Econ 101: Principles of Microeconomics

Project

Due on 11/10/2020

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Introduction

The purpose of this project is to

1. Teach you how to use the typesetting system LaTeX.

2. Teach you how to search for and cite economics papers.

3. Give you a brief introduction to the minimum wage literature.

Project Grading

This project is composed of two parts. Part 1 is worth 20% of the project grade and is graded for completion. Part 2 is worth 80% of the project grade and its grading is specified in Part 2.

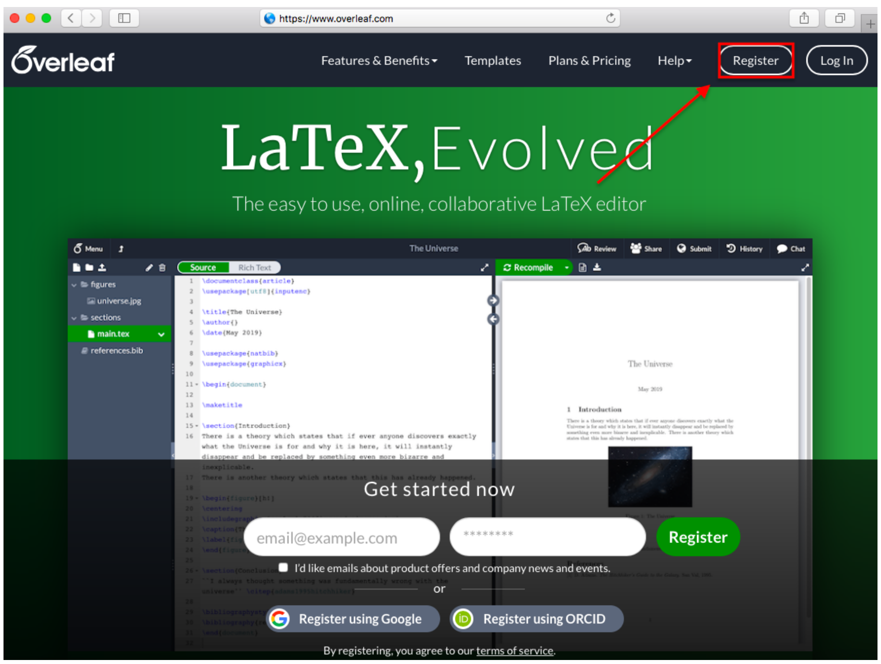
Part 1

What is LaTeX?

Latex[1] is a typesetting tool used to make high-quality, professional looking documents. It was created by Leslie Lamport in the early 1980s and has many advantages over other typesetting options like, for example, Microsoft Word. Its easy to change formatting and interface that allows the user to write equations effortlessly are some reasons it is so commonly used in science, mathematics, and economics.

Getting Started

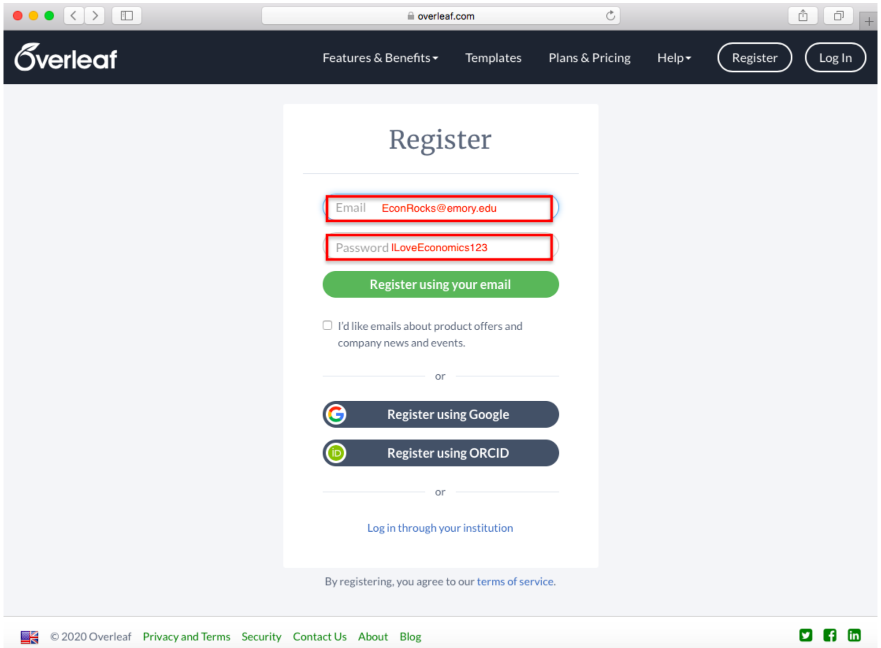
While there are many LaTeX editors, I recommended you use Overleaf for this project. Start by going to `https://www.overleaf.com` and click register (see figure below).



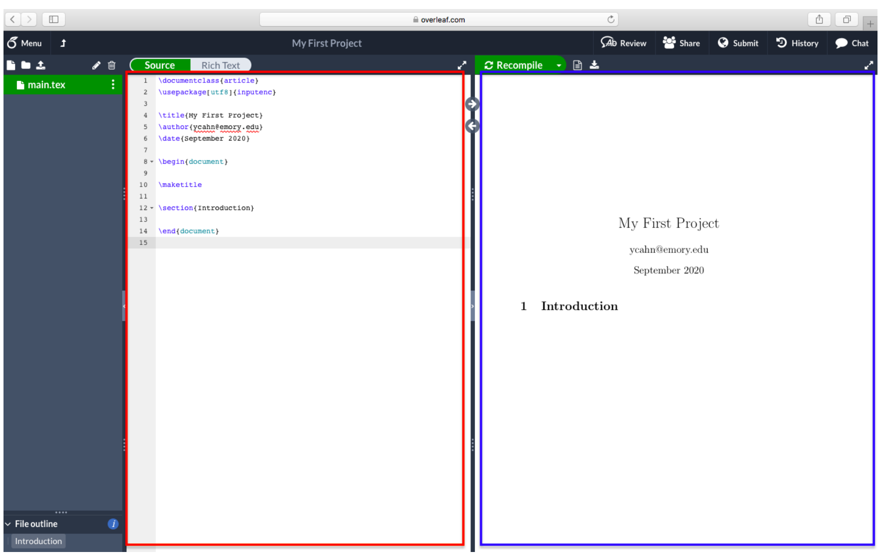
Use an email address and make up a password (see figure below).

[1]Latex is stylized as LaTeX and pronounced "Lay-tek" because the characters 'T' 'E', and 'X' in Latex are meant to be the Greek letters tau, epsilon, and chi, respectively. How pretentious and awesome is that!

Part 1 continued on next page. . .



Click "Create First Project" and choose "Blank Project".[2] When prompted, name the project "My First Project". Your screen should look like this:



Source code (what you write to make your document) is typed into the red box, it is compiled (turned into language the computer understands so it can make your document), and produces the PDF on the right in the blue box. Take a look at the figures below

[2]Overleaf has many different templates for presentations, resumes, and more, but for now we are just writing a simple article. Overleaf also allows you to collaborate with others, much like a Google doc.

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{My First Project}
\author{ycahn@emory.edu}
\date{September 2020}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

This area before the document starts is called the preamble

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{My First Project}
\author{ycahn@emory.edu}
\date{September 2020}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

This line in the preamble says what kind of document it is. In this case, the document is an article.

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{My First Project}
\author{ycahn@emory.edu}
\date{September 2020}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

This line adds a package which enables the document to have additional features. We will add more packages later.

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{My First Project}
\author{ycahn@emory.edu}
\date{September 2020}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

These lines define features of the document's title.

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{My First Project}
\author{ycahn@emory.edu}
\date{September 2020}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

This line starts the document.

This line ends the document.

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{My First Project}
\author{ycahn@emory.edu}
\date{September 2020}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

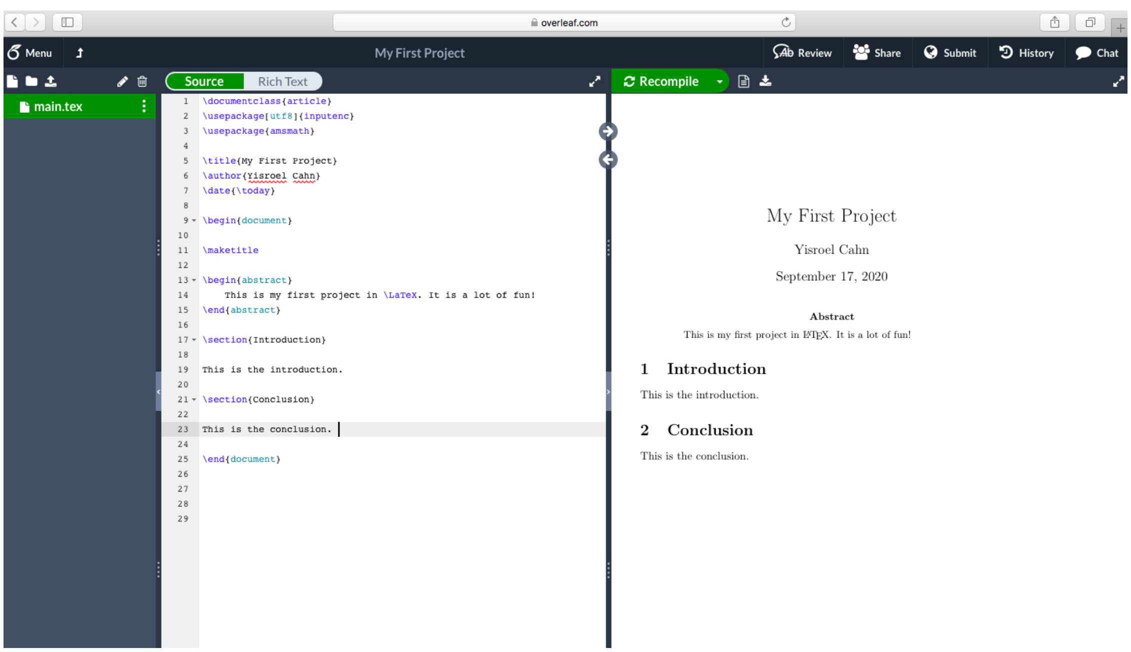
Now that we are finally inside the document, we start by putting the title which we already defined the features for in the preamble.

Part 1 continued on next page. . .

Let's start by doing a couple of things: change your name from you email address to your actual name, change the date to `\today`, add `\usepackage{amsmath}` in the preamble under `\usepackage[utf8]{inputenc}`, add

```
\begin{abstract}
    This is my first project in \LaTeX. It is a lot of fun!
\end{abstract}
```

under `\maketitle`, type "`This is the introduction.`" in the introduction section, and add a section called "Conclusion" (by writing `\section{Conclusion}` after the introcution section) with the word "`This is the conclusion.`" in it. After you press `ctrl+s` or hit "Recompile," your screen should look like this



Basic Commands and Math Mode

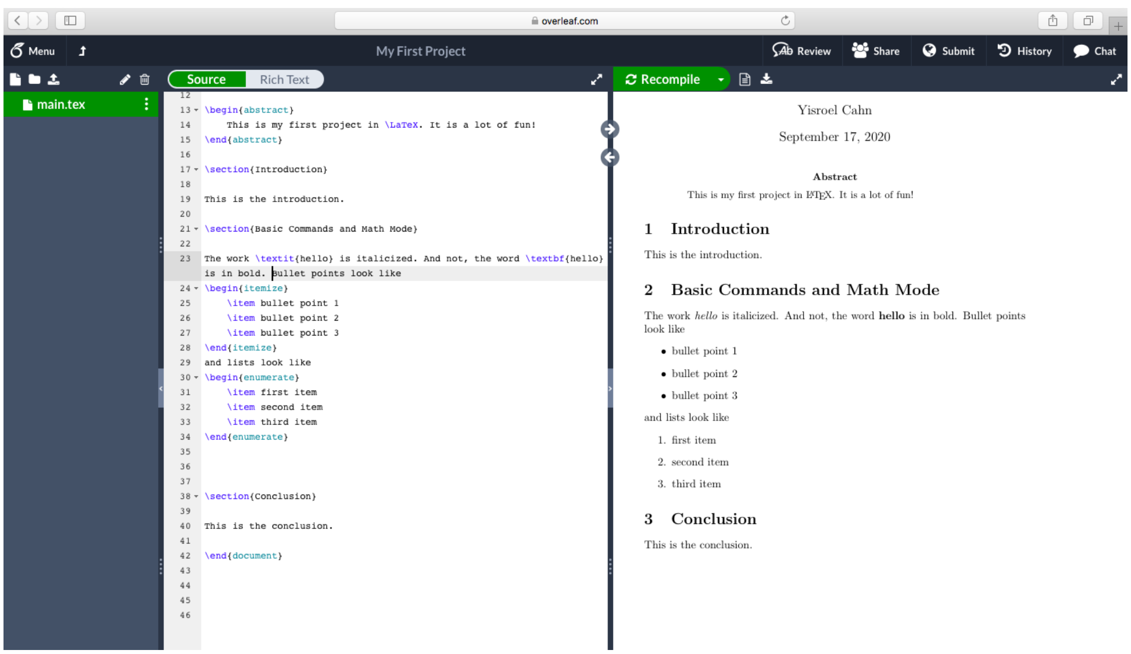
Commands in Latex are done using the backslash button (\). Create a section in between the introduction and the conclusion called "Basic Commands and Math Mode." Then type

```
The word \textit{hello} is italicized. And now, the word \textbf{hello} is in bold.
```

Notice that things inside the `{}` are the arguments of the command. A common command is to begin and end an object. For example, type

```
Bullet points look like
\begin{itemize}
    \item bullet point 1
    \item bullet point 2
    \item bullet point 3
\end{itemize}
and lists look like
\begin{enumerate}
    \item first item
    \item second item
    \item third item
\end{enumerate}
```

in the same section. Your screen should look like this



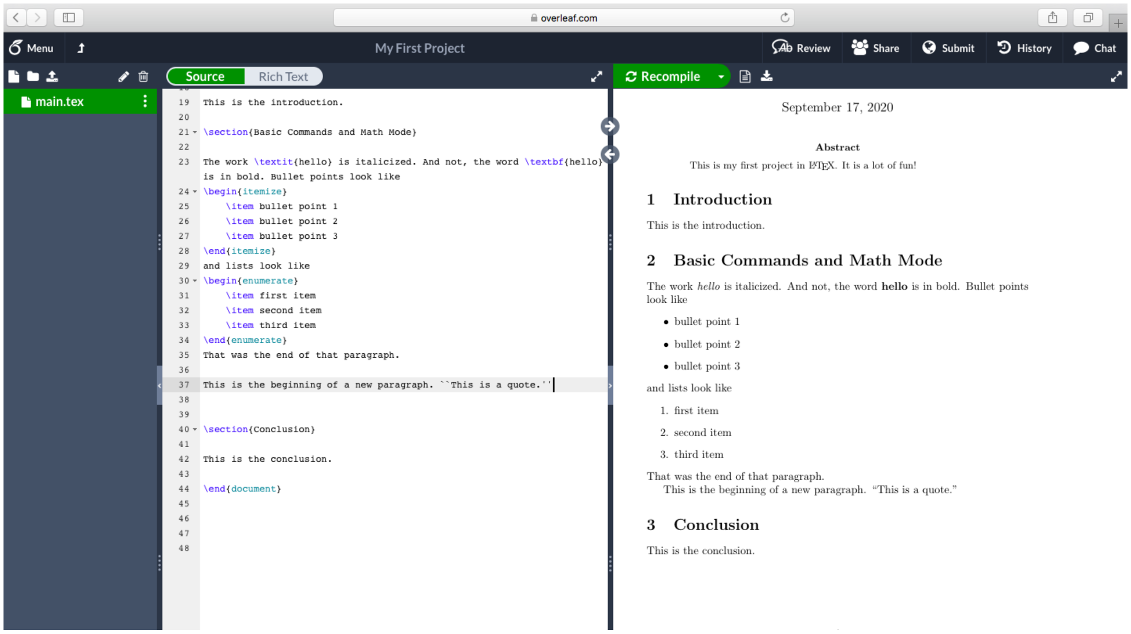
If you want to write something in the source code to explain what you are doing (for someone else who might look at your source code or for yourself for future reference so you don't forget), you can write a comment. Comment by using the `%`. For example write "`%this is a comment`" above "`\section{Conclusion}`". New paragraphs are started by leaving a space between paragraphs in the source code. Continuing from where we left off, add

```
    ...
    \item third item
\end{enumerate}
That was the end of that paragraph.

This is the beginning of a new paragraph.
```

Part 1 continued on next page. . .

Quotations are done using two back-ticks and two apostrophes (‘‘’’) and single quotations are done with one back-tick and apostrophe (‘’). Add `‘‘This is a quote.’’` to the end of the last paragraph. Your screen should look like



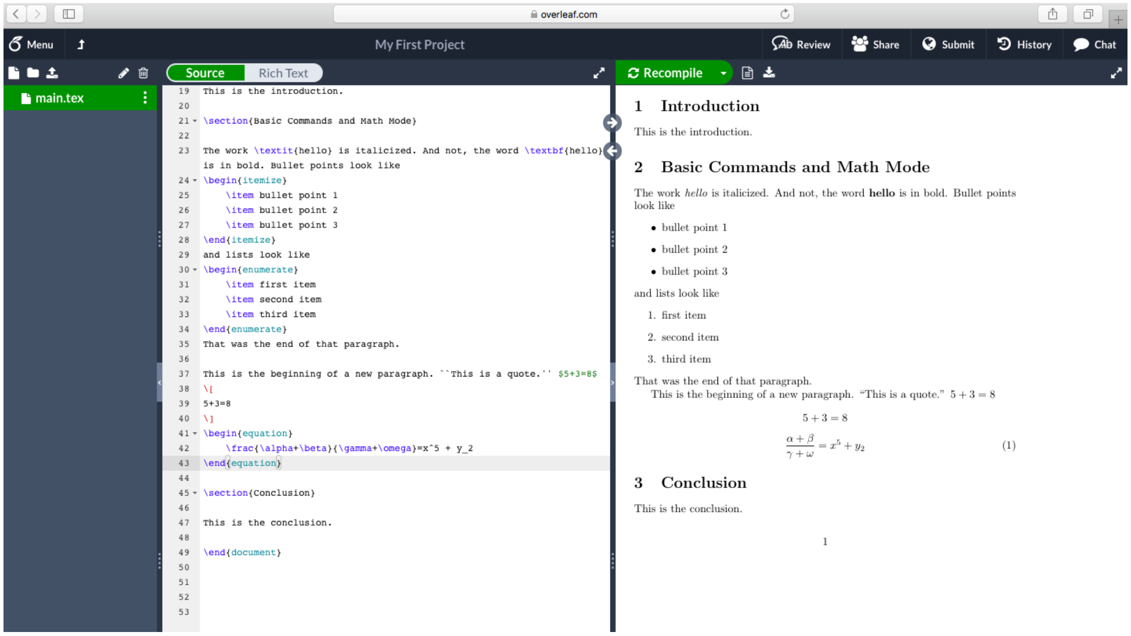
Latex has a separate mode for entering math equations. To enter math mode in-line use `$` and exit in-line math mode also with `$`. To enter and exit math mode on a new line use `\[ \]`. Add `$5+3=8$` to the end of the last paragraph and

```
\[
5+3=8
\]
```

right after. To write an equation, some math symbols, superscripts, subscripts, and fractions, type for example

```
\begin{equation}
    \frac{\alpha+\beta}{\gamma+\omega}=x^5 + y_2
\end{equation}
```

Your screen should look like



`\frac` is how to right fractions in math mode with the first argument in `{}` being the numerator and the second argument in the second `{}` being the denominator. Try typing

$$\frac{1}{2}+\left(\frac{\alpha}{2}\right)^2=\frac{2+\alpha^2}{4}$$

in the same section and note that in order to make the parenthesis larger, you need to write "`\left(`" and "`\right)`" so that the parenthesises becomes as large as what is in-between them.
Next, in the same section, try typing

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

by googling how to do the plus-minus sign and square root sign in Latex.
To produce aligned equations like

$$\begin{aligned} y&=6+7\\ &=(3+3)+(4+3)\\ &=(3+2+1)+(2+2+3) \end{aligned}$$

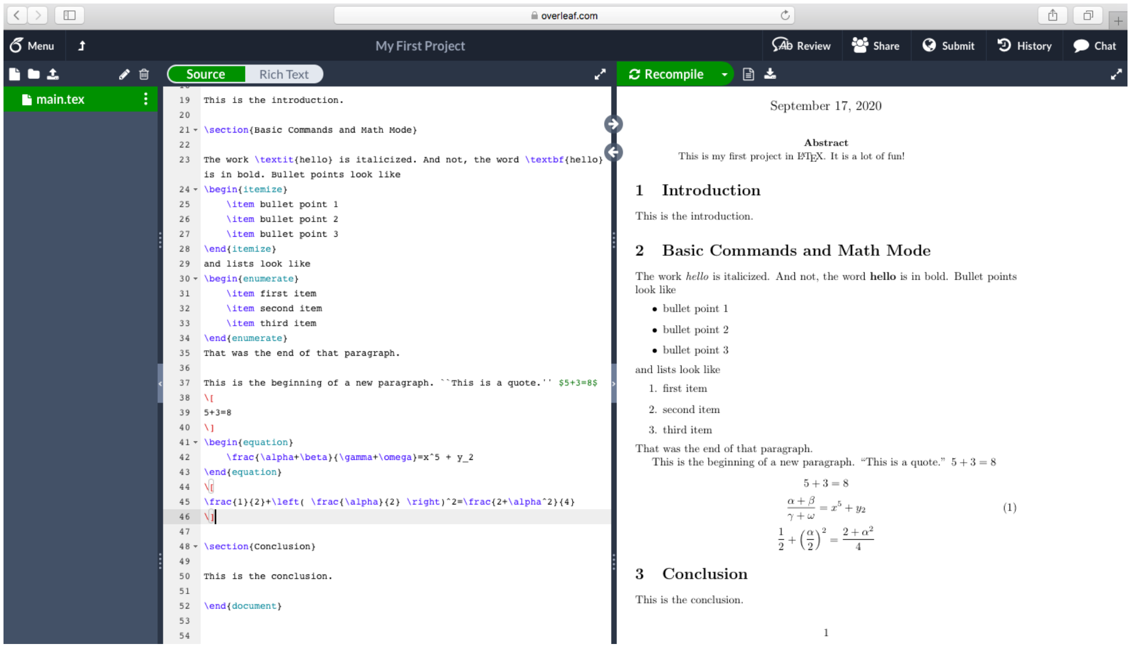
type

```
\begin{align*}
    y&=6+7 \\
     &=(3+3)+(4+3) \\
     &= (3+2+1)+(2+2+3)
\end{align*}
```

in the same section, and note that `\\` starts a new line and `&` is where the equation aligns. Add

```
\begin{align}
    y&=6+7 \\
     &=(3+3)+(4+3) \\
     &= (3+2+1)+(2+2+3)
\end{align}
```

in the same section and note that it puts equations numbers after each line.
Your screen should look like



Referencing

Make a new section before the conclusion called referencing. In it, create two subsections be typing

```
\subsection{Cross-Referencing}
```

```
\subsection{Bibliography}
```

Next to reference the section "Referencing", type `\label{sec:Referencing}` after the section, like

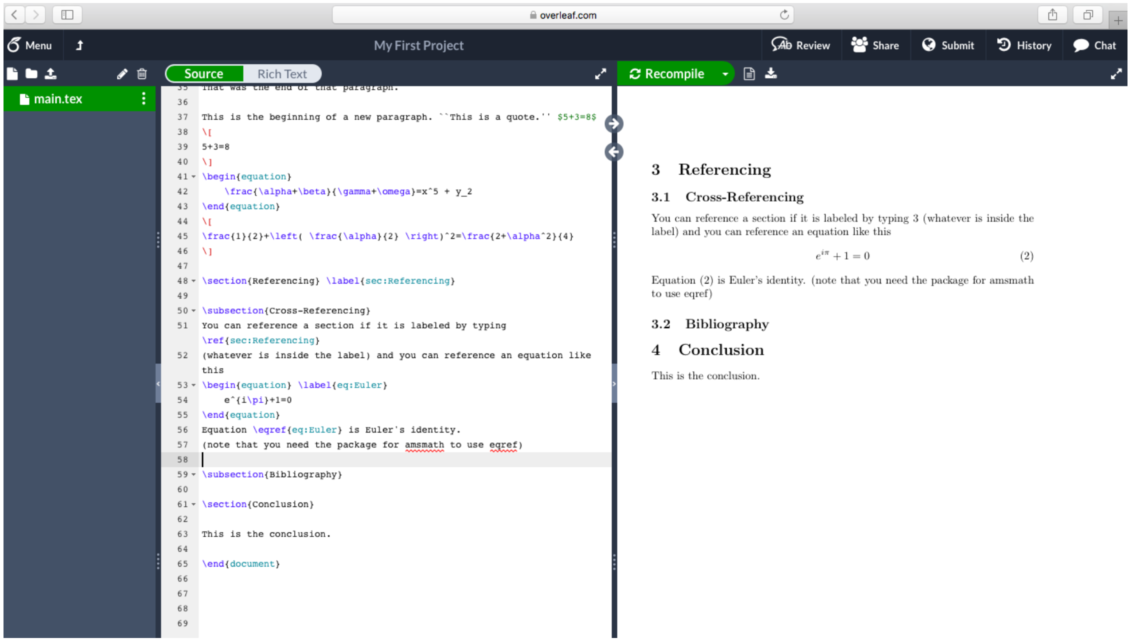
```
\section{Referencing} \label{sec:Referencing}
```

Under the subsection "Cross-Referencing" type

```
You can reference a section if it is labeled by typing \ref{sec:Referencing}
(whatever is inside the label) and you can reference an equation like this
\begin{equation} \label{eq:Euler}
    e^{i\pi}+1=0
\end{equation}
Equation \eqref{eq:Euler} is Euler's identity.
(note that you need the package for amsmath to use eqref)
```

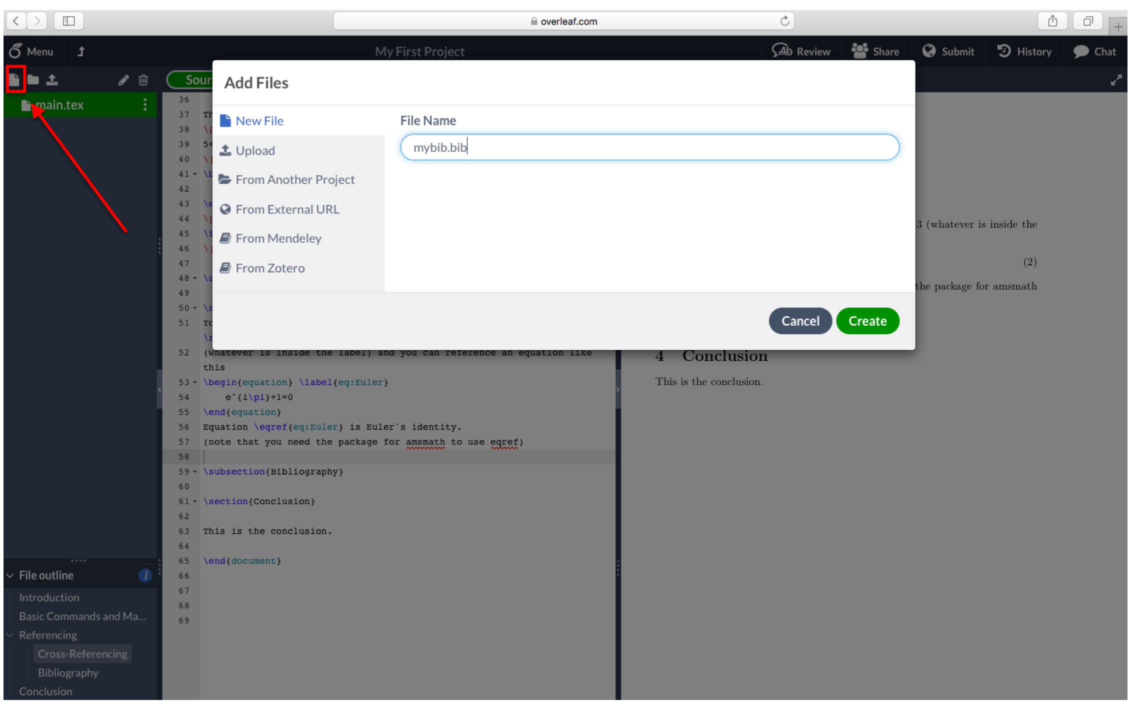
Your screen should look like

Part 1 continued on next page. . .



Cross-referencing in this way is extremely useful. While writing a paper, you will be moving around sections, equations, figures, and tables (which we will talk about shortly) and having to manually change each cross-reference would be a nightmare!

Now we are going to add a bibliography. Click the page button and create a bibliography file called "mybib.bib" (as shown in the figure below).



In the new file type

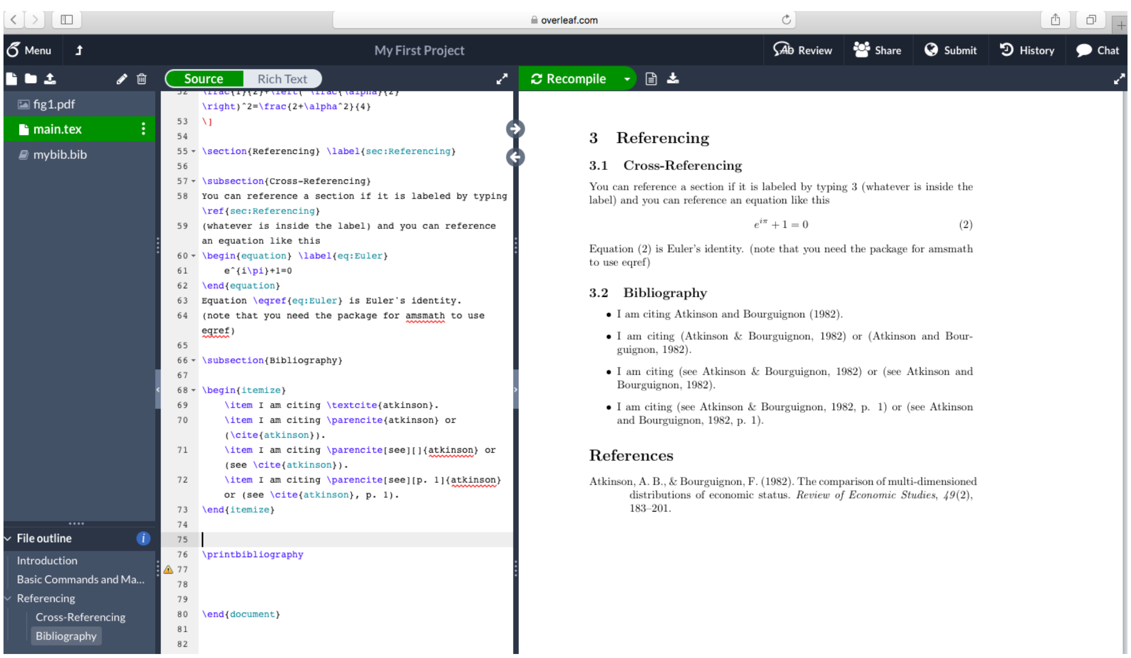
```
@article{atkinson,
Author = {Atkinson, Anthony B. and Bourguignon, Francois},
```

```
ISSN = {00346527},
Journal = {Review of Economic Studies},
Keywords = {Welfare Theory--General 0240},
Number = {2},
Pages = {183 - 201},
Title = {The Comparison of Multi-Dimensioned Distributions of Economic Status.},
Volume = {49},
Year = {1982},
}
```

Hit `cntrl+s` and click on main.tex to go back to the main file. In the preamble, add `\usepackage[style=apa]{biblatex}` and right underneath add `\addbibresource{mybib.bib}`. The first line that we added to the preamble imports the package for bibliography with APA style references and the second line we imported our bib file into main.
Now under the subsection bibliography type

```
\begin{itemize}
    \item I am citing \textcite{atkinson}.
    \item I am citing \parencite{atkinson} or (\cite{atkinson}).
    \item I am citing \parencite[see][]{atkinson} or (see \cite{atkinson}).
    \item I am citing \parencite[see][p. 1]{atkinson} or (see \cite{atkinson}, p. 1).
\end{itemize}
```

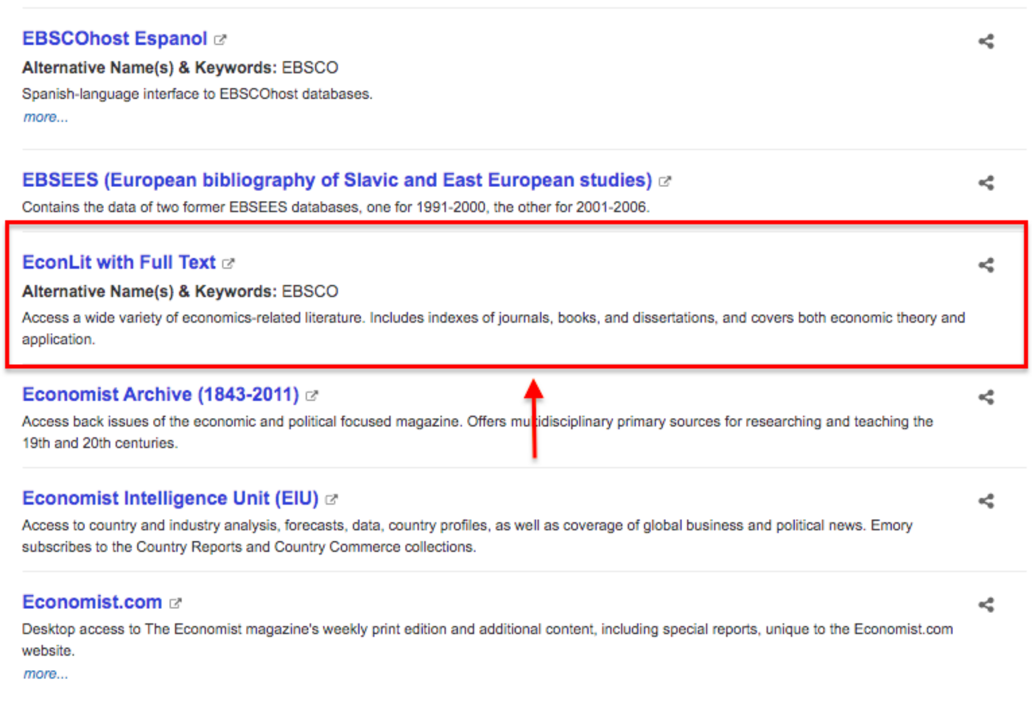
and add `\printbibliography` right before `\end{document}` at the end of the document. See figure below



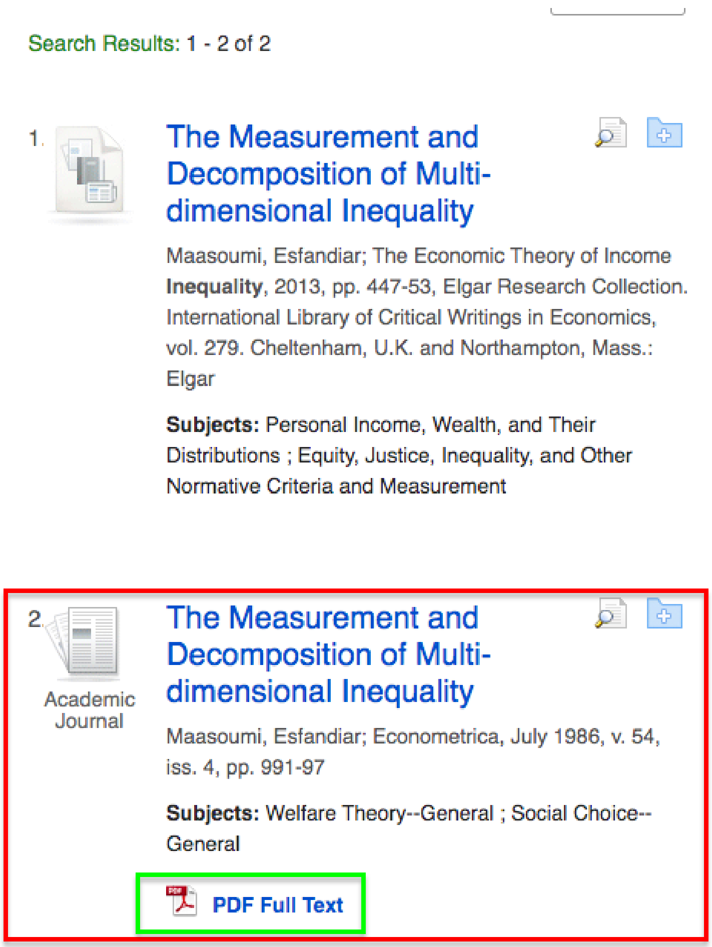
Add `\usepackage{hyperref}` to the end of the preamble to make references hyperlinks. The referencing style can easily be changed. Try changing the style to `mla` or `phys` by changing `\usepackage[style=apa]{biblatex}` to `\usepackage[style=mla]{biblatex}` or `\usepackage[style=pys]{biblatex}` (you do not need to do this, it is just to show you that the referencing style can be changed easily).
Now, we are going to find articles through a database and export the citation. Go to `https://guides.libraries.emory.edu/az.php` or google "Emory library database" and click the first link. These are all

Part 1 continued on next page. . .

the databases Emory has access to, many of them are in fields other than economics. For economics, we will use Econlit. Click 'E', find Econlit, and log in using your Emory account (see figure below).



Search "The Measurement and Decomposition of Multi-dimensional Inequality". The article seems to have been used in a book, but the you can access the original by click "PDF Full Text" (see figure below).



Search Results: 1 - 2 of 2

1. The Measurement and Decomposition of Multi-dimensional Inequality

Maasoumi, Esfandiar; The Economic Theory of Income **Inequality**, 2013, pp. 447-53, Elgar Research Collection. International Library of Critical Writings in Economics, vol. 279. Cheltenham, U.K. and Northampton, Mass.: Elgar

Subjects: Personal Income, Wealth, and Their Distributions ; Equity, Justice, Inequality, and Other Normative Criteria and Measurement

2. Academic Journal

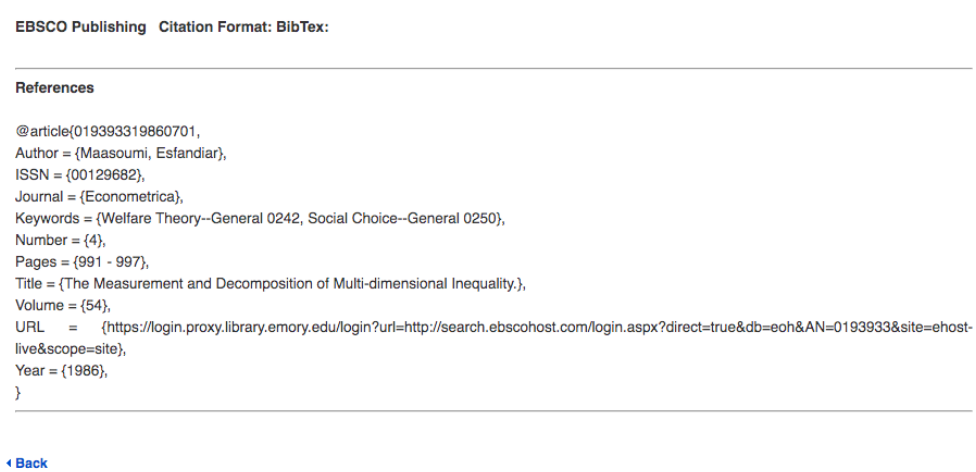
The Measurement and Decomposition of Multi-dimensional Inequality

Maasoumi, Esfandiar; Econometrica, July 1986, v. 54, iss. 4, pp. 991-97

Subjects: Welfare Theory--General ; Social Choice--General

PDF Full Text

Now, click on the article's name, click "export" on the right (to export) the citation, click "Citations in BibTeX format", and click "save". Your screen should look like this



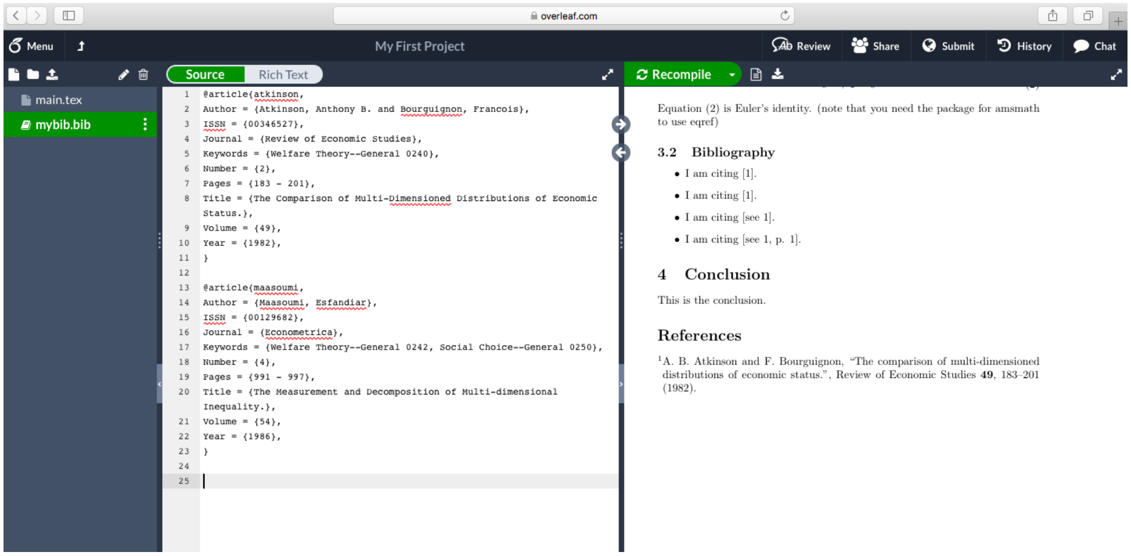
EBSCO Publishing Citation Format: BibTex:

References

@article{019393319860701,
Author = {Maasoumi, Esfandiar},
ISSN = {00129682},
Journal = {Econometrica},
Keywords = {Welfare Theory--General 0242, Social Choice--General 0250},
Number = {4},
Pages = {991 - 997},
Title = {The Measurement and Decomposition of Multi-dimensional Inequality.},
Volume = {54},
URL = {https://login.proxy.library.emory.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eoh&AN=0193933&site=ehost-live&scope=site},
Year = {1986},
}

Back

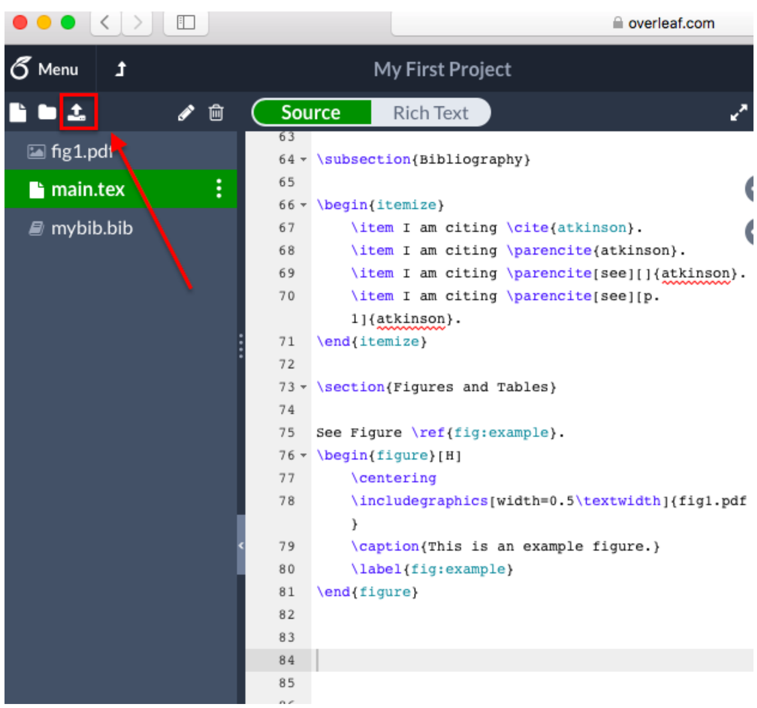
Copy and paste the citation into your "mybib.bib" file in overleaf. Delete the URL line and change the numbers on the first line to "maasouni" (that is how we reference the citation in main), as shown below



Notice that the citation does not show up in references. The citation will only show up if it is called in the text. To make the citation appear in references type `\nocite{maasoumi}` above `\printbibliography`. And, `\nocite{*}` will show all citations in `mybib.bib`.

Figures and Tables

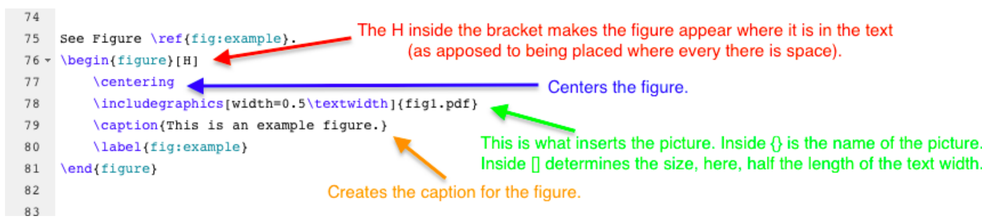
After downloading example.pdf from Canvas, upload it to your project by click the upload button in Overleaf. See the figure below



Add `\usepackage{graphicx}` and `\usepackage{float}` to the preamble. Add a section called "Tables and Figures" before the conclusion section. In the new section type

```
See Figure \ref{fig:example}.
\begin{figure}[H]
    \centering
    \includegraphics[width=0.5\textwidth]{example.pdf}
    \caption{This is an example figure.}
    \label{fig:example}
\end{figure}
```

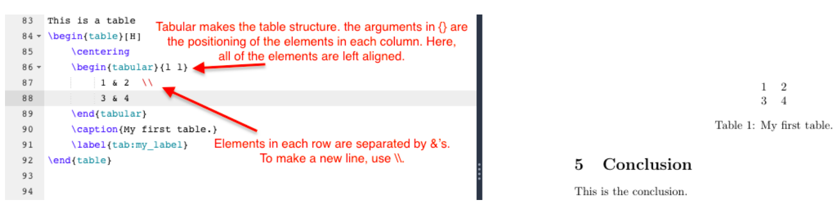
Let's break down what is going on. See the figure below



Next let's make a table. In the same section type

```
This is a table
\begin{table}[H]
    \centering
    \begin{tabular}{l l}
        1 & 2  \\
        3 & 4
    \end{tabular}
    \caption{My first table.}
    \label{tab:my_label}
\end{table}
```

The output should be



To get the gist of it, add the following two tables

```
This is another table
\begin{table}[H]
    \centering
    \begin{tabular}{l c r} \hline \hline
       left & center & right \\  \hline
        1 & 22 & 333 \\
        4444 & 55555 & 66666666 \\
        777 & 88 & 9999 \\ \hline
    \end{tabular}
    \caption{My second table.}
    \label{tab:two}
\end{table}
```

and

```
This is another table
\begin{table}[H]
    \centering
    \begin{tabular}{|l|l|l|}  \hline
        $\alpha$ & $\beta$ & $\gamma$ \\  \hline
         123 & 353 & 94837 \\
         45734 & 54557 & 66 \\
         67783 & 37 & 1899 \\ \hline
    \end{tabular}
    \caption{My third table.}
    \label{tab:three}
\end{table}
```

Last, add this table

Name	Age	Height	Weight
Adam	20	5'9"	165 lb
Benjamin	24	5'5"	152 lb
Carla	19	5'3"	127 lb
Deborah	27	5'6"	141 lb

Tikz

Tikz is a package in latex for drawing figures. Add `\usepackage{tikz}` to the preamble. A good website with lots of economics figures to tweak is `https://sites.google.com/site/kochiuyu/Tikz`.
Make a new section above the conclusion section called "Tikz". In the new section, type

```
Figure \ref{fig:tikz} is a figure using the Tikz package.
\begin{figure}[H]
    \centering
    \begin{tikzpicture}[scale=0.3]
        \draw (5,0) -- (-5, 0);
    \end{tikzpicture}
    \caption{My first Tikz figure}
    \label{fig:tikz}
\end{figure}
```

This draws a line from coordinates (5,0) to (-5,0) and the picture's size is "0.3".
Now type

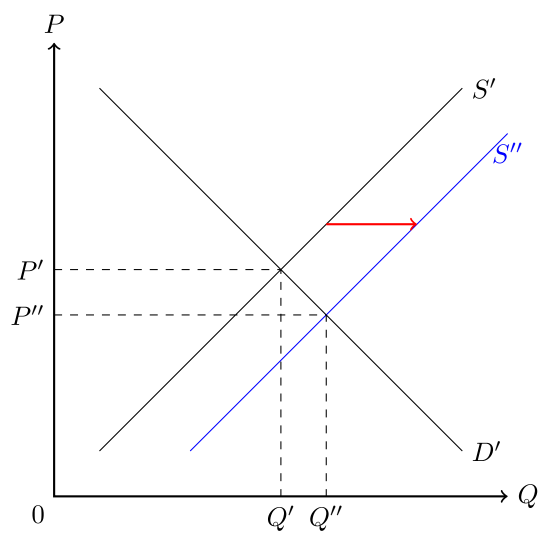
```
Figure \ref{fig:tikz2} is a figure using the Tikz package.
\begin{figure}[H]
    \centering
    \begin{tikzpicture}[scale=0.3]
        \draw (5,0) -- (-5, 0);
        \draw[->] (0,0) -- (5,5);
        \draw[red, dashed] (-1,0) -- (-1,7);
        \node [left] at (-2,3.5) {$W_1$};
        \filldraw [blue] (0,0) circle (4pt);
```

```
    \end{tikzpicture}
    \caption{My second Tikz figure}
    \label{fig:tikz2}
\end{figure}
```

and

```
Figure \ref{fig:tikz3} is a figure using the Tikz package.
\begin{figure}[H]
    \centering
    \begin{tikzpicture}[scale=0.6]
        \draw[thick,<->] (0,10) node[above]{$P$}--(0,0)--(10,0) node[right]{$Q$};
        \node [below left] at (0,0) {$0$};
        \node [below] at (5,0) {$Q^*$};
        \node [left] at (0,5) {$P^*$};
        \draw(1,1)--(9,9) node[right]{\texttt{Supply}};
        \draw(1,9)--(9,1) node[right]{\texttt{Demand}};
        \draw[dashed](0,5)--(5,5)--(5,0);
    \end{tikzpicture}
    \caption{My third Tikz figure.}
    \label{fig:tikz3}
\end{figure}
```

Add this figure to the section



note that `P^{\prime \prime}` produces P''.

Beamer

To make slides using latex, the document type is called beamer. This is beyond the scope of this introduction, but interested readers should look at `https://www.overleaf.com/learn/latex/Free_online_introduction_to_LaTeX_(part_3)`.

Note on Errors

Don't panic! Errors happen. It is usually a misspelling. Recompile often and fix errors as soon as they pop up. It is much easier to fix one error than to try to fix several.

Google

Now that you know the basics, if there is anything new you want to do just Google it! Getting good at Latex takes a little while and you will be Googling a lot of things in the beginning, but as you get better, using Latex will be really efficient.

You are done!

You just made your first document in LaTeX! Click "Download PDF" (as shown in the figure below), and submit in on Canvas.

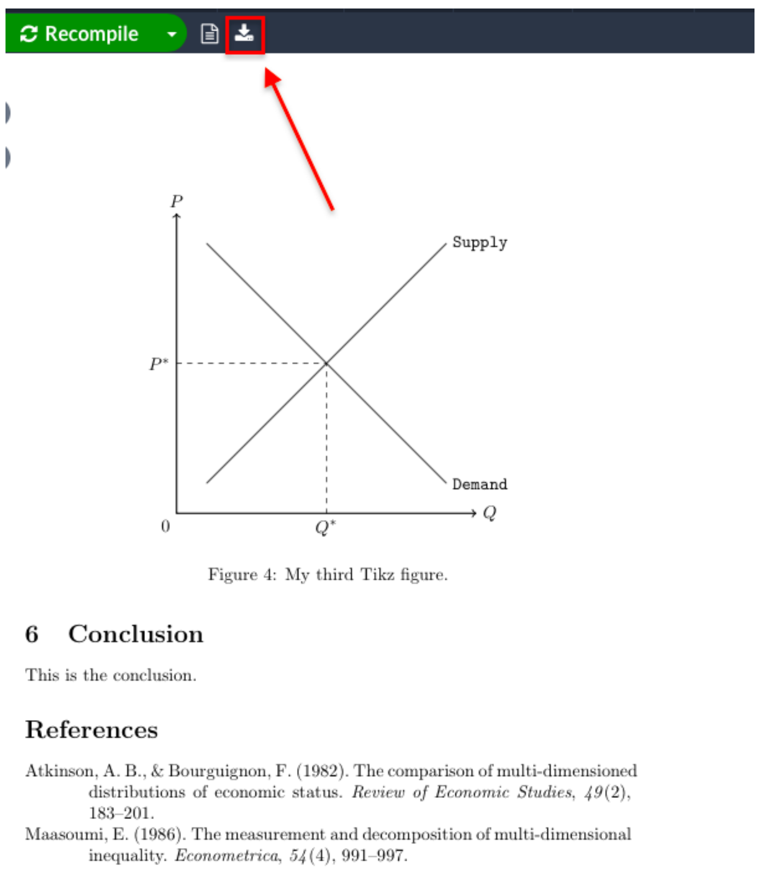


Figure 4: My third Tikz figure.

6 Conclusion

This is the conclusion.

References

Atkinson, A. B., & Bourguignon, F. (1982). The comparison of multi-dimensioned distributions of economic status. *Review of Economic Studies*, *49*(2), 183–201.

Maasoumi, E. (1986). The measurement and decomposition of multi-dimensional inequality. *Econometrica*, *54*(4), 991–997.

Part 2

What is the effect of a policy?

Suppose the government implements a policy. How do we know the effect of that policy on some outcome of interest? For example, suppose a state increases its minimum wage. How do we know what the effect of that increase in minimum wage is on employment? As we learned, if the assumptions of a perfectly competitive market hold, individuals are acting rationally, and the minimum wage is binding (there are people working at a wage below the new minimum wage), then there should be a decrease in employment. However, these assumptions likely do not hold in most of the cases we might be interested in—particularly the assumption of a perfectly competitive market. While we could try relaxing some assumptions and see what results follow, we would still have to rely on some other *a priori* assumptions, which may not be *a priori* in the true meaning of the word (i.e. self-evident). Indeed, there might be no such thing as true self-evident assumptions in economics. That is why empirical economics is important. We would like to deduce strong, compelling *a posteriori* evidence of the effect of the policy with observational data that does not follow from "*a priori*" assumptions.

To be sure, the theoretical model is still important. The theoretical model allows us to say **how** the policy is effecting a particular outcome. Once we know how the policy works, we can answer more nuanced questions like, if a small minimum wage increase does not reduce employment, then what is the optimal minimum wage level before it does start to reduce employment? As you can see, empirical and theoretical work are not substitutes, but complements.

So, back to our question of how to determine the effect a policy (e.g. minimum wage) has on some outcome of interest (e.g. employment). Naively, one might look at the employment before and after the minimum wage increase and compare the two. However, what if employment would have gone up on its own due to other factors? In that case, it is possible minimum wage reduced jobs but by observing employment before and after would lead you to the conclusion that minimum wage increases jobs.

In the next section we will discuss one possible method for parsing out the causal effect of a policy. Note that much of the technical details have been removed for exposition.

Difference-in-differences

You will have undoubtedly heard of the famous expression "correlation does not equal causation." To demonstrate this idea, consider the case where murders and ice cream sales are positively correlate—that is, when murders increase, so do ice cream sales. Confusing correlation with causation, one might think ice cream sales cause murders. The easily implemented policy prescription would be to reduce ice cream sales in order to reduce murders. Of course, this is silly and there are likely other factors a work, possibly causing both ice cream sales and murders. If we were only interested in predicting murders, using ice cream sales would be perfectly acceptable. But, economics is generally interested in policy and causation, not prediction like, for example, facial recognition (or finance for that matter).

John Stuart Mill postulated five methods for inductively determining causation (see `https://en.wikipedia.org/wiki/Mill%27s_Methods`). Note the "Method of Difference." If the only difference between a control and a treatment group is one thing, A, and the only difference in outcome is one thing, w, then we say A caused w.[3]

Consider Table 1. Let y be the outcome of interest (employment), "Before" is the period before the policy was implemented (period before a minimum wage increase), "After" is the period after the policy was implemented, treatment is a group that gets the minimum wage increase in the "After" period (state that

[3]Modern economics and causal inference is not based on "Mill's Method" but rather on probabilistic models. Curious readers should see the first chapter of `http://fitelson.org/woodward/haavelmo.pdf`. Trygve Haavelmo won a Nobel Prize for formalizing economic models in terms of probabilistic models.

Part 2 continued on next page. . .

implemented a minimum wage increase), and control is a group that does not get a minimum wage increase in the "After" period (state that did not implement a minimum wage increase). So, $y_{\mathrm{c,b}}$ is the employment in the control state before the policy was implemented. Then, $y_{(\mathrm{c,b})}$ - $y_{(\mathrm{c,a})}$ is how much employment changes in the control state (without minimum wage), $y_{(\mathrm{t,b})}$ - $y_{(\mathrm{t,a})}$ is how much employment changes in the treatment group, and hence ($y_{(\mathrm{c,b})}$ - $y_{(\mathrm{c,a})}$)-($y_{(\mathrm{t,b})}$ - $y_{(\mathrm{t,a})}$) is the effect of employment due to the only difference between the control and treatment groups—minimum wage.

	Before	After	Difference
Control	$y_{(\mathrm{c,b})}$	$y_{(\mathrm{c,a})}$	$y_{(\mathrm{c,b})}$ - $y_{(\mathrm{c,a})}$
Treatment	$y_{(\mathrm{t,b})}$	$y_{(\mathrm{t,a})}$	$y_{(\mathrm{t,b})}$ - $y_{(\mathrm{t,a})}$
			($y_{(\mathrm{c,b})}$ - $y_{(\mathrm{c,a})}$)-($y_{(\mathrm{t,b})}$ - $y_{(\mathrm{t,a})}$)

Table 1: Difference-in-differences

Minimum Wage Literature

This section gives you some sources on minimum wage to read. For a nice, nontechnical review of the minimum wage literature, please read `https://www.sas.upenn.edu/~jesusfv/The_Economics_Minimum_Wage_Regulations.pdf`. Or, try: `https://cepr.net/documents/publications/min-wage-2013-02.pdf`. You will need to reference Card and Kruger (1994): `https://davidcard.berkeley.edu/papers/njmin-aer.pdf`. That paper is what really revolutionized how we think about minimum wage (as you will read in Fernandez-Vallaverde).

Paper

For Part 2 of this project, write a short paper (2-4 pages is fine) using Latex. Pretend you are writing the Card and Kruger (1994) paper now. The paper should includes:

1. An abstract, introduction, and conclusion section (10%)
2. A literature review section which summarizes the minimum wage controversy (45%)
3. A reference section using APA referencing (10%)
4. A "Model of Perfect Compotition" section with something similar to Figure 1 of Fernandez-Villaverde drawn with Tikz and explained (20%)
5. A data section briefly describing the data used in Card and Kruger (1994) (5%)
6. A results section with the table of Figure below and explain it. So, what you need to do is put the numbers in from Figure into a table like Table 1 above. Ignore the numbers in parenthesis in Figure , they are the standard errors. (10%)

Most empirical microeconomics papers follow a similar structure. The paper should be structured: abstract, introduction, literature review, data, model (generally this section would be empirical strategy), results, (there would generally be a section here on robustness checks that address any concerns a reader might have so that the results of the paper are compelling), conclusion, references.

Part 2 continued on next page. . .

TABLE 3—AVERAGE EMPLOYMENT PER
IN NEW JERSEY M

Variable	PA (i)	NJ (ii)	Difference, NJ − PA (iii)
	Stores by state		
1. FTE employment before, all available observations	23.33 (1.35)	20.44 (0.51)	−2.89 (1.44)
2. FTE employment after, all available observations	21.17 (0.94)	21.03 (0.52)	−0.14 (1.07)
3. Change in mean FTE employment	−2.16 (1.25)	0.59 (0.54)	2.76 (1.36)

Figure 1: Table 3 in Card and Kruger (1994) showing the difference-in-differences results