to find data to calculate this CPI.

4.3 Data

4.3.1 Test for Stationarity

A unit root test was necessary to preformed to confirm stationarity of the data in the times series. It is important to have stationary data in the model because the linear relationship that is to be tested. The Dickey- Fuller p-value test was used to test stationarity in the data set using Gretl.

Test for Stationarity Dickey-Fuller

Null Hypothesis: Non-Stationarity; $p\text{-value} > 0.05$

Alternative Hypothesis: Stationarity; $p\text{-value} < 0.05$

Table 3 Test for Stationarity

Variable	Lags (t-n)	1st differences (Δ)	P-value verification	Stationarity Confirmation
log y	1	yes	0.02	Stationary
log x ₁	1	yes	0.00049	Stationary
log x ₂	3	no	0.02	Stationary
log x ₃	2	no	0.007	Stationary
x ₄	1	yes	0.009	Stationary
x ₅	1	yes	0.0034	Stationary
log x ₆	1	yes	0.002041	Stationary

Source: Author's calculations via Gretl

All the variables were tested for stationarity and to be able to achieve stationarity, the test shows how the data must be dynamized to be able to fit a linear model equation. All the p-values confirm stationarity at the given lags and first differences of each variable in the time series, because the p-value is less than the 5% critical value. The variables after dynamization of the data is presented in Table 4. Appendix 4 will show the data table showing the time series data with dynamization.

Table 4 Variables with dynamization

Variables with dynamization
$\Delta \log y_{(t-1)}$
$\Delta \log x_1_{(t-1)}$
$\log x_2_{(t-3)}$
$\log x_3_{(t-2)}$
$\Delta x_4_{(t-1)}$
$\Delta x_5_{(t-1)}$
$\Delta \log x_6_{(t-1)}$

Source: Author's calculation

4.3.2 Measures of Central Tendency

Table 5 Measures of Central Tendency

Variable	Mean	Median	Standard Deviation	Min	Max
$\Delta \log y_{(t-1)}$	0.02436	0.0259	0.01519	-0.02569	0.04644
$\Delta \log x_{1(t-1)}$	0.02323	0.02409	0.01214	0.002303	0.05369
$\log x_{2(t-3)}$	2.931	2.944	0.2605	2.549	3.326
$\log x_{3(t-2)}$	17.29	17.46	0.6847	15.86	18.08
$\Delta x_{4(t-1)}$	-0.0009917	-0.00025	0.01005	-0.022	0.0193
$\Delta x_{5(t-1)}$	-0.0009917	0	0.01112	-0.0294	0.0193
$\Delta \log x_{6(t-1)}$	0.02413	0.02507	0.01431	-0.02119	0.0193

Source: Author's calculation

4.4 Regression Analysis

The basis of the regression analysis will be based on the Gauss -Markov Theorem of the Ordinary Least Squares (OLS) estimators to create the best, linear, unbiased estimator (BLUE) model. Table 6 was created to be able to display the OLS assumptions, tests for the assumptions, and mathematical proofs of the Gauss-Markov Theorem and how the model is verified using this well-known procedure and proofs for the BLUE model.

Table 6 Gauss-Markov OLS Assumptions

OLS Assumptions	Testing the Assumptions	Mathematical Proof
Regression model is linear.	Dickey-Fuller Test, R-Squared Analysis and Parameter Estimation	$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$
There is random sampling of observation.	P-Value Significance Test	$(x_i, y_i): i = 1, 2, \dots, n$
Conditional mean should be zero.	Breusch-Pagan Homoscedasticity Test and Breusch-Godfrey Autocorrelation Test	$E(u x) = 0$
No perfect collinearity.	Correlation Matrix	$Cov(x u) = 0$
No homoscedasticity and no autocorrelation.	Breusch-Pagan Homoscedasticity Test and Breusch-Godfrey Autocorrelation Test	$Var(u x) = \sigma^2_u$
Error terms should be normally distributed.	Normality of Residuals Test	$Cov(u u) = 0$

Source: Author's own contribution

The following figure 10 is taken from Gretl using the OLS function by using the variables with dynamic data to start the overall analysis of the model. Tests for the assumptions will be performed in later sections to verify that the model is BLUE.

Figure 10 Gretl OLS Computation

Model 9: OLS, using observations 1998-2018 (T = 21)

Dependent variable: d_logyt1

	coefficient	std. error	t-ratio	p-value	
const	0.370980	0.142446	2.604	0.0208	**
d_logx1t1	0.540593	0.351240	1.539	0.1461	
d_logx4t1	0.477515	0.467976	1.020	0.3249	
d_logx5t1	-0.317646	0.399433	-0.7952	0.4397	
d_logx6t1	0.410587	0.255706	1.606	0.1307	
logx2t3	0.0348107	0.0194728	1.788	0.0955	*
logx3t2	-0.0268759	0.00995526	-2.700	0.0173	**
Mean dependent var	0.023695	S.D. dependent var	0.016518		
Sum squared resid	0.003050	S.E. of regression	0.014760		
R-squared	0.441086	Adjusted R-squared	0.201551		
F(6, 14)	1.841429	P-value(F)	0.162459		
Log-likelihood	62.99255	Akaike criterion	-111.9851		
Schwarz criterion	-104.6735	Hannan-Quinn	-110.3983		
rho	0.168296	Durbin-Watson	1.610121		

Excluding the constant, p-value was highest for variable 23 (d_logx5t1)

LM test for autocorrelation up to order 1 -

Null hypothesis: no autocorrelation

Test statistic: LMF = 0.530894

with p-value = $P(F(1, 13) > 0.530894) = 0.479152$

Breusch-Pagan test for heteroskedasticity -

Null hypothesis: heteroskedasticity not present

Test statistic: LM = 5.84305

with p-value = $P(\text{Chi-square}(6) > 5.84305) = 0.441$

Test for normality of residual -

Null hypothesis: error is normally distributed

Test statistic: Chi-square(2) = 4.38379

with p-value = 0.111705

Source: Author's own contribution from Gretl

4.4.1 Test for Multicollinearity

A correlation matrix was created to calculate the correlation coefficients between pairs of each variable. This is done to show if there is a correlational relationship between the variables. High correlation is not wanted between the variables, especially for the exogenous variables to show that they are truly independent of each other and their correlation with the dependent variable as well. Correlation coefficients lie between -1 and +1 interval. This is with -1 showing a perfectly negative correlation, +1 showing a perfectly positive correlation relationship, and perfectly no correlation at 0. So, the closer the coefficient is to 0, the less correlation there is between the variable pair. Insignificant correlation coefficients are either greater than +0.8 or less than -0.8. This is the threshold used to confirm or deny high multicollinearity. Some correlation will be present due to the economic nature of the model and its variables all relating to federal student loans. The correlation coefficients are determined.

Table 7 Correlation Matrix

$\Delta \log y(t-1)$	$\Delta \log x1(t-1)$	$\log x2(t-3)$	$\log x3(t-2)$	$\Delta x4(t-1)$	$\Delta x5(t-1)$	$\Delta \log x6(t-1)$	
1	0.0645	-0.1626	-0.4725	0.0322	-0.1135	0.3042	$\Delta \log y(t-1)$
	1	-0.1695	0.0764	-0.3006	-0.2084	-0.3002	$\Delta \log x1(t-1)$
		1	0.6481	-0.1095	-0.0758	-0.3794	$\log x2(t-3)$
			1	0.0315	0.0364	-0.2744	$\log x3(t-2)$
				1	0.6913	0.221	$\Delta x4(t-1)$
					1	0.1278	$\Delta x5(t-1)$
						1	$\Delta \log x6(t-1)$

Source: Author's computation using Gretl

There is no high multicollinearity present. All the values are less than absolute value of 0.8 which means there is no insignificant correlation coefficients, and that the correlational relationship of these variables are not strong, and they are suitable for the purpose of this model. This confirms the verification of no perfect multicollinearity.

4.4.2 Test of Parameter Significance

The test of parameter significance will be tested to show the significance of the parameter of the exogenous variable to the endogenous variable to determine if they have a significant relationship using p-values. The lower the p-value the higher probability of a significant relationship of the parameter and the dependent variable. Significance is wanted to be able to confirm that the strength of the parameter and the probability of the parameter influencing the dependent variable.

Test of significance with p-value

Null Hypothesis: $\gamma = 0$, no significance

Alternative Hypothesis: $\gamma \neq 0$, significance

If the p-value is greater than the critical value, then there is acceptance of the null hypothesis and there is no significance. Evaluating when the significance is at 0.05.

Table 8 P-value test of parameter significance

Variable	P- value	Reject Null	Significance Test
constant	0.0208**	yes	Significance
$\Delta \log x_1(t-1)$	0.1461	no	No significance
$\log x_2(t-3)$	0.0955*	yes	Some significance
$\log x_3(t-2)$	0.0173**	yes	Significance
$\Delta x_4(t-1)$	0.3249	no	No significance
$\Delta x_5(t-1)$	0.4397	no	No significance
$\Delta \log x_6(t-1)$	0.1307	no	No significance

Source: Author's calculation from Gretl

The results show that there is significance between the constant parameter, default rates, and total federal student loans. Coefficient confidence intervals were used to test the probability of the true value of the parameter in the model. The interval will determine if the coefficient lies in the 95% confidence of being a true parameter. The following results of the confidence interval are taken from Gretl.

Table 9 Parameter confidence Interval Test

Variable	Coefficient	95% Confidence Interval
Constant	0.37098	[0.0654637, 0.676495]
$\Delta \log x_1 (t-1)$	0.540593	[-0.212743, 1.29393]
$\log x_2 (t-3)$	0.0348107	[-0.00695419, 0.0765757]
$\log x_3 (t-2)$	-0.0268759	[-0.0482278, -0.00552403]
$\Delta x_4 (t-1)$	0.477515	[-0.526193, 1.48122]
$\Delta x_5 (t-1)$	-0.317646	[-1.17434, 0.539054]
$\Delta \log x_6 (t-1)$	0.410587	[-0.137847, 0.959022]

Source: Author's own contribution from Gretl

This test confirms that the parameters in this regression analysis are confident coefficients for testing the hypothesis.

4.4.3 R-squared and Adjusted R-squared Verification

R-squared and adjusted R-squared tests the goodness of fit of the data to the linear model. R-squared assumes that every independent variable in the model effects the variation in the dependent variable. Adjusted r-squared accounts for only the independent variables the model and the probability that the data variables fit the model.

R-squared: 0.441086 shows that there is a significant the amount of variability between dependent and independent variables.

Adjusted R-squared: 0.201551 shows that even when considering the independent variables in the predicted model, that there is a significant amount of variability regarding the line of best fit.

More independent variables need to be evaluated or taken into consideration into the model. Due to the many variables needed to properly have a full model is very complex and requires a lot of data that is not consistent and are beyond the capabilities of this research. These variables have been chosen to be able to show these important features of federal student loans.

4.4.4 Test for Autocorrelation

Testing for autocorrelation is necessary because of the OLS assumption for no autocorrelation in the model. The Breusch-Godfrey test would be used to be able to determine if there is autocorrelation present in the model. If the test statistic is greater the critical value 0.05 then the null hypothesis is accepted and there is no autocorrelation in the model. If the test statistic from Gretl Breusch-Godfrey test is less than 0.05 critical value, then the null hypothesis is rejected and there is autocorrelation present. Autocorrelation present is bad for the model, because it is assumed for a BLUE model that the exogenous variables are not correlated together and that they are truly independent of each other.

Test for Autocorrelation Breusch-Godfrey

Null Hypothesis: Autocorrelation absence

Alternative Hypothesis: Autocorrelation presence

Figure 11 Breusch-Godfrey test for autocorrelation

```

Breusch-Godfrey test for first-order autocorrelation
OLS, using observations 1998-2018 (T = 21)
Dependent variable: uhat

      coefficient      std. error      t-ratio      p-value
-----
const      -0.00976745      0.145513      -0.06712      0.9475
d_logx1t1  -0.0352928      0.360545      -0.09789      0.9235
d_logx4t1  -0.0687257      0.485274      -0.1416      0.8895
d_logx5t1  -0.0178109      0.407033      -0.04376      0.9658
d_logx6t1  -0.100780      0.294590      -0.3421      0.7377
logx2t3    -0.00225174      0.0200471     -0.1123      0.9123
logx3t2     0.00110513      0.0102393      0.1079      0.9157
uhat_1     0.252901      0.347094      0.7286      0.4792

Unadjusted R-squared = 0.039236

Test statistic: LMF = 0.530894,
with p-value = P(F(1,13) > 0.530894) = 0.479

Alternative statistic: TR^2 = 0.823950,
with p-value = P(Chi-square(1) > 0.82395) = 0.364

Ljung-Box Q' = 0.581272,
with p-value = P(Chi-square(1) > 0.581272) = 0.446

```

Source: Author's own contribution from Gretl

P-value = 0.479. P-value is greater than the 0.05 significance level, and there is acceptance the null hypothesis. This indicates that there is no autocorrelation in the model. Another autocorrelation verification can be seen through the Durbin-Watson test statistic which is approximately 1.6. The Durbin-Watson test statistic shows that there is no autocorrelation when the test statistic is 2 or is approaching the value 2. It is seen in the result that 1.6 is very close to 2 and determines that there is no autocorrelation present in the model.

4.4.5 Test for Heteroscedasticity

It is important to test for homoscedasticity, because it is a part of the BLUE model assumption that the residuals have equal variances. It tests whether the estimated variance of the residuals from a regression are dependent on the values of the independent variables. The Breusch-Pagan test for heteroskedasticity was used to verify this assumption. If the Breusch-Pagan test statistic is greater than the critical value 0.05 then the null hypothesis is accepting the null hypothesis and there is homoscedasticity.

Test for heteroscedasticity Breusch-Pagan

Null hypothesis: Homoskedasticity; p-value > 0.05

Alternative hypothesis: Heteroskedasticity; p-value < 0.05

Figure 12 Breusch-Pagan test for heteroscedasticity

```

Breusch-Pagan test for heteroskedasticity
OLS, using observations 1998-2018 (T = 21)
Dependent variable: scaled uhat^2

```

	coefficient	std. error	t-ratio	p-value
const	-17.6154	17.0425	-1.034	0.3188
d_logx1t1	-47.6468	42.0231	-1.134	0.2759
d_logx4t1	-53.9741	55.9896	-0.9640	0.3514
d_logx5t1	36.1097	47.7890	0.7556	0.4624
d_logx6t1	-30.9660	30.5932	-1.012	0.3286
logx2t3	-2.26586	2.32976	-0.9726	0.3473
logx3t2	1.54324	1.19107	1.296	0.2160

Explained sum of squares = 11.6861

Test statistic: LM = 5.843046,
with p-value = P(Chi-square(6) > 5.843046) = 0.441000

Source: Author's own contribution from Gretl

P-value = 0.441. P-value is greater than 0.05 significant level, and the null hypothesis is accepted. this indicates that there is homoscedasticity.

4.4.6 Test for Normality

Testing for normality is the last step in testing for a BLUE model. It examines how the residuals are normally distributed in the regression that confirms that the model is valid and follows the mathematical proof. The test for normality was tested in Gretl using a p-value and critical value of 0.05 to be able to reject or accept the null hypothesis that there is normality presence of the random variable.

Testing for Normality

Null hypothesis: normality presence of random variable

Alternative hypothesis: normality absence of random variable

Figure 13 Normality Test

```

Frequency distribution for uhat9, obs 10-30
number of bins = 7, mean = 1.82394e-016, sd = 0.0147597

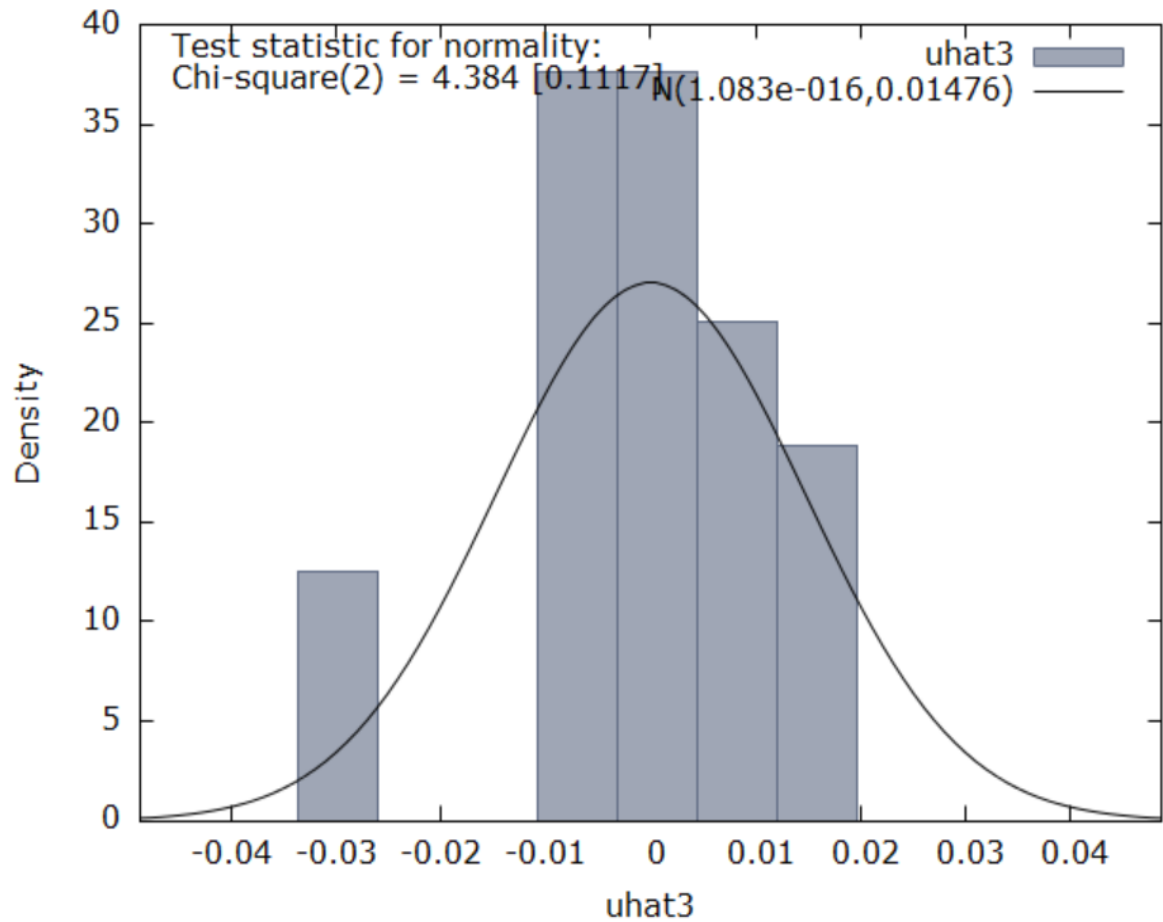
      interval      midpt  frequency  rel.    cum.
      < -0.025986 -0.029787      2     9.52%   9.52% ***
-0.025986 - -0.018385 -0.022186      0     0.00%   9.52%
-0.018385 - -0.010784 -0.014585      0     0.00%   9.52%
-0.010784 - -0.0031832 -0.0069837      6    28.57%  38.10% *****
-0.0031832 -  0.0044178  0.00061730      6    28.57%  66.67% *****
 0.0044178 -  0.012019  0.0082183      4    19.05%  85.71% *****
      >=  0.012019  0.015819      3    14.29% 100.00% *****

Test for null hypothesis of normal distribution:
Chi-square(2) = 4.384 with p-value 0.11170

```

Source: Author's own contribution from Gretl

Graph 8 Test for normality



Source: Author's own contribution from Gretl

P-value = 0.11170. P-value is greater than 0.05 significant level, we do not reject the null hypothesis. This indicates that there is normality presence in the distribution of the residuals.

4.4.7 Model Verification

Figure 14 is the final estimated model regression model. A simulation of the coefficients will be performed on the last year of the times series to be able to determine the degree of effect that the estimated variable parameters have on GDP and be able to further draw some conclusions and build a framework that is the base factors to evaluate in federal student loan policy proposals examined.

Figure 14 Estimate Model

$$\Delta \log y(t-1) = 0.37 + 0.54 \Delta \log x1_{(t-1)} + 0.035 \log x2_{(t-3)} - 0.027 \log x3_{(t-2)} + 0.47 \Delta x4_{(t-1)} - 0.32 \Delta x5_{(t-1)} + 0.41 \Delta \log x6_{(t-1)}$$

Source: Author's own contribution

Average Tuition and Fees with Room and Board

When average tuition and fees increases by 1% then GDP increases by 0.54%.

Default Rates

When default rates increase by 1% then GDP increases by 0.035%.

Total Undergraduate Federal Student Loans

When total undergraduate federal student loans increase by 1% then GDP decreases by 0.027%.

Subsidized Interest Rates

When subsidized interest rates increase by 1% then GDP increases by 0.47%.

Unsubsidized Interest Rates

When unsubsidized interest rates increase by 1% then GDP decreases by 0.32%.

CPI

When the consumer price index increases by 1% then GDP increases by 0.41%.

Table 10 shows that the answer to the research question that wants to know the relationship between the given variables and dependent variables. With half of the variables have the relationship on GDP as previously predicted, this table will allow for further analysis of the student loan policies that will be evaluated to determine which policy would be best fit for economic growth.

Table 10 Prediction of Parameter Sign

Variable	Indicator	Prediction of Parameter Sign	Parameter Sign from Results
log x_1	Average Tuition and Fees (Undergraduate)	+	+
log x_2	Default Rates (Undergraduate)	-	+
log x_3	Total Federal Student Loans (Undergraduate)	+	-
x_4	Subsidized Federal Student Loan Interest Rate (Undergraduate)	+	+
x_5	Unsubsidized Federal Student Loan Interest Rate (Undergraduate)	+	-
log x_6	Consumer Price Index	+	+

Source: Author’s own contribution

4.5 Evaluation of Results

4.5.1 Strengths and Validity

There is validity and strength in the performed model. The model was able to be verified by the tests for multicollinearity, autocorrelation, heteroscedasticity, and normality to be able to confirm the Gauss-Markov Theorem for the best, linear, unbiased estimator. The p-value test, coefficient confidence interval, and R-squared verification also help to show the verification of this model. The model helps to answer the research questions about how the factors of federal student loans effect economic growth through examining the relationship on GDP. It is shown through the verification of the model how each variable effects GDP and the estimated percentage to display to what degree GDP is affected. The data was manipulated, and each step was triple checked for accuracy and the computations were completed in Excel for the log of the data and the rest of the calculations were performed by Gretl statistical software. All the data comes from well-known organizations, official government entities, and other reliable resources to be able to know that the data is trustworthy.

4.5.2 Weaknesses and Limitations

There were some limitations in the data collection and methodology of the model. In previous models done by other research, the researchers had access to more information, data, and abilities to complete large and complex models to get the wanted answers. Data for default rates, subsidized interest rates, and unsubsidized interest rates were limited with not having all data for each year available from the source. Default rate data was only available from 1995 to 2015, and subsidized and unsubsidized interest rates are available from 1996 to 2019. There was a National Student Loan Data System that has all the necessary data, however special clearance is needed to access this information because it is for institutions and other official organizations. They were contacted, however there was difficulties with communication with this organization to access the data. Other limitation is the ability to complete some very complex econometric methodologies. There may other methodologies available for suitable for this purpose of this research that is to be done by researchers with more expertise and abilities to compete more complex models.

Some possible weaknesses are present in the model outside of the limitations. Even though the model is verified using the Gauss-Markov Theorem for the best, linear, unbiased estimator, it must be stated that more variables are needed and necessary to get more information about the error term. This is because the R-squared and adjusted R-squared show some significant amounts of variability in the model. More variables are needed to make the model more complete. Other variables were not used in the model, because of issues finding enough data for the needed time series and what is being testing will help to answer the research questions and what is known from research about these factors. Additionally, there was no high level of significance for tuition and fees, subsidized and unsubsidized interest rates, and CPI. This is not necessarily the most optimal for the model, however in real world application the results are justified, because these variables may not affect GDP in a large way. On the other hand, the test of the coefficient interval for the model was verified to be able to continue to get the answers wanted from the model. Also, the variables had to be dynamized to be able to fit the linear model for stationarity of the data.

5 Policy Analysis

The Aspen Institute's Expanding Prosperity Impact Collaborative (EPIC) is an initiative that covers and tries to find solutions to problems in financial securities in the US. They categorized in their article, "Student Loan Cancellation: Assessing Strategies To Boost Financial Security And Economic Growth ", the main three types of current student loan policies proposed, and these will be analysed in this research. A critical analysis of the stated policies will be evaluated using the variables in the model to determine how the policies addresses any of the variables and how to promote economic growth. Additionally, projected outcomes published by the policymakers will be used to evaluate which policy overall, from an economic standpoint, would be the most optimal policy decision. (McKay & Kingsbury, 2019; Warren, 2019; Zandi & Yaros, 2020;)

5.1 SIMPLE and PROSPER Act

The first proposal is to create reforms to the Income-Driven Repayment (IDR) plan. The Streamlining Income-driven, Manageable Payments on Loans for Education (SIMPLE), Affordable Loans for Any Student Act, and Promoting Real Opportunity, Success, and Prosperity through Education Reform (PROSPER) Acts are just a few proposals to name that have similar goals of simplifying the IDR plan, making it the choice for loan defaults, or whether to include all students into an IDR plan. This is much like President Donald Trump's approach to student loan policies, through creating a IBR that are set at 12.5% of monthly income and cuts to PSLF and other student loan subsidies. The SIMPLE Act is proposed by Congresswoman Suzanne Bonamici (D-OR), Paul Mitchell (R-MI), Seth Moulton (D-MA), and Brian Fitzpatrick (R-PA) to amend the Higher Education Act of 1965, to be able to streamline recertification of income- driven plans to be able to help the most vulnerable borrowers to avoid default by making the paperwork and requirements easier for them and keeping borrowers the correct repayment plan. The PROSPER Act was introduced by House Representative Virginia Foxx (R-NC) in 2018 to help student with making higher education more affordable and prepare for the labour force. This proposal to amend the Higher Education Act of 1965 and to aid with the U.S labour force post-economic crisis of 2008. (Foxx, 2017)

The main variable that the SIMPLE bill will address are the default rates and how to keep default rates lower. Although default rates have a positive effect on GDP from the results, borrowers avoiding default is always a good thing because default can have rippling negative economic effects for the borrower and the money is not being repaid to the government for the loans. There is a problem with repayment for borrowers because every year they must reapply and submit income information to be able to qualify for the repayment, however with this act it could allow for the Treasury to give access to the Department of Education to be able to get the income information for borrowers to be able avoid default. (Bonamici, S. et al., 2019)

The main variables that are addressed in the PROSPER Act are interest rates and total student loans. It is seen through the proposal to cancel the Direct Federal Loan Program and to adapt the One Loan Program to offer only one unsubsidized loan with interest rates for an undergraduate, graduate, or parent loan. Along with this provision will be to decrease loan limits to promote better lending outcomes and to change the disbursement of loans to help with any loan originating fees. The bill continues by wanting to provide more transparency for borrowers, financial aid counselling, and to encourage higher level of skills to be develop through education for the betterment of labour force and employment.

In this proposal takes on a more managerial and neoliberal ideology than compared to the welfarism, human-capital approach. This policy wants to allow the government through the Department of Education and other government entities to try to alleviate default through the strategic management of recreating a better IDR program that already exists. This is government intervention; however, it is main aim is to decrease default rates that could potentially harm the population of borrowers it is intending to aid.

5.2 Student Loan Debt Relief Act

The second type of proposal is to implement student loan cancellation to specific population of borrowers that is intended to help borrowers who are under financial hardship. In 2018, an automatic loan forgiveness for disabled veterans was proposed. A democratic proposal in 2015, had to target loan cancellation options. It could either cancel student debt for borrowers making under \$50,000 or \$25,000 per year to help with shrinking the racial wealth gap. This is like President-elect Joe Biden's plan to increase federal funding in higher

education through making public colleges free for families making less than \$125,000 and reconstruction on the IDR programs. (Biden, 2020; White House, 2020)

A similar proposal is to have loan cancellation capped at \$10,000-\$50,000 per borrower. The most notable proposal was by Senator Elizabeth Warren (D-MA) while running for the presidential campaign. Her proposal would cancel \$50,000 of student debt for those making under \$250,000, which will cover 95% of federal borrowers and estimates to cost the federal government \$640 billion to implement. To further the proposal, citizens will be able to go to public colleges tuition free, allow for student loans to be declared during borrower bankruptcy, and reframing of the interest rate backed on the Bank on Student Emergency Loan Refinancing Act. Both similar proposals are promoting and creating transparency, streamlining federal aid services for loans, and to overall give more aid to those in financial need. (Biden, 2020; Hornsby, 2021)

The main variables addressed in this type of proposal are interest rates, total federal student loans, default, and tuition and fees. The cancellation of student loans and the want to make public colleges free for low-income students shows that they proposal is about lower the cost of education to borrowers and lower the volume of federal student loans. Currently the COVID-19 pandemic has pushed the government to decide to lower the interest rates to less than 2% to help with the economic anomaly and financial burden it has caused many of borrowers and the population in general. Cancelling student debt and the possibility of allowing cancelled student debt to be excluded from taxable income to the borrowers also helps to lower the default rates.

This proposal takes on more of a welfarism and human capital approach to policy. The government wants to intervene heavily on the debt burden for most student borrowers and provide free education and aid to those in need. The human capital approach is key, because it is the other important basis in which to help continue to provide quality and affordable higher education. This will allow the country to promote a higher skilled labour force, allow graduates to be able to contribute more to the economy in other markets, and protect borrowers from the economic crisis with the pandemic.

5.3 “Get On Your Feet” Bill

The last proposal type is full student loan cancellation for all. Like Sen. Warren’s proposal, this will allow students to access public higher education free of tuitions and fees. Governor Jared Polis (D-CO) proposed this bill in 2018 to replace the Tax Cuts and Jobs Act of 2017, which he plans would cost less than the \$1.9 trillion spent on the current bill. In Colorado, the “Get On Your Feet” bill was proposed to be able to state fund \$14 million in relief. Senator Steve Fenberg (D-CO), House Representative Julie McCluskie (D-CO), and House Representative Leslie Herod (D-CO). This proposal could potentially aid residents of Colorado to have the state to cover the payments of the borrowers on the IDR plan for up to two years after graduating given the pandemic situation. This not a federal bill, however it could potentially be considered or proposed on that level by congress members who have proposed similar bills in their state. (Hernandez, 2020)

The variables that are addressed in this policy is to lower loan volume and default because they want to help borrowers from being in financial burden. The policy is to help the lives of borrowers so that they can continue to be able to contribute to society by being able to further their education. This proposal also take a welfarism approach with the human capital ideology, like in the previous proposal to be able to help and aid the borrowers in need and help those students to be better to contribute to the economy in other sectors.

5.4 Policy Analysis Result

To conclude the results of this policy analysis, Table 11 was created to display the findings as they relate to the results of the regression analysis and what is known from the literature review about approaches to higher education policy.

Table 11 Results of Policy Analysis

	SIMPLE and PROSPER Act	Student Loan Debt Relief Act	“Get On Your Feet” Bill
Interest Rates	X	X	
Default Rate	X	X	X
Total Student Loans	X	X	X
Tuition and Fees		X	
Managerial/Neoliberal Approach	X		
Welfarism/Human Capital Approach		X	X

Source: Author’s own contribution

From this table, it can be seen the examined variables and educational policy approaches used in each type of policy proposal. The Biden Administration Emergency Action Plan and Student Loan Debt Relief Act has the most intentions on focusing on these factors through the welfarism human capital approach. Considering the pandemic situation this choice of policy may be the best to be able to implement to be able to help the student borrowers, the total amount of loan debt, interest rates, default, and tuition costs.

6 Discussion

6.1 Economic Implications

There are two ways to implementing federal student loan cancellation: either forgiving loan balances as they become due or to have the Federal Reserve buy the debt to cancel or pay down over time. Both options lead to increasing GDP, individual consumption, and employment. This implementation would lessen the burden to borrowers, while charging the costs to the government deficit (Fullwiler et al., 2018). It was explored the relationship between debt-to-income ratio of student loans to individual consumer consumption, in the state of North Carolina, through research done by Bahadir and Gicheva using OLS. The study considers that there is a notable relationship between student debt and individuals making life decisions that have links to consumption options. The results find that there is a moderate impact to lower consumption growth with the increased debt-to-income ratio over some time. It was concluded that recent graduates that are usually going into their careers at rather lower earnings are forced to lower their consumption to be able to pay off their debts. In this case, it is shown the effects of student debt on households' ability to contribute to the economic cycle through consuming. (Bahadir and Gicheva, 2019)

If student cancellation policies can have positive macroeconomic, then it can be a better social option than trying to reform student loan eligibility. Gross et al. in 2009 investigated on past research to determine the validity of predictors of student loan default. This research reflected on the characteristics of the new student's college experiences, financial aid and debt, and post education income and employment. The government introduced loans to be able to give opportunity to anyone in need, so the hypothetical alternative of denying high risk borrowers the eligibility to apply for the loans would be contradicting and highly controversial. (Gross et al., 2009)

If the costs of tuition are increasing, it also is a weak point in trying to implement new IDR reform. In a report done by the Federal Reserve Bank of New York, Lucca et al. in 2015 explored the connection between student loan availability and college tuition prices through the 'Bennett Hypothesis'. This hypothesis is that tuition is raised when financial aid is increased, which does not help the situation of making higher education more affordable. It judges the effects of increased tuition costs and enrolments on the benefits of federal student

loan programs. Strengthening the IDR program will not fully alleviate the burden to debtors if the costs of attendance continue to increase. It could potentially lead to more borrowing for students to pay back over time. (Lucca et al., 2015)

6.2 Empirical Findings

Fullwiler et al. researched the outcomes of a complete student debt cancellation program policy for the Department of Education. This conclusion was made through a forecasting using Ray Fair’s US Macroeconomic Model and Moody’s US Macroeconomic Model with a Keynesian and Classical economic theoretical background that if the government spends more than the economic outcome will be more while allowing for economic growth and freedom for individuals. It finds that this type of implementation will allow for macroeconomic growth for the country with outcomes leading to a higher GDP and lowering unemployment without a significant impact on inflation. This outcome, however, will have a significant impact on the federal deficit, but make for important social changes for how the US deals with investing in higher education. The research goes on to include other findings that also show research that predicts benefits of the effects of student debt cancellation programs in Figure 15. (Fullwiler et al., 2018)

Table 125 Additional Benefits of Student Debt Cancellation

Predicted Effect of Student Debt Cancellation	Description	Source
Increased small business formation	High student debt as a share of total debt reduces an individual’s ability to access alternative forms of credit for business formation. Small business formation declines 14.4 percent with an increase of one standard deviation of relative student debt.	Ambrose, Cordell, and Ma (2015)
Increased college degree attainment	Grant funding increases college attendance and reduces college dropout rates. A \$1,000 increase in Pell Grants is associated with a 1.2 percent to 8.6 percent decrease in students leaving college; \$1000 in non-need-based grant aid increases college attendance by 3.6 percent.	Bettinger (2004) Dynarski (2003)
Increased household formation	A \$1,000 increase in student debt is associated with a 2 percent decline in the likelihood of first marriage among female degree-holders.	Bozick and Estacion (2014) Addo (2014)
Higher credit scores	Student loan borrowers have lower credit scores, potentially leading to household credit constraints and reduced consumption.	Edmiston, Brooks, and Shepelwich (2013) Li (2013)
Reduced vulnerability to economic shocks	Households with student debt experienced greater reductions in net worth than households with no student debt during the most recent recession. A \$1 increase in student loan debt in 2007 was associated with \$0.87 less in net worth in 2009.	Elliott and Nam (2013)

Source: Fullwiler et al., 2018

Table 15 shows the researched economic and social outcomes for borrowers under a loan cancellation policy. It shows how student loan cancellation or forgiveness can help the borrowers to overall be able to contribute to society through being able to follow through with their educational goals and have less of a financial burden that allows the borrowers to be able to invest and make other optimal lifestyle choices that can benefit the economic cycle.

It has been questioned how the rise in student loan debt and defaults will affect the US economy and if there is a possibility of a financial bubble burst. Together, the increased COA, state budget cuts, and student debt is a financial burden to a significant portion of its borrowers. Student debt is correlated with individuals having lower rates of homeownership and other investment activities, such as retirement; however, it can there is a positive return on educational investment if incomes postgraduation are adequate (Cooper and Wang, 2014; Mezz et al., 2016). “In fact, each \$1,000 increase in student debt causes a 1- to 2-percentage point decrease in the homeownership rate of student loan borrowers in their late 20s and early 30s. Sizeable debt means limited spending, and limited spending means constrained economic growth” (Boggs, 2019). This can be an indicator of economic decrease in consumer spending, thus having some negative effects on GDP. There is also the issue of default rates. Although unemployment rates in the US began to increase after the 2008 recession, there continues to be increases to default rates. This indicates that although there are jobs available and occupied, that wages are not matching what is needed for borrowers to tackle their debts (Boggs, 2019).

Patel and Krishnan used data from the Federal Reserve Bank of St. Louis to create a regression and logistic curve statistical model to find the correlation between student loan debt, total GDP, student loan forgiveness programs, and the probability of recession. It was found that the larger percentage of student debt erased would attribute to a lower possibility of a recession. This includes the percentage of GDP that student loans debt holds decreased also decreased as well. So, the research argues that it should be further investigated whether the variables of GDP in relation to student loan forgiveness has some correlational effect on each: consumer spending, government spending, investment, and net exports. (Patel and Krishnan, 2020)

All these empirical findings help to confirm the hypothesis that the best policy is to include federal student loan cancellation. It shows not only the macroeconomic benefits, but also on the microlevel of borrowers. These findings used GDP as their economic indicator, which is why it was chosen in this methodology. It is important to know the economic inhibitors that federal student loan debt cause on the national level to be able to better understand what policies to put in place during this time of high economic uncertainty. Also, it is important to know the long-term effects of the policies in place to know their outcomes and points of efficiency. More longitudinal research show test the prognosis of the effects of borrowing for students a long period of time to determine what it would be the outcomes in different federal student loan policy simulations.

7 Conclusion

The aim of this research is to determine which U.S. federal student loan policy proposal will have the best economic growth through examining the effects of student loans on GDP.

This aim was completed through the regression analysis on factors of federal student loans on GDP. The raw time series of 1990-2019 was used and the sample of the variables were to collect the data on the undergraduate student borrowers. Verification of this model was complete, and the explanation of the parameters were determined to be able to know the relationship of tuition costs, default rates, student loan interest rates, total student loans volume, and consumer price index on the GDP. This verification will further the foundation of the policy analysis of recent proposals and with knowledge from literature to determine which type of student loan policy was the best option. Previous work by other researchers also has similar findings to suggest the strength of these results.

Due to these findings, it is concluded that the policy around student loan forgiveness policy Student Loan Debt Relief Act was the optimal policy to help with economic growth and overall have outlined how to address each variable from the regression analysis to be able to create a more holistic policy that will not only help the macroeconomy but also individuals. This is displayed through the welfarism and human capital approach used in this policy. To help to aid those in financial need or that are vulnerable borrowers while also promoting more affordable higher education through the lower of interest rates, loan caps, and restructure of the IDR plan. This push for affordable and streamlined aid to higher education is also because it will help produce a more high-skilled labour force that can be able to have better salary potentials, innovation, technology, and other abilities for investment or consumption.

As a result, my hypothesis was confirmed that a policy regarding student loan cancellation will have the best economic outcomes. Considering the current pandemic situation, this is the best policy that I could suggest for the U.S. government to enact. This type of proposal has been supported by 2021 President Joe Biden for up to \$10,000 in student loan forgiveness for low-income borrowers, however, was not a part of his recent American Rescue Plan for the pandemic economic relief. There were other relief that was granted to student borrowers; however, it would be interesting to see the outcomes of this policy if enacted and if it would be the next pivotal reauthorization of the Higher Education Act.

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10 Acronyms

BLUE	Best, Linear, Unbiased Estimator
CBO	Congressional Budget Office
COA	Cost of attendance
CPI	Consumer Price Index
(D-CO)	Democrat- Colorado
(D-MA)	Democrat- Massachusetts
(D-OR)	Democrat-Oregon
ED	Department of Education
EFC	Estimated Family Contribution
EOG	Educational Opportunity Grant
GDP	Gross Domestic Product
GEAR-UP	Gaining Early Awareness and Readiness for Undergraduate Programs
GED	General Education Diploma
GPA	Grade point average
GSL	Guaranteed Student Loan
GI Bill	Servicemen’s Readjustment Act of 1944
FAFSA	Free Application for Federal Student Aid
FEEL	Federal Family Education Loans
FTE	Full Time Enrolment
FSA	Federal Student Aid
FSEOG	Federal Supplemental Education Opportunity Grant
FWS	Federal Work-study
HEA	Higher Education Act
IBR	Income Based Repayment
ICR	Income Contingent Repayment
IDR	Income-Driven Repayment
MISAA	Middle-Income Student Assistance Act
MPN	Master Promissory Note
NDSL	National Direct Student Loans
NGO	Non-governmental organization
PLUS	Parent loan for undergraduate students
PROSPER	Promoting Real Opportunity, Success, and Prosperity through Education Reform
REPAYE	Streamlining Income-driven, Manageable Payments on Loans for Education
(R-NC)	Republican- North Carolina
(R-PA)	Republican- Pennsylvania
SAR	Student Aid Report
SIMPLE	Streamlining Income-driven, Manageable Payments on Loans for Education
TEACH	Teacher Education Assistance for College and Higher education
TRIO	Upward Bound, Talent Search, and Student Support Services Programs
OLS	Ordinary Least Squares
U.S.	United States

11 Appendix

Appendix 1: RAW DATA TABLE

Year	y	x1	x2	x3	x4	x5	x6
1989	9.19213E+12	12264.14817					124.4
1990	19.36549E+12	12381.09824		7721485.168			130.4
1991	9.35535E+12	12409.65008		8395877.771			136.2
1992	9.68489E+12	12968.7924		8734851.177			140.5
1993	9.9515E+12	13243.0467		11776433.54			144.4
1994	1.03524E+13	13738.04373		15593929.35			148.4
1995	1.06303E+13	13985.43303	0.22368	18104599.21	0.0743	0.0743	152.5
1996	1.10313E+13	14426.1975	0.18987	19946724.76	0.0825	0.0825	157.0
1997	1.15219E+13	14672.20144	0.18432	21085003.48	0.0825	0.0825	160.5
1998	1.20383E+13	15012.8679	0.1592	21712867.8	0.0825	0.0825	163.2
1999	1.26105E+13	15508.93217	0.12985	22583737.44	0.0746	0.0746	166.7
2000	1.3131E+13	15604.06119	0.147	23694724.19	0.0692	0.0692	172.8
2001	1.32621E+13	15650.59707	0.13479	25858497.61	0.0819	0.0819	177.5
2002	1.34931E+13	16175.00618	0.12789	29237889.56	0.0599	0.0599	180.1
2003	1.38791E+13	16707.88801	0.13157	33729110.33	0.0406	0.0406	183.9
2004	1.44064E+13	17629.46264	0.14252	37174845.23	0.0342	0.0342	189.4
2005	1.49125E+13	18224.01166	0.15412	39261861.79	0.0337	0.0337	195.4
2006	1.53383E+13	18625.21548	0.17963	39865693.81	0.053	0.053	203.5
2007	1.5626E+13	19212.49729	0.2159	43820560.6	0.068	0.068	208.3
2008	1.56047E+13	19413.49476	0.22997	57913027.65	0.068	0.068	220.0
2009	1.52088E+13	20110.95087	0.26164	67681483.98	0.06	0.068	215.4
2010	1.55988E+13	20624.83393	0.27817	70899286.51	0.056	0.068	218.0
2011	1.58407E+13	21164.57999	0.26851	71294597.51	0.045	0.068	225.9
2012	1.6197E+13	21592.66355	0.24163	67937063.65	0.034	0.068	229.1
2013	1.64954E+13	22149.67169	0.23085	65652303.78	0.034	0.068	233.6
2014	1.6912E+13	22630.16	0.22631	62423127.85	0.0386	0.0386	238.3
2015	1.74322E+13	23251.784	0.20527	59815726.71	0.0466	0.0466	238.7
2016	1.77305E+13	23851.01641		57798286.79	0.0429	0.0429	240.6
2017	1.81441E+13	24100.9775		55792919.04	0.0376	0.0376	244.8
2018	1.86878E+13	24326.60016		53293772.85	0.0445	0.0445	252.0
2019	`	24623.06666		50332934.69	0.0505	0.0505	256.6

Appendix 2: DATA WITH LOG

Year	log y	log x1	log x2	log x3	x4	x5	log x6
1990	29.84936923	9.414435502					4.82350218
1991	29.8680532	9.423926253		15.85951728			4.870606649
1992	29.86697	9.426229681		15.9432514			4.914124394
1993	29.90158824	9.470301166		15.98283146			4.945207489
1994	29.92874466	9.491227916		16.28161093			4.972587226
1995	29.96824256	9.527924178		16.56239225			4.999911331
1996	29.99473146	9.545771569	3.107631366	16.71167656	0.0743	0.0743	5.027164596
1997	30.03176231	9.576801104	2.943754534	16.80857552	0.0825	0.0825	5.056245805
1998	30.07527401	9.593709924	2.914088285	16.86407261	0.0825	0.0825	5.078293943
1999	30.11911294	9.616662973	2.76757618	16.89341563	0.0825	0.0825	5.094976443
2000	30.16555022	9.649171406	2.563794845	16.93274062	0.0746	0.0746	5.11619579
2001	30.20599593	9.655286492	2.687847494	16.98076297	0.0692	0.0692	5.152134856
2002	30.21592989	9.658264347	2.601132919	17.06814983	0.0819	0.0819	5.178970609
2003	30.23319693	9.691222502	2.548585426	17.19097601	0.0599	0.0599	5.193512252
2004	30.26140728	9.723636223	2.576953936	17.33387183	0.0406	0.0406	5.214392132
2005	30.29869245	9.777326795	2.656897248	17.43114289	0.0342	0.0342	5.243861181
2006	30.33322149	9.810495325	2.735146427	17.48576417	0.0337	0.0337	5.27504874
2007	30.36137126	9.832271613	2.888314087	17.50102671	0.053	0.053	5.315666005
2008	30.3799592	9.863316247	3.072230245	17.59561369	0.068	0.068	5.338974547
2009	30.37859247	9.873723709	3.135363773	17.87445292	0.068	0.068	5.393463897
2010	30.35289758	9.909019765	3.26438442	18.0303232	0.06	0.068	5.372269255
2011	30.37821212	9.934251159	3.325647345	18.07677093	0.056	0.068	5.38454552
2012	30.39360144	9.960084308	3.290303064	18.08233111	0.045	0.068	5.420189807
2013	30.41584762	9.980108885	3.184822538	18.0340923	0.034	0.068	5.434176049
2014	30.43410082	10.00557795	3.139183056	17.99988325	0.034	0.068	5.453593128
2015	30.45904678	10.02703881	3.119320648	17.9494464	0.0386	0.0386	5.473320543
2016	30.48933847	10.05413714	3.021741093	17.90677917	0.0466	0.0466	5.475014804
2017	30.50630792	10.07958211		17.87246969	0.0429	0.0429	5.483331129
2018	30.52936682	10.09000768		17.83715752	0.0376	0.0376	5.500384359
2019	30.55889127	10.09932569		17.79133005	0.0445	0.0445	5.529452897
2020	30.58027282	10.11143895		17.73417019	0.0505	0.0505	5.547405429

Appendix 3: DATA WITH LOG AND LAG

Year	log $y(t-1)$	log $x_1(t-1)$	log $x_2(t-3)$	log $x_3(t-2)$	$x_4(t-1)$	$x_5(t-1)$	log $x_6(t-1)$
1990							
1991	29.84936923	9.414435502					4.82350218
1992	29.8680532	9.423926253					4.870606649
1993	29.86697	9.426229681		15.85951728			4.914124394
1994	29.90158824	9.470301166		15.9432514			4.945207489
1995	29.92874466	9.491227916		15.98283146			4.972587226
1996	29.96824256	9.527924178		16.28161093			4.999911331
1997	29.99473146	9.545771569		16.56239225	0.0743	0.0743	5.027164596
1998	30.03176231	9.576801104		16.71167656	0.0825	0.0825	5.056245805
1999	30.07527401	9.593709924	3.107631366	16.80857552	0.0825	0.0825	5.078293943
2000	30.11911294	9.616662973	2.943754534	16.86407261	0.0825	0.0825	5.094976443
2001	30.16555022	9.649171406	2.914088285	16.89341563	0.0746	0.0746	5.11619579
2002	30.20599593	9.655286492	2.76757618	16.93274062	0.0692	0.0692	5.152134856
2003	30.21592989	9.658264347	2.563794845	16.98076297	0.0819	0.0819	5.178970609
2004	30.23319693	9.691222502	2.687847494	17.06814983	0.0599	0.0599	5.193512252
2005	30.26140728	9.723636223	2.601132919	17.19097601	0.0406	0.0406	5.214392132
2006	30.29869245	9.777326795	2.548585426	17.33387183	0.0342	0.0342	5.243861181
2007	30.33322149	9.810495325	2.576953936	17.43114289	0.0337	0.0337	5.27504874
2008	30.36137126	9.832271613	2.656897248	17.48576417	0.053	0.053	5.315666005
2009	30.3799592	9.863316247	2.735146427	17.50102671	0.068	0.068	5.338974547
2010	30.37859247	9.873723709	2.888314087	17.59561369	0.068	0.068	5.393463897
2011	30.35289758	9.909019765	3.072230245	17.87445292	0.06	0.068	5.372269255
2012	30.37821212	9.934251159	3.135363773	18.0303232	0.056	0.068	5.38454552
2013	30.39360144	9.960084308	3.26438442	18.07677093	0.045	0.068	5.420189807
2014	30.41584762	9.980108885	3.325647345	18.08233111	0.034	0.068	5.434176049
2015	30.43410082	10.00557795	3.290303064	18.0340923	0.034	0.068	5.453593128
2016	30.45904678	10.02703881	3.184822538	17.99988325	0.0386	0.0386	5.473320543
2017	30.48933847	10.05413714	3.139183056	17.9494464	0.0466	0.0466	5.475014804
2018	30.50630792	10.07958211	3.119320648	17.90677917	0.0429	0.0429	5.483331129
2019	30.52936682	10.09000768	3.021741093	17.87246969	0.0376	0.0376	5.500384359
2020	30.55889127	10.09932569		17.83715752	0.0445	0.0445	5.529452897

Appendix 4: DATA WITH LOG, LAGS, AND 1ST DIFFERENCES

Year	$\Delta \log y(t-1)$	$\Delta \log x_1(t-1)$	$\log x_2(t-3)$	$\log x_3(t-2)$	$\Delta x_4(t-1)$	$\Delta x_5(t-1)$	$\Delta \log x_6(t-1)$
1990							
1991	0.01868	0.009491					0.0471
1992	-0.001083	0.002303		15.85952			0.04352
1993	0.03462	0.04407		15.94325			0.03108
1994	0.02716	0.02093		15.98283			0.02738
1995	0.0395	0.0367		16.28161			0.02732
1996	0.02649	0.01785		16.56239			0.02725
1997	0.03703	0.03103		16.71168	0.0082	0.0082	0.02908
1998	0.04351	0.01691	3.107631	16.80858	0	0	0.02205
1999	0.04384	0.02295	2.943755	16.86407	0	0	0.01668
2000	0.04644	0.03251	2.914088	16.89342	-0.0079	-0.0079	0.02122
2001	0.04045	0.006115	2.767576	16.93274	-0.0054	-0.0054	0.03594
2002	0.009934	0.002978	2.563795	16.98076	0.0127	0.0127	0.02684
2003	0.01727	0.03296	2.687847	17.06815	-0.022	-0.022	0.01454
2004	0.02821	0.03241	2.601133	17.19098	-0.0193	-0.0193	0.02088
2005	0.03729	0.05369	2.548585	17.33387	-0.0064	-0.0064	0.02947
2006	0.03453	0.03317	2.576954	17.43114	-0.0005	-0.0005	0.03119
2007	0.02815	0.02178	2.656897	17.48576	0.0193	0.0193	0.04062
2008	0.01859	0.03104	2.735146	17.50103	0.015	0.015	0.02331
2009	-0.001367	0.01041	2.888314	17.59561	0	0	0.05449
2010	-0.02569	0.0353	3.07223	17.87445	-0.008	0	-0.02119
2011	0.02531	0.02523	3.135364	18.03032	-0.004	0	0.01228
2012	0.01539	0.02583	3.264384	18.07677	-0.011	0	0.03564
2013	0.02225	0.02002	3.325647	18.08233	-0.011	0	0.01399
2014	0.01825	0.02547	3.290303	18.03409	0	0	0.01942
2015	0.02495	0.02146	3.184823	17.99988	0.0046	-0.0294	0.01973
2016	0.03029	0.0271	3.139183	17.94945	0.008	0.008	0.001694
2017	0.01697	0.02544	3.119321	17.90678	-0.0037	-0.0037	0.008316
2018	0.02306	0.01043	3.021741	17.87247	-0.0053	-0.0053	0.01705
2019	0.02952	0.009318		17.83716	0.0069	0.0069	0.02907
2020	0.02138	0.01211		17.79133	0.006	0.006	0.01795