Chapter 3. Getting Started with R: data frame

SEOUL WOMEN'S UNIVERSITY
DEPT OF ECONOMICS

Introduction

- 각 entity(사람, 기업, 국가 등)에 대해 다양한 characteristics(특성: 소득, 소비; 판매수입, 이윤; GDP, 인구 ...)들을 요약하는 데이터를 생각해볼 수 있다.

observation	성별	나이	소득	노동시간	...
person 1	F	26	...		
person 2	M	41	...		
person 3	F	37	...		
...					

이와 같은 형태의 데이터를 R로 표현하기 위해서 `data.frame()`을 사용할 수 있다.

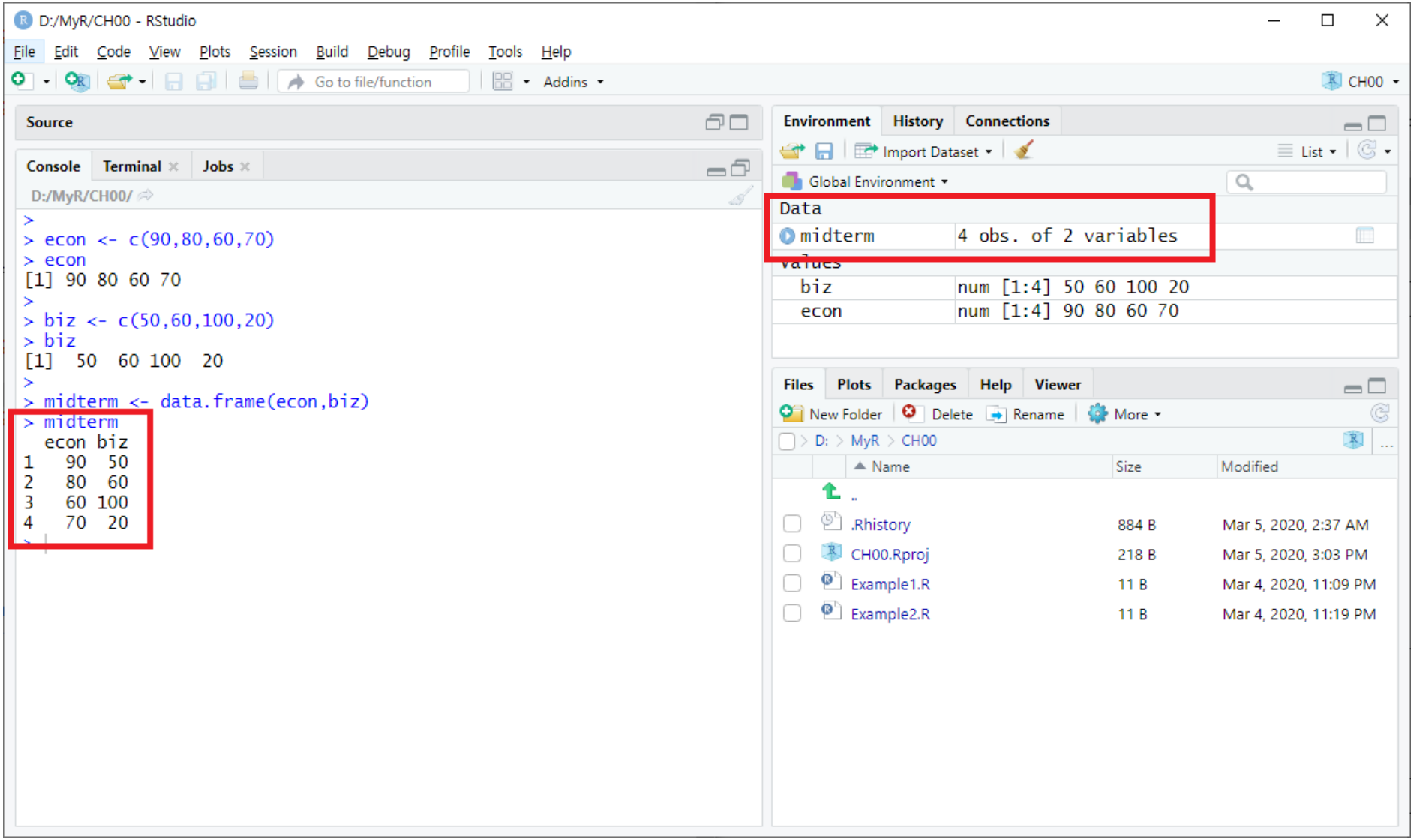
- `data.frame()` 함수를 사용하여 data frame을 만들 수 있다.

midterm	Economics	Business
person 1	90	50
person 2	80	60
person 3	60	100
person 4	70	20

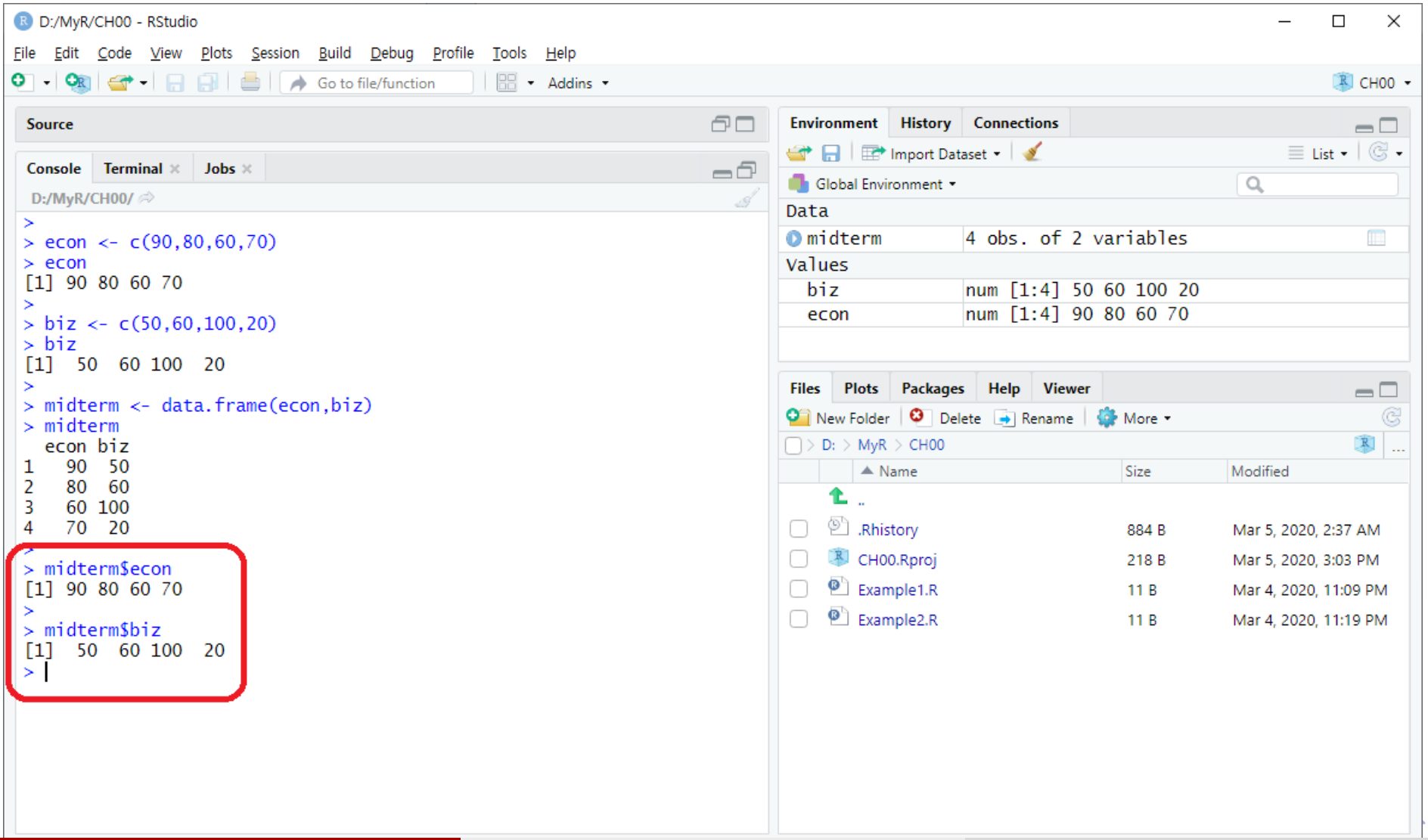
R Console

```
> econ <- c(90,80,60,70)
> econ
 [1] 90 80 60 70
>
> biz <- c(50,60,100,20)
> biz
 [1] 50 60 100 20
>
> midterm <- data.frame(econ,biz)
>
```

- `data.frame()`은 두 개의 numeric vector인 `econ`과 `biz`를 결합하여 하나의 data frame을 만드는 함수이다.
- 새로운 data frame의 이름은 midterm이다. 이어서 `midterm`을 type 해보자.


D:/MyR/CH00 - RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
CH00
Source
Console Terminal Jobs
D:/MyR/CH00/
> econ <- c(90,80,60,70)
> econ
[1] 90 80 60 70
> biz <- c(50,60,100,20)
> biz
[1] 50 60 100 20
> midterm <- data.frame(econ,biz)
> midterm
econ biz
1 90 50
2 80 60
3 60 100
4 70 20
Environment History Connections
Import Dataset
List
Global Environment
Data
midterm 4 obs. of 2 variables
Values
biz num [1:4] 50 60 100 20
econ num [1:4] 90 80 60 70
Files Plots Packages Help Viewer
New Folder Delete Rename More
D: MyR CH00
Name Size Modified
.Rhistory 884 B Mar 5, 2020, 2:37 AM
CH00.Rproj 218 B Mar 5, 2020, 3:03 PM
Example1.R 11 B Mar 4, 2020, 11:09 PM
Example2.R 11 B Mar 4, 2020, 11:19 PM

- data frame `midterm`에 있는 변수들은 econ과 biz이다. econ이란 변수만 보고 싶다면 `midterm$econ`이라고 입력하고, biz라는 변수만 보고 싶다면 `midterm$biz`라고 입력한다.



- econ 점수의 평균과 biz 점수의 평균

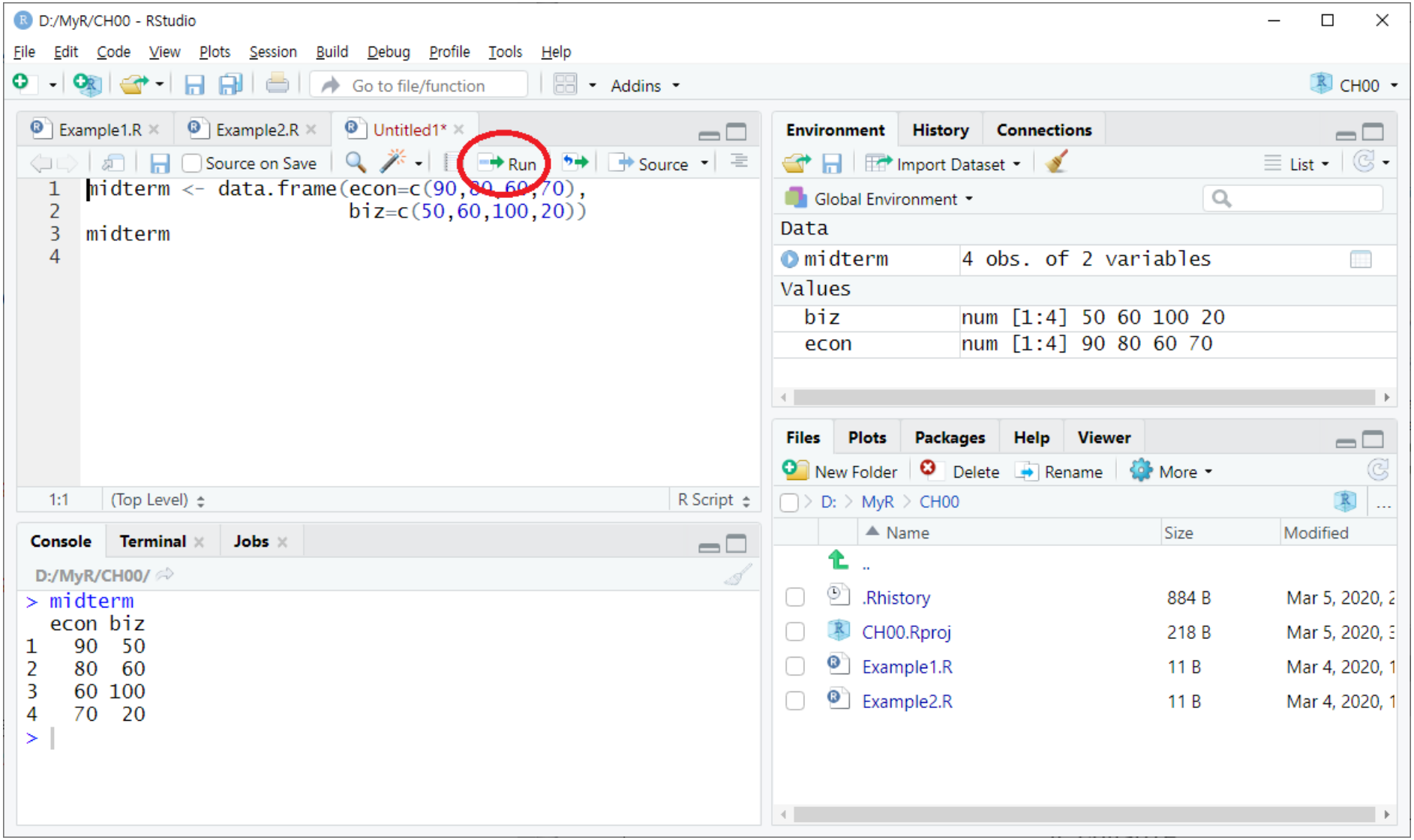
R Console

```
> mean(midterm$econ)
 [1] 75
>
> mean(midterm$biz)
 [1] 57.5
>
```

- data frame을 한 번에 만들 수도 있다. Source 창을 사용하는 것이 좋다. Source 창에서 새로운 스크립트 파일을 열어서 다음과 같이 입력한다.

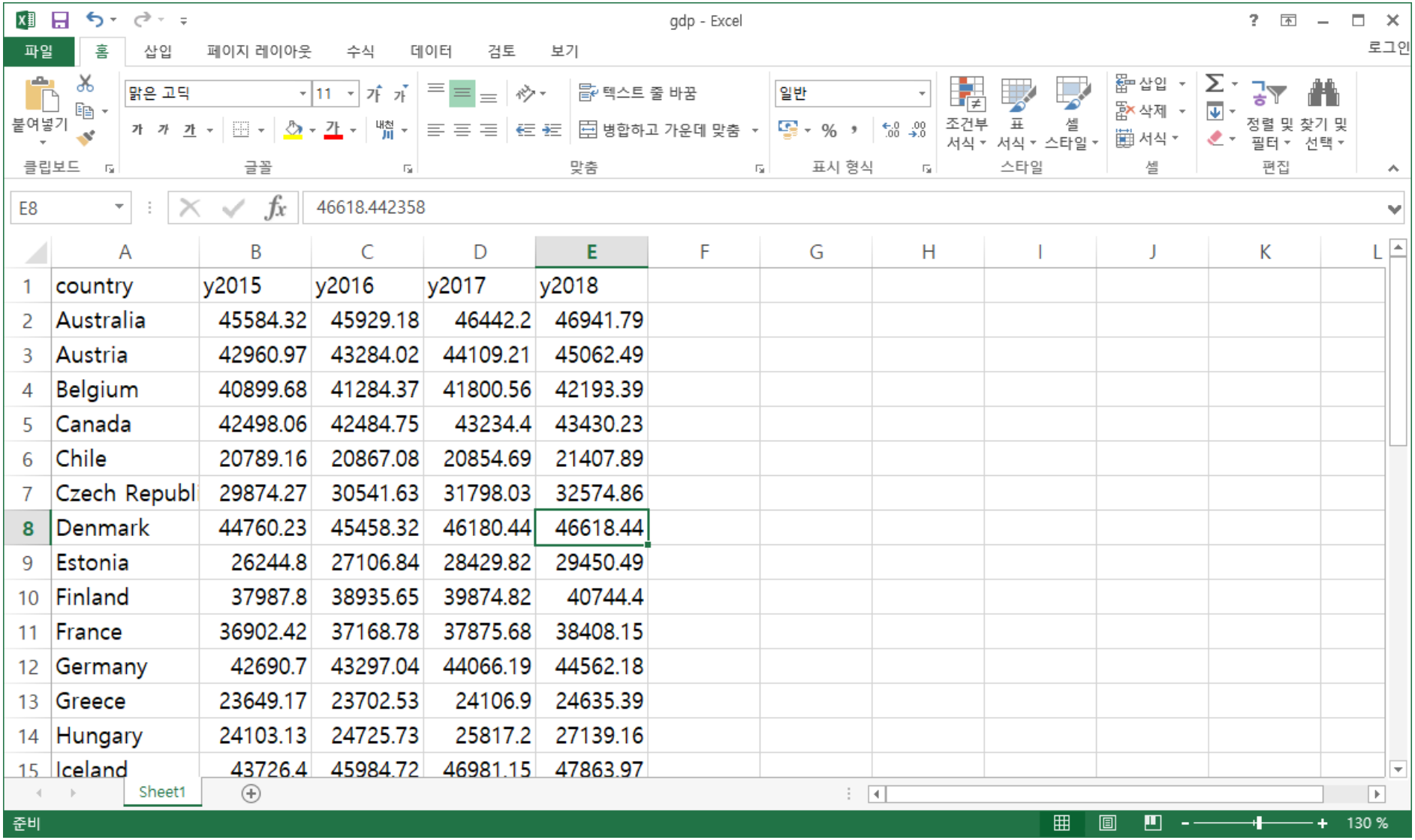
```
midterm <- data.frame(econ=c(90,80,60,70),
                      biz=c(50,60,100,20))
midterm
```

- Run을 클릭한다.


D:/MyR/CH00 - RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
CH00
Example1.R
Example2.R
Untitled1*
Source on Save
Run
Source
1 midterm <- data.frame(econ=c(90,80,60,70),
2 biz=c(50,60,100,20))
3 midterm
4
1:1
(Top Level)
R Script
Console
Terminal
Jobs
D:/MyR/CH00/
> midterm
econ biz
1 90 50
2 80 60
3 60 100
4 70 20
>
Environment
History
Connections
Import Dataset
List
Global Environment
Data
midterm
4 obs. of 2 variables
Values
biz
num [1:4] 50 60 100 20
econ
num [1:4] 90 80 60 70
Files
Plots
Packages
Help
Viewer
New Folder
Delete
Rename
More
D: MyR CH00
Name
Size
Modified
..
.Rhistory
884 B
Mar 5, 2020,
CH00.Rproj
218 B
Mar 5, 2020,
Example1.R
11 B
Mar 4, 2020,
Example2.R
11 B
Mar 4, 2020,

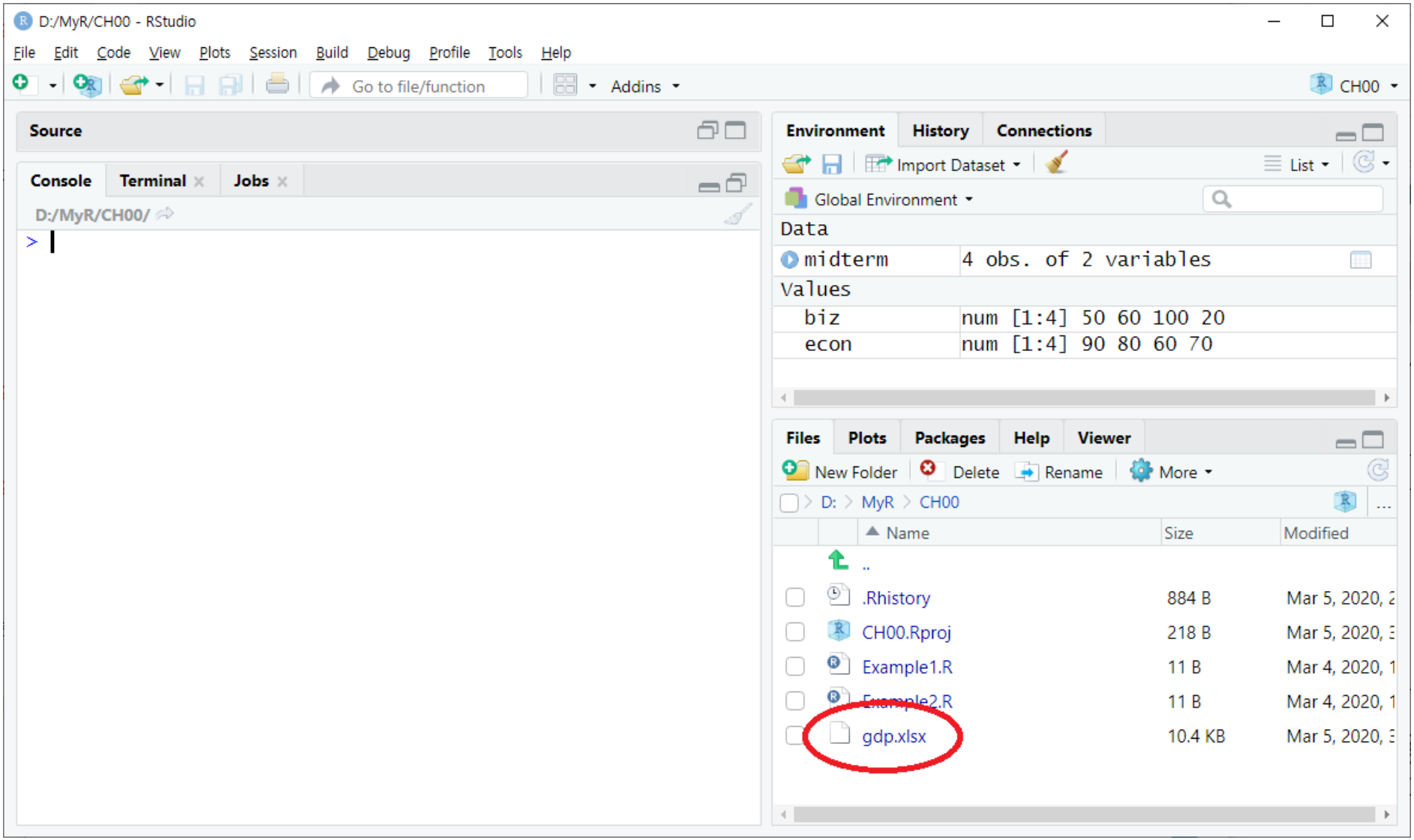
How To Import Files

- ‘spreadsheet’ 형태의 파일들을 R로 불러와서 data frame을 만들 수 있다. 다음과 같은 excel file을 R로 불러오자.

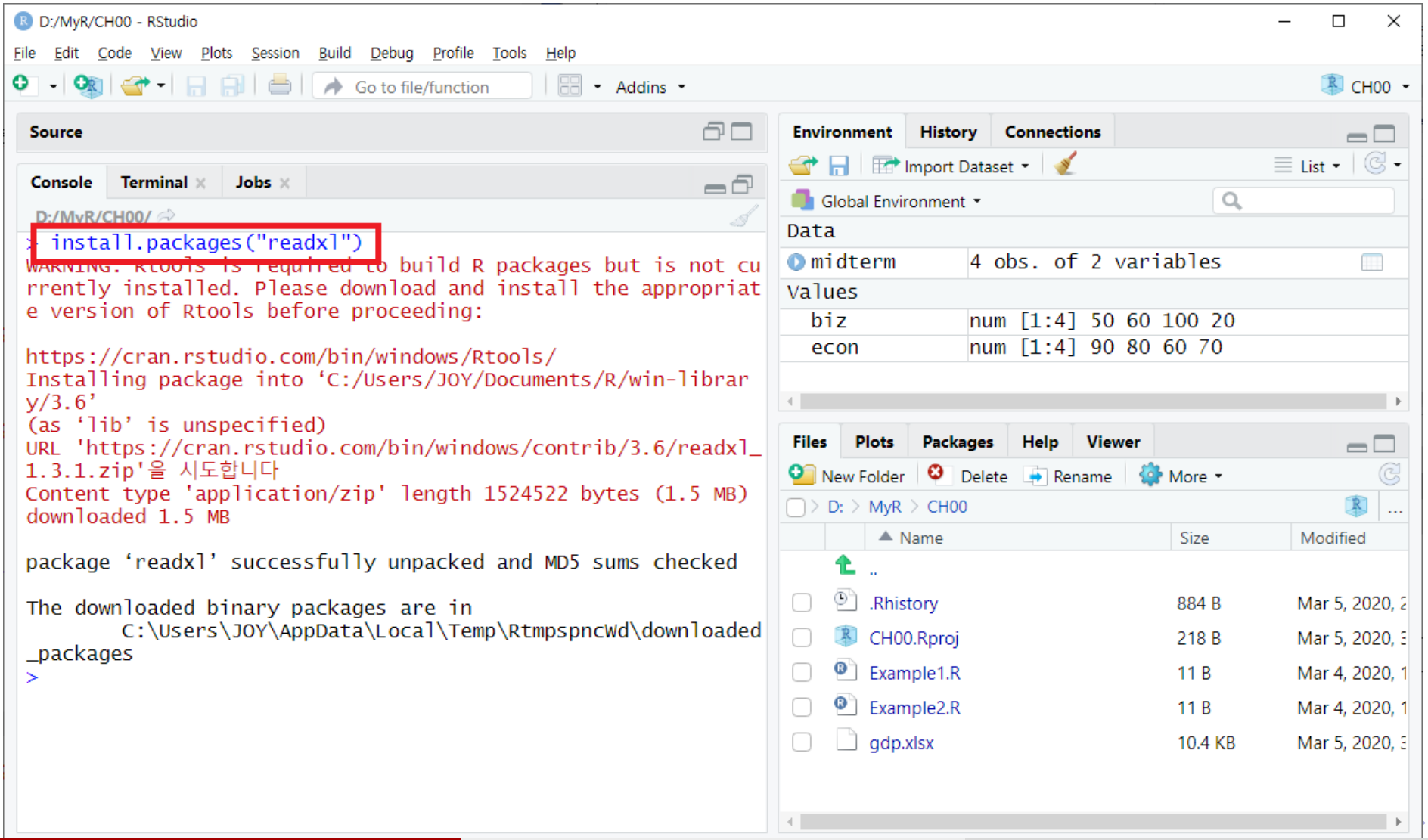


	A	B	C	D	E
1	country	y2015	y2016	y2017	y2018
2	Australia	45584.32	45929.18	46442.2	46941.79
3	Austria	42960.97	43284.02	44109.21	45062.49
4	Belgium	40899.68	41284.37	41800.56	42193.39
5	Canada	42498.06	42484.75	43234.4	43430.23
6	Chile	20789.16	20867.08	20854.69	21407.89
7	Czech Republ	29874.27	30541.63	31798.03	32574.86
8	Denmark	44760.23	45458.32	46180.44	46618.44
9	Estonia	26244.8	27106.84	28429.82	29450.49
10	Finland	37987.8	38935.65	39874.82	40744.4
11	France	36902.42	37168.78	37875.68	38408.15
12	Germany	42690.7	43297.04	44066.19	44562.18
13	Greece	23649.17	23702.53	24106.9	24635.39
14	Hungary	24103.13	24725.73	25817.2	27139.16
15	Iceland	43726.4	45984.72	46981.15	47863.97

- 1단계: 현재 작업 중인 working directory에 해당 파일이 있어야 한다. R로 불러올 파일을 working directory로 옮겨놓는다.



- 2단계: excel file을 불러오기 위해서는 `read_excel()`이라는 함수를 사용해야 한다. 이 함수는 `readxl`이라는 패키지에 들어있다. `readxl` 패키지를 설치한다.

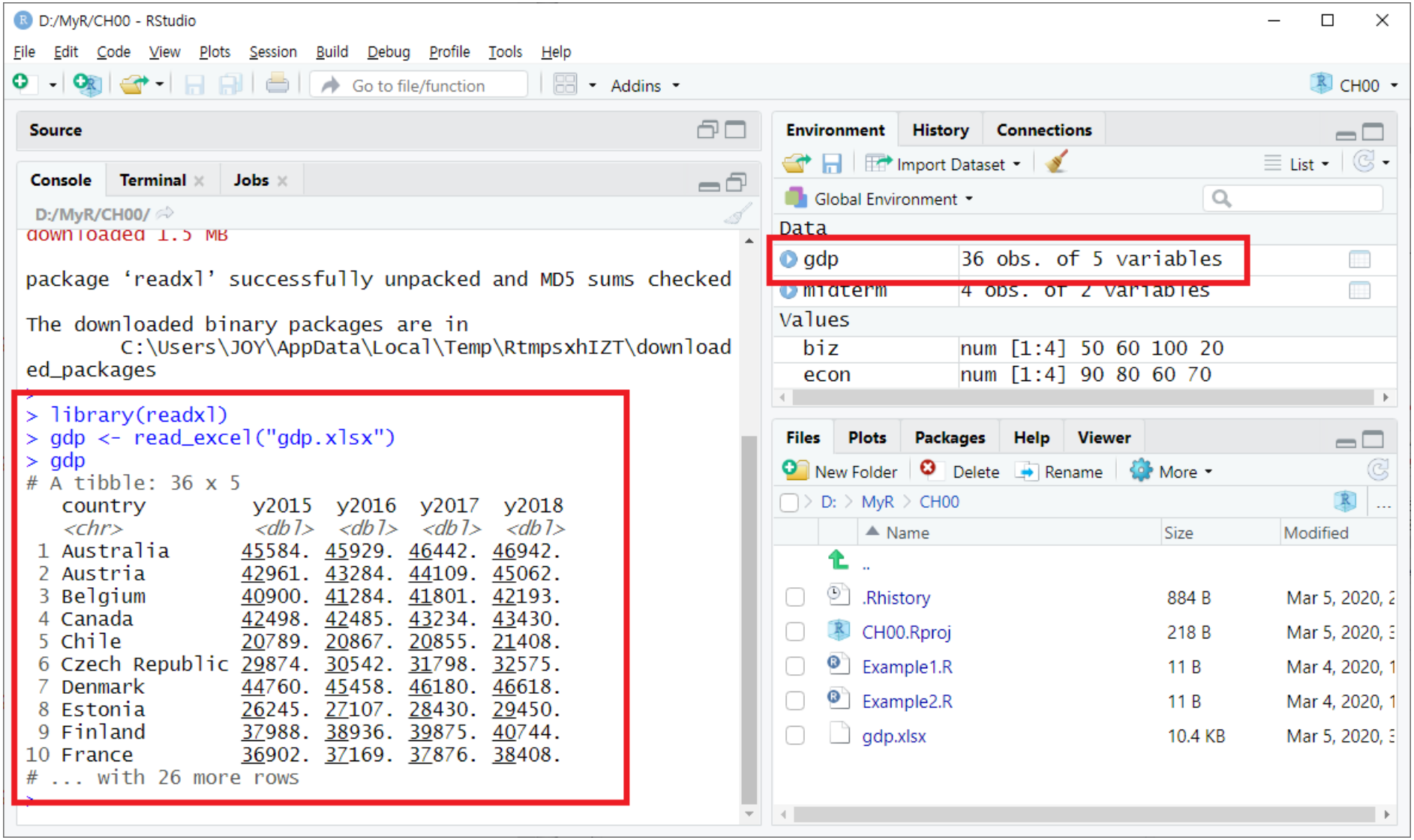


- 3단계: `library(readxl)`를 입력해서 설치한 패키지를 load한다.
- 4단계: `read_excel("파일이름.xlsx")`를 입력해서 excel 파일을 불러온다. R로 불러들인 excel 파일은 data frame 형태로 자동 변환된다.

```
read_excel( "파일이름.xlsx" )
```

R Console

```
> library(readxl)
> gdp <- read_excel("gdp.xlsx")
> gdp
```

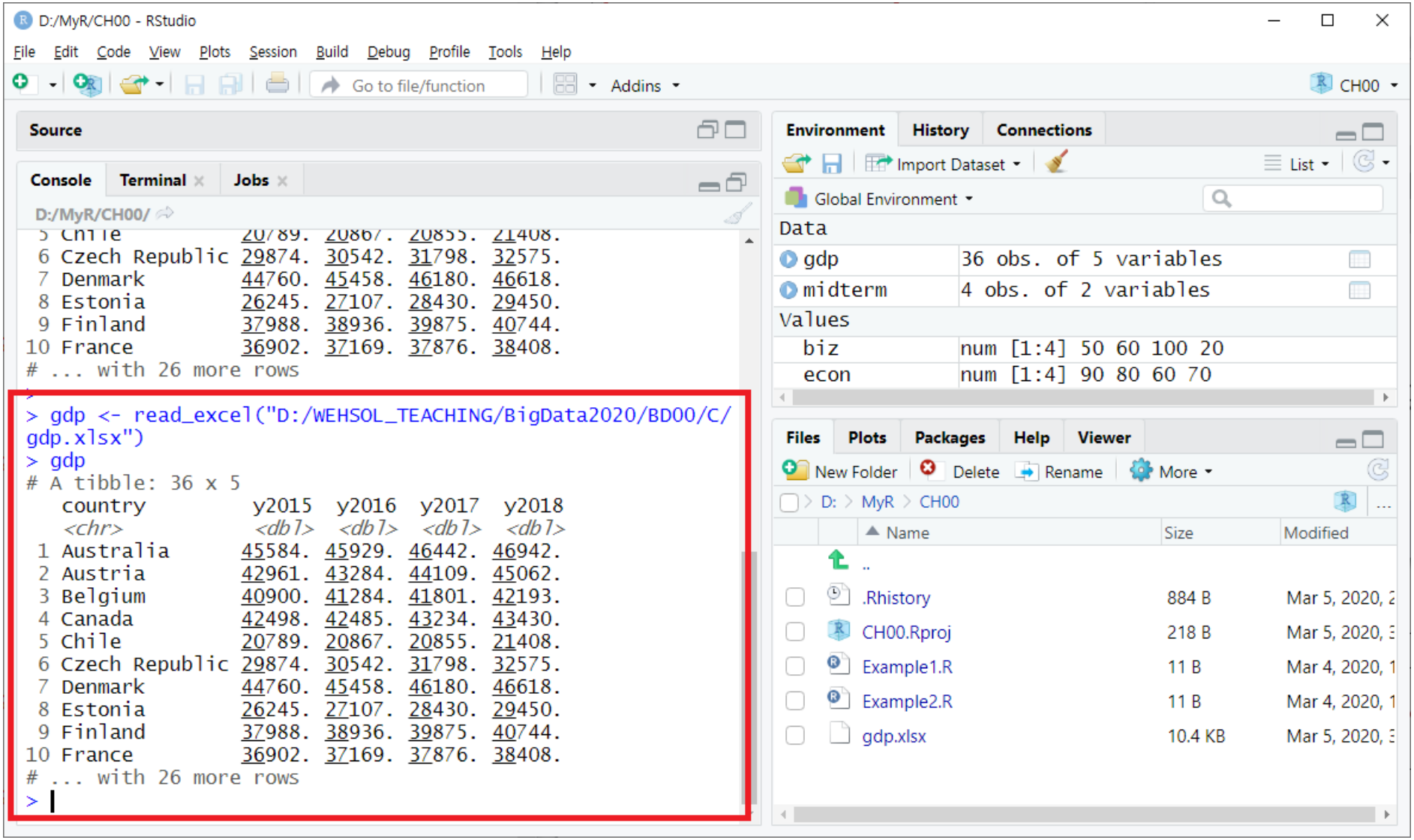

D:/MyR/CH00 - RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
CH00
Source
Console
Terminal
Jobs
D:/MyR/CH00/
downloaded 1.5 MB
package 'readxl' successfully unpacked and MD5 sums checked
The downloaded binary packages are in
C:\Users\JOY\AppData\Local\Temp\RtmpsxhIZT\downloaded_packages
> library(readxl)
> gdp <- read_excel("gdp.xlsx")
> gdp
A tibble: 36 x 5
country y2015 y2016 y2017 y2018
<chr> <dbl> <dbl> <dbl> <dbl>
1 Australia 45584. 45929. 46442. 46942.
2 Austria 42961. 43284. 44109. 45062.
3 Belgium 40900. 41284. 41801. 42193.
4 Canada 42498. 42485. 43234. 43430.
5 Chile 20789. 20867. 20855. 21408.
6 Czech Republic 29874. 30542. 31798. 32575.
7 Denmark 44760. 45458. 46180. 46618.
8 Estonia 26245. 27107. 28430. 29450.
9 Finland 37988. 38936. 39875. 40744.
10 France 36902. 37169. 37876. 38408.
... with 26 more rows
Environment
History
Connections
Import Dataset
List
Global Environment
Data
gdp 36 obs. of 5 variables
midterm 4 obs. of 2 variables
Values
biz num [1:4] 50 60 100 20
econ num [1:4] 90 80 60 70
Files
Plots
Packages
Help
Viewer
New Folder
Delete
Rename
More
D: > MyR > CH00
Name
Size
Modified
..
.Rhistory 884 B Mar 5, 2020,
CH00.Rproj 218 B Mar 5, 2020,
Example1.R 11 B Mar 4, 2020,
Example2.R 11 B Mar 4, 2020,
gdp.xlsx 10.4 KB Mar 5, 2020,

- 불러오고 싶은 파일이 working directory가 아닌 다른 곳에 있는 경우, path를 지정하면 된다.

```
read_excel( ".../.../파일이름.xlsx" )
```

R Console

```
> library(readxl)
> gdp <- read_excel("D:/WEHSOL_TEACHING/BigData2020/BD00/C/gdp.xlsx")
> gdp
```


D:/MyR/CH00 - RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
CH00
Source
Console
Terminal
Jobs
D:/MyR/CH00/
5 Chile 20789. 20867. 20855. 21408.
6 Czech Republic 29874. 30542. 31798. 32575.
7 Denmark 44760. 45458. 46180. 46618.
8 Estonia 26245. 27107. 28430. 29450.
9 Finland 37988. 38936. 39875. 40744.
10 France 36902. 37169. 37876. 38408.
... with 26 more rows
> gdp <- read_excel("D:/WEHSOL_TEACHING/BigData2020/BD00/C/gdp.xlsx")
> gdp
A tibble: 36 x 5
country y2015 y2016 y2017 y2018
<chr> <dbl> <dbl> <dbl> <dbl>
1 Australia 45584. 45929. 46442. 46942.
2 Austria 42961. 43284. 44109. 45062.
3 Belgium 40900. 41284. 41801. 42193.
4 Canada 42498. 42485. 43234. 43430.
5 Chile 20789. 20867. 20855. 21408.
6 Czech Republic 29874. 30542. 31798. 32575.
7 Denmark 44760. 45458. 46180. 46618.
8 Estonia 26245. 27107. 28430. 29450.
9 Finland 37988. 38936. 39875. 40744.
10 France 36902. 37169. 37876. 38408.
... with 26 more rows
>
Environment
History
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Import Dataset
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Global Environment
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gdp 36 obs. of 5 variables
midterm 4 obs. of 2 variables
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biz num [1:4] 50 60 100 20
econ num [1:4] 90 80 60 70
Files
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New Folder
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Rename
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D: MyR CH00
Name
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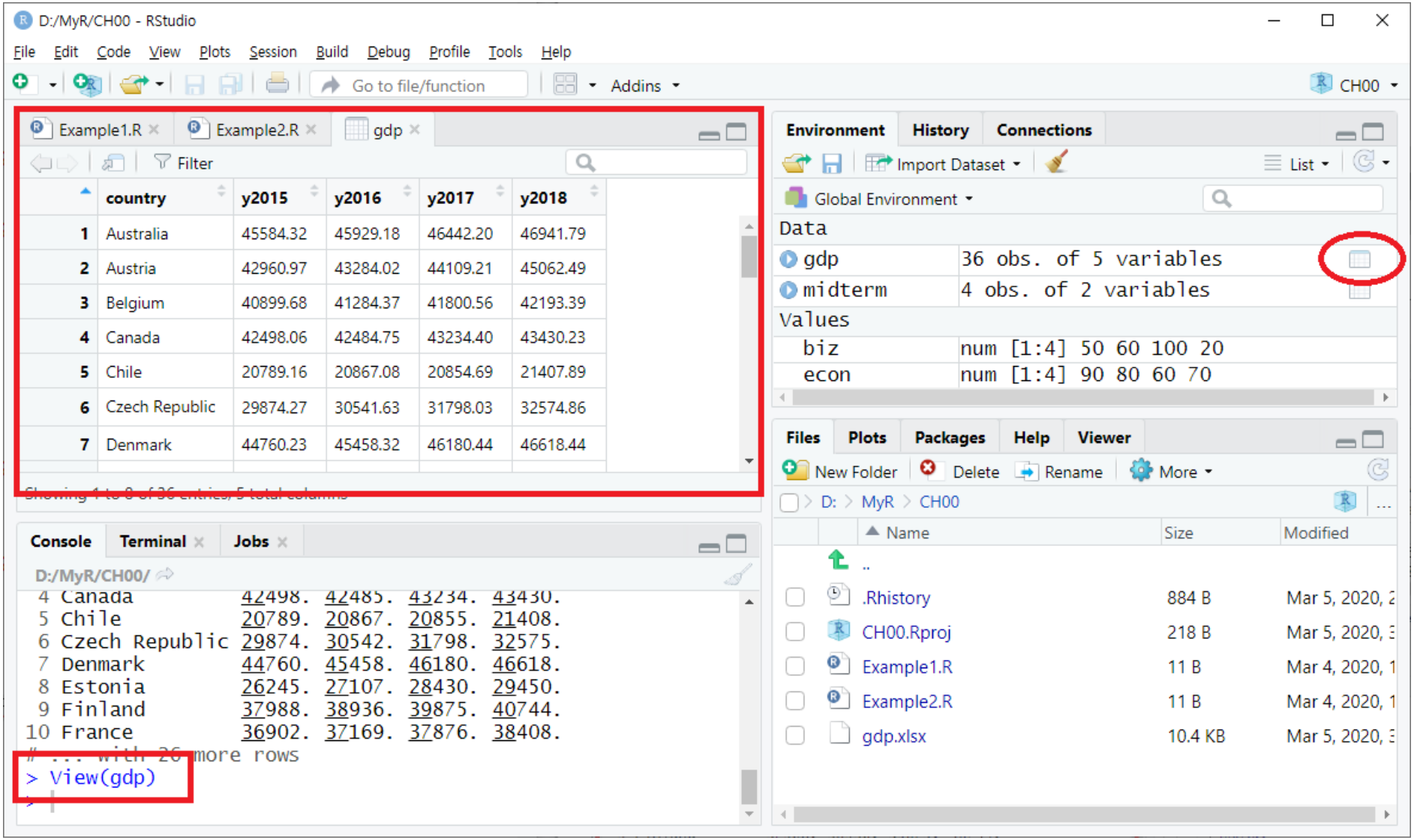
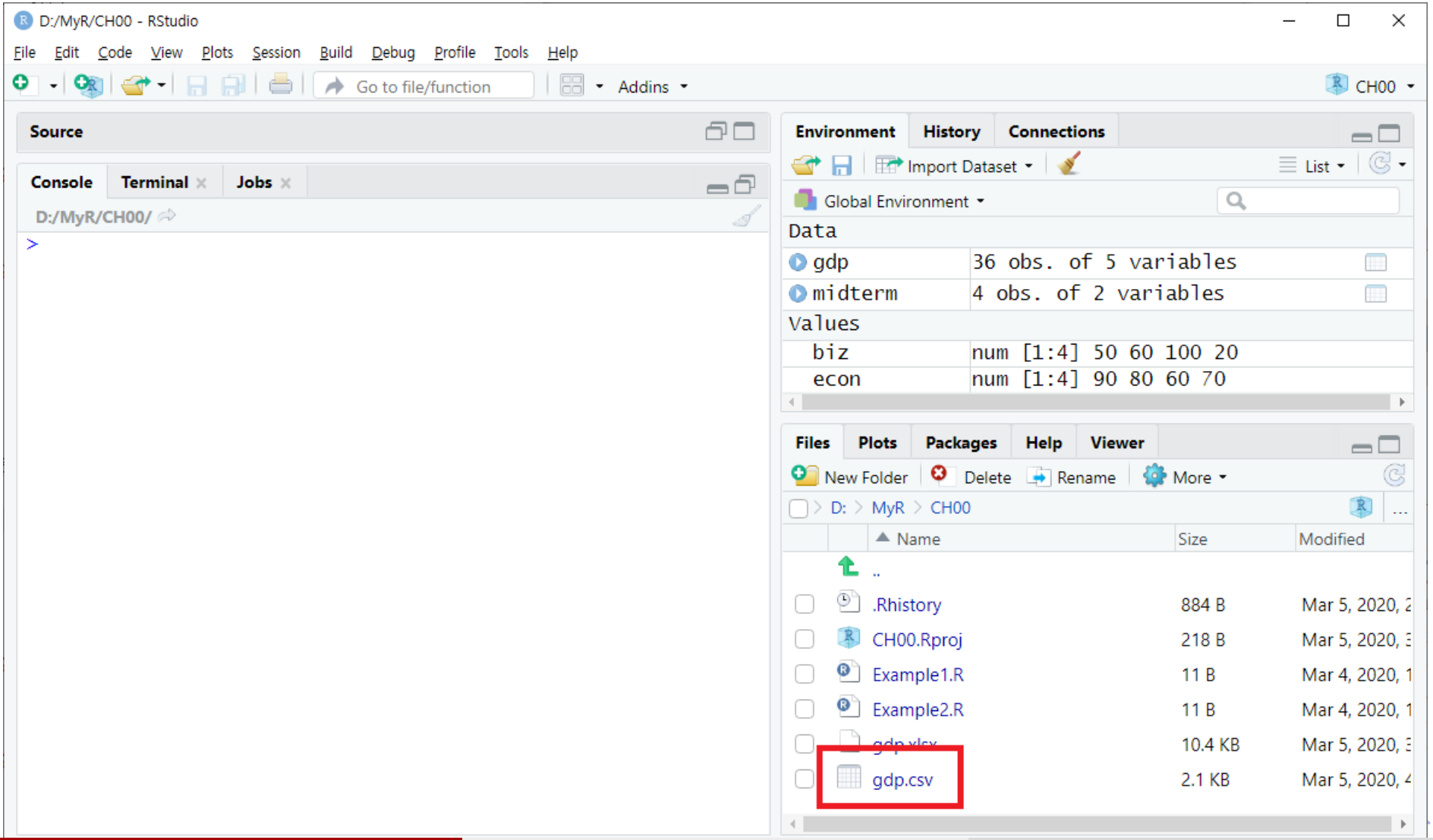
Modified
..
.Rhistory 884 B Mar 5, 2020,
CH00.Rproj 218 B Mar 5, 2020,
Example1.R 11 B Mar 4, 2020,
Example2.R 11 B Mar 4, 2020,
gdp.xlsx 10.4 KB Mar 5, 2020,

- gdp가 어떻게 생겼는지 직접 확인할 수 있다.



이번에는 다음과 같은 csv(comma separated values) file을 R로 불러오자.

- 1단계: 현재 작업 중인 working directory에 해당 파일이 있어야 한다. R로 불러올 파일을 working directory로 옮겨놓는다.



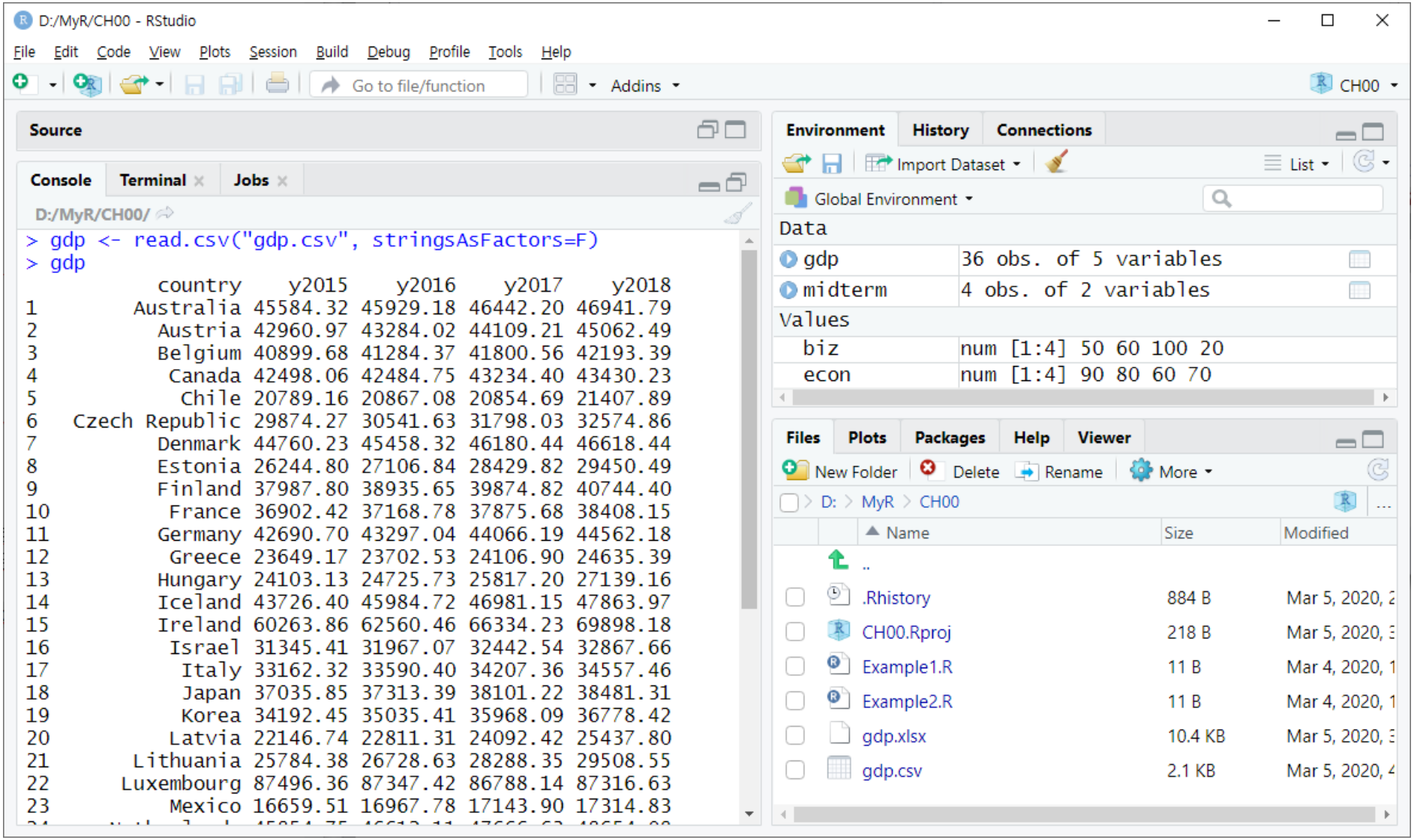
- 2단계: csv file을 불러오기 위해서는 `read.csv()`라는 함수를 사용해야 한다. `read.csv()`함수는 R에 내장되어 있다.
- 3단계: `read.csv("파일이름.csv")`를 입력해서 csv 파일을 불러온다. R로 불러들인 csv 파일은 data frame 형태로 자동 변환된다.

```
read.csv( ".../.../파일이름.csv", stringsAsFactors=F )
```

- `read.csv("파일이름.csv")`를 사용하여 문자(character)로 이루어진 data를 불러오면 자동으로 범주형(factor) 변수로 변환된다. 범주형(factor) 변수로 변환될 경우 data 분석을 할 때 error가 발생하기 쉽다.
- `stringsAsFactors=F`라고 설정하면, 문자를 'character'로 불러온다.

R Console

```
> gdp <- read.csv("gdp.csv", stringsAsFactors=F)
> gdp
```


D:/MyR/CH00 - RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
CH00
Source
Console
Terminal
Jobs
D:/MyR/CH00/
> gdp <- read.csv("gdp.csv", stringsAsFactors=F)
> gdp
country y2015 y2016 y2017 y2018
1 Australia 45584.32 45929.18 46442.20 46941.79
2 Austria 42960.97 43284.02 44109.21 45062.49
3 Belgium 40899.68 41284.37 41800.56 42193.39
4 Canada 42498.06 42484.75 43234.40 43430.23
5 Chile 20789.16 20867.08 20854.69 21407.89
6 Czech Republic 29874.27 30541.63 31798.03 32574.86
7 Denmark 44760.23 45458.32 46180.44 46618.44
8 Estonia 26244.80 27106.84 28429.82 29450.49
9 Finland 37987.80 38935.65 39874.82 40744.40
10 France 36902.42 37168.78 37875.68 38408.15
11 Germany 42690.70 43297.04 44066.19 44562.18
12 Greece 23649.17 23702.53 24106.90 24635.39
13 Hungary 24103.13 24725.73 25817.20 27139.16
14 Iceland 43726.40 45984.72 46981.15 47863.97
15 Ireland 60263.86 62560.46 66334.23 69898.18
16 Israel 31345.41 31967.07 32442.54 32867.66
17 Italy 33162.32 33590.40 34207.36 34557.46
18 Japan 37035.85 37313.39 38101.22 38481.31
19 Korea 34192.45 35035.41 35968.09 36778.42
20 Latvia 22146.74 22811.31 24092.42 25437.80
21 Lithuania 25784.38 26728.63 28288.35 29508.55
22 Luxembourg 87496.36 87347.42 86788.14 87316.63
23 Mexico 16659.51 16967.78 17143.90 17314.83
Environment
History
Connections
Import Dataset
List
Global Environment
Data
gdp 36 obs. of 5 variables
midterm 4 obs. of 2 variables
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biz num [1:4] 50 60 100 20
econ num [1:4] 90 80 60 70
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New Folder
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Rename
More
D: MyR CH00
Name
Size
Modified
..
.Rhistory 884 B Mar 5, 2020,
CH00.Rproj 218 B Mar 5, 2020,
Example1.R 11 B Mar 4, 2020,
Example2.R 11 B Mar 4, 2020,
gdp.xlsx 10.4 KB Mar 5, 2020,
gdp.csv 2.1 KB Mar 5, 2020,