ECON 180

Introduction to Principles of Microeconomics and Financial Project Evaluation

Lecture 36: Multipliers and Broken Windows

December 3, 2021

Version 1

Required Reading and Viewing

- Archer, B. H. (1982). The value of multipliers and their policy implications. *Tourism Management*, *3*(4), 236-241. https://doi-org.ezproxy.library.uvic.ca/10.1016/0261-5177(82)90044-9
  - **An excellent discussion of the nature and limitations of multipliers, in the context of tourism.**
- Clifford, J. (2015, December 2). The Multiplier Effect - Macro Topic 3.2 [Video File]. https://youtu.be/RqWYmQQzXxs
  - **A very short overview of various multipliers taught in undergraduate economics courses, with a focus on their calculation.**

Recommended Readings

- Horne, G. (2008). 2004 British Columbia Provincial Multipliers and How to Use Them. Retrieved from http://frst318.forestry.ubc.ca/files/2013/01/2004-British-Columbia-Provincial-Economic-Multipliers-and-How-to-Use-Them.pdf
  - **This remains one of the best guides to the use of multipliers.**
- The Input-Output Structure of the Canadian Economy, 2000-2001 [Web Page]. (2005, March 9). Retrieved from http://www.statcan.gc.ca/pub/15-201-x/00005/4113385-eng.htm
  - **A simple overview of multipliers.**

Readings on Multipliers and Tourism

- **Presented in recommended reading order, assuming the required reading (Archer, 1982) has been completed:**
- Crompton, J.L., Jeong, J.y. & Dudensing, R.M. (2016). Sources of Variation in Economic Impact Multipliers. *Journal of Travel Research, 55*(8), 1051-1064. https://doi-org.ezproxy.library.uvic.ca/10.1177%2F0047287515617298
  - **Examines why multiplier estimates may differ, & issues in comparing them.**
- Liu, J. & Var, T. (1982). Differential multipliers for the accommodation sector. *Tourism Management, 3*(3), 177-187. https://doi-org.ezproxy.library.uvic.ca/10.1016/0261-5177(82)90066-8
  - **Multipliers for tourism in Victoria, B.C.**
- Archer, B.H. (1976). The anatomy of a multiplier. *Regional Studies, 10*(1), 71-77. https://doi-org.ezproxy.library.uvic.ca/10.1080/09595237600185071
  - **What Liu & Var based their calculations on.**
- West, G. R. & Gamage, A. (1997). Differential Multipliers for Tourism in Victoria. *Tourism Economics*, *3*(1), 57-68. https://doi-org.ezproxy.library.uvic.ca/10.1177%2F135481669700300104
  - **Multipliers for tourism in Victoria, Australia.**
- Mariolis, T., Rodousakis, N. & Soklis, G. (2020). The COVID-19 multiplier effects of tourism on the Greek economy. *Tourism Economics,* forthcoming. https://doi-org.ezproxy.library.uvic.ca/10.1177%2F1354816620946547
  - **COVID & tourism multipliers in Greece.**

Optional Reading: Methodology

- World Bank Group. (2015). *Power Sector Economic Multiplier Tool: Estimating the Broad Impacts of Power Sector Projects – Methodology*. https://silo.tips/download/power-sector-economic-multiplier-tool-estimating-the-broad-impacts-of-power-sect
  - **An excellent overview of direct, indirect and induced effects in the power sector.**
- Harrington, J., Murphy, J., Coledman, M., Jordan, D. & Szacsuri, G. (2016). Financial modelling and analysis of the management of dredged marine sediments – development of a decision support tool. *Journal of Shipping and Trade*, 1, 7. Retrieved from https://doi-org.ezproxy.library.uvic.ca/10.1186/s41072-016-0010-6
  - **A short civil engineering perspective on multiplier effects.**

Optional Reading: The Basics

- MARGINAL PROPENSITY TO CONSUMER [Web Page]. (n.d.). http://www.amosweb.com/cgi-bin/awb_nav.pl?s=wpd&c=dsp&k=marginal+propensity+to+consume
- Mukherjee, S. (n.d.). Keynes' Theory of Investment Multiplier (With Diagram) [Web Page]. http://www.economicsdiscussion.net/keynesian-economics/keynes-theory/keynes-theory-of-investment-multiplier-with-diagram/10363
- Oxford Economics. (2015). *BP's impact on the UK economy*. http://www.oxfordeconomics.com/my-oxford/projects/313837
- Vermann, E.K. (2012). Wait, is Saving Good or Bad? The Paradox of Thrift [Web Page]. Retrieved from https://research.stlouisfed.org/publications/page1-econ/2012/05/01/wait-is-saving-good-or-bad-the-paradox-of-thrift/

Optional Reading: Statistics Canada

- Cross, P. (2016, January 12). Study: Multipliers and outsourcing: How industries interact with each other and affect GDP [Web Page]. Retrieved from http://www.statcan.gc.ca/daily-quotidien/060112/dq060112b-eng.htm
  - **Breaks down the different types of multiplier tracked by StatCan.**
- Petroleum and coal product manufacturing; Canada; Direct plus indirect greenhouse gas emissions intensity (tonnes per thousand current dollars of production) [v79875273]. (n.d.). Retrieved from http://www.statcan.gc.ca/pub/16-509-x/2016001/v79875273-eng.htm
- Real-Financial Linkages in the Canadian Economy: An Input-Output Approach [Web Page]. (2015, November 27). Retrieved from http://www.statcan.gc.ca/pub/11f0027m/2010065/part-partie1-eng.htm
  - **Math detail, for those who are interested. Matrix algebra required.**

Optional Readings: Sources and Misc.

- Bastiat, F. (1884). The Broken Window. In *Selected Essays on Political Economy* (S. Cain, Trans.). Retrieved from http://www.econlib.org/library/Bastiat/basEss1.html
  - **The parable of the broken window (translated from the original French).**
- de Rugy, V. & Debnam, J. (2010). Does government spending stimulate economies? *Mercatus on Policy,* 77. Retrieved from https://www.mercatus.org/publication/does-government-spending-stimulate-economies
  - **Describes and explains observed government spending multipliers of less than 1.**
- The Early Edition. (2015, March 30). 3 changes to BC Liquor Stores you will start to notice on April 1 [Web Page]. Retrieved from http://www.cbc.ca/news/canada/british-columbia/3-changes-to-bc-liquor-stores-you-will-start-to-notice-on-april-1-1.3015012
  - **Changes to liquor store pricing**.

Optional readings: Keynes & Queerness

- Janes, D. (2014). Eminent Victorians, Bloomsbury Queerness and John Maynard Keynes' The Economic Consequences of the Peace (1919). *Literature & History, 23*(1), 19-32. http://search.proquest.com.ezproxy.library.uvic.ca/scholarly-journals/eminent-victorians-bloomsbury-queerness-john/docview/1558467911/se-2?accountid=14846
- Keynes, J.M. (1935). The General Theory of Employment, Interest and Money. USA: Polygraphic Company of America. https://www.marxists.org/reference/subject/economics/keynes/general-theory/
  - **Chapter 10 deals with the multiplier.**
- Keynes, J.M. (1919). The Economic Consequences of the Peace. https://oll.libertyfund.org/title/keynes-the-economic-consequences-of-the-peace

Learning objectives

- Understand what a multiplier is
- Understand the concept of ‘marginal propensity to consume’
- Understand the basics of how a multiplier is calculated
- Understand the difference between direct, indirect and induced effects of spending
- Understand the Paradox of Thrift
- Gain an introductory understanding of how input-output models work.
- Become familiar with the different types of reported multipliers (open, closed, SN, NSN)

Relevant Solved Problems

- Some solved problems are available at:
- Jan, O. (n.d.). Spending Multiplier [Web Page]. Retrieved from https://xplaind.com/958349/spending-multiplier
- McConnell, T. (n.d.). The Leontief Input-Output Model [Web Page]. Retrieved from http://72.167.220.210/mat183/l32/
- Waner, S. (2006). 3.5 Input-Output Models [Web Page]. Retrieved from http://www.zweigmedia.com/RealWorld/tutorialsf1/frames3_4.html

ESSENTIALS (17 slides)

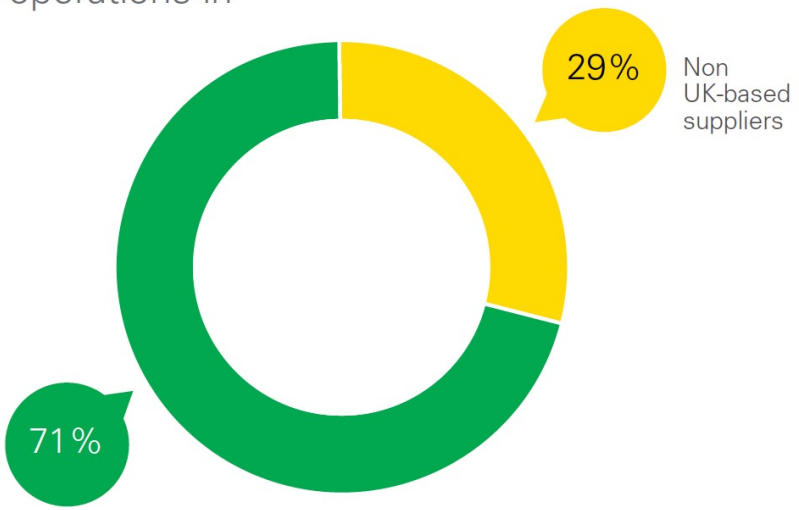
£7.7 bn

spent in the
UK supply chain

"The complexity of the project has offered learning opportunities for individuals in our teams. There are probably a million little things I could say on the technical side that we learned."

Dave Stuart
Chief executive
Wood Group PSN

Percentage of spend by BP's British-based operations in the UK



Source: BP

BP sure contributes a lot to the UK economy!

BP directly contributes

£2.3 bn

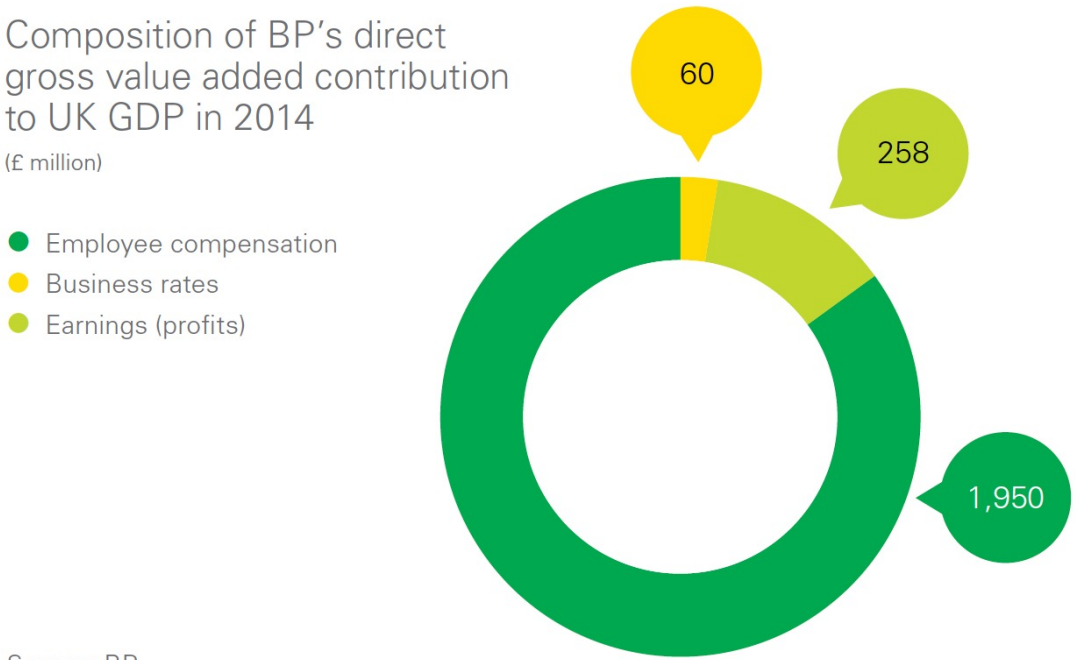
to UK GDP

"We at BP are proud of the contribution we make in the UK, and we remain committed, with billions of pounds of planned investment across our businesses in the UK."

Dev Sanyal
Executive vice president, strategy and regions, BP

Composition of BP's direct gross value added contribution to UK GDP in 2014

(£ million)



Source: BP

…

Wait, what?

What happens when you spend $10?

- Let's say you spend $10 at Tim Horton's on TimBits.
- Tim Horton's uses some of that money to buy more flour and milk from Canadian producers.
- Some of the money may be saved (as part of Timmy's cash reserves)
- …or sent out of the country to pay for imports. (e.g. Chinese ginger)
- Some of the money will pay salaries…
- ...and those Tim Horton's employees will then spend some of their money at all sorts of other businesses.
- That $10 ends up 'sponsoring' a lot more than $10 of economic activity!
- We can break the impact down into direct, indirect and induced effects.

This kind of talk is everywhere

	Employment	Labor Income	Value Added	Economic Output
Direct Impact	7,654	$677,399,093	$1,018,047,851	$12,537,202,953
Indirect Impact	13,444	$732,815,429	$1,111,684,452	$2,938,875,640
Induced Impact	9,679	$362,442,766	$677,761,174	$1,158,262,928
Total Impact	**30,777**	**$1,772,657,287**	**$2,807,493,477**	**$16,634,341,520**

	Finding
Direct, indirect and induced spending resulting from reconstruction	$105.5 million

CONSTRUCTION EXPENDITURES	OUTPUT (MILLIONS)
DIRECT	20.3
INDIRECT + INDUCED	15.1
TOTAL	35.4

Contribution Type	Business Activity
Direct Effect1	$79,013,000
Indirect Effect4	$32,752,700
Induced Effect5	$46,269,200
Total Effect	$158,035,000
Effective Agency Multiplier	2.000

Direct Effect

- Just what it sounds like:
- If you spend $10 at Tim Horton's, the direct effect is $10 spent at Tim Horton's. The company will use that to pay staff and buy stuff.
- What kind of stuff? Well…

Indirect Effect

- Timmy's needs to pay its suppliers.
- An extra $10 spent at Timmy's means an extra % of $10 that's paid to Timmy's suppliers.
- Indirectly, part of that $10 has been spent on flour, sugar, milk, etc.

- "The additional output and employment created in the supply chain … is the indirect effect." (IFC 2015, p. 8)

Induced Effect

- When Tim Horton's pays its workers, the buck doesn't stop there!

- Some money will be saved, yes…
- (Assume it's stuffed in a mattress. Banks makes things messy in a way that's beyond the scope of this course.)
- The rest will be passed on.
- Maybe the workers buy clothing...
- ...the clothing store owners buy a fancy meal...
- ...the restaurant wait staff buy Tim Horton's coffee...

- Suppose half of the money gets spent each 'round'...

Induced effect for 50% spending each round

Round	Received	Spent	Total Received
1	$10.00	$5.00	$10.00
2	$5.00	$2.50	$15.00
3	$2.50	$1.25	$17.50
4	$1.25	$0.63	$18.75
5	$0.63	$0.31	$19.38
6	$0.31	$0.16	$19.69
7	$0.16	$0.08	$19.84
8	$0.08	$0.04	$19.92

That 50% is the ‘marginal propensity to consume’

‘Marginal propensity to consume’, or MPC, is…

- how much of each additional dollar people are willing to spend
- (instead of stuffing it under the mattress)
- If you’re looking at the economic impact *in a specific geographic area*…
- …then buying a good from outside the area (an import) is treated the same as stuffing money under the mattress
- ...since it doesn’t immediately contribute to the local economy
- It can definitely contribute in the long run, though! Eventually, China (say) has to spend all its Canadian dollars on something...
- …and they’re only legal tender in Canada.

Bringing in algebra

- Ignore indirect effects – just look at total and induced.
- The total impact of $Y of extra spending is…
- $Y + MPC \times Y + MPC^2 \times Y + \cdots + MPC^{\infty} \times Y$
- Since (with any saving) MPC < 1, this converges:
- $\sum_{t=0}^{\infty} MPC^t \times Y = \frac{Y}{1-MPC} \equiv M \times Y$
- Where M is the **Multiplier**, because you multiply the direct effect, Y, by it to get the full direct + induced effect.
- This formula only applies if MPC is constant each round.

Back to BP

- According to BP, its direct effect is £2.2 billion → Y = 2.2
- According to BP, its total effect is £7.7 billion → M x Y = 7.7
- → M = 7.7/2.2 = 3.5, and since M = 1/(1 – MPC)
- → MPC = 71.43% (approx.)
- This is very close to the 71% claimed by BP as:
- “percentage of spend … [w]ith UK-based domestic suppliers”
- It looks like Oxford Economics (who wrote the report) just used (1 – 0.71) as the ‘stuff under the mattress’ factor, calculated the simple multiplier, rounded it off and called it a day!

Early work on the multiplier

- The multiplier was popularized by economists writing during the Great Depression of the 1930s:
- One focus was figuring out whether (and to what extent) government spending could help in a setting where there was massive unemployment.
- Baron Richard Kahn (1905 - 1989) published his ideas on the multiplier in "The Relation of Home Investment to Unemployment" in 1931.
- John Maynard Keynes collaborated with Kahn and included a version of the multiplier as a key part of his *General Theory of Employment, Interest and Money* in 1935.
- **Pride Month Note**: Keynes is one of history's most famous economists, and also a queer icon – he had romantic relationships with both men and women, including famous author Lytton Strachey, painter Duncan Grant, and ballerina Lydia Lopokova – who he married at a ceremony where Duncan Grant was best man.
- See https://www.queerportraits.com/bio/keynes and optional readings.

No unemployed resources?

- Then the multiplier value can be misleading.
- You're not creating new work, just shuffling around employed resources…
- AND you might be lousy at it.
- Common example: new taxes to pay for Olympics, or a new stadium.
- Money that would have been spent for profit and pleasure by the private sector is spent by the government.
- Private spending and investment is crowded out by government spending.
- (Here, the measured multiplier from government spending can be less than 1.)
- The 19th century French economist, Frederic Bastiat, had a great example…

Want a big multiplier? Smash windows!

- The ‘bang for the buck’ (sorry) from smashing every window in downtown Victoria is huge!
- Creates work for glaziers, security firms, construction companies, cleanup crews… all at a very low initial cost.
- That is *what is seen*, said Bastiat. BUT *what is not seen* is more important.
- *“It is not seen* that if [the shop owner] had not had a windowpane to replace, he would have replaced, for example, his worn-out shoes or added another book to his library.”
- The opportunity to do so has been lost.

Opportunity Cost

- Economists study the distribution of limited resources among unlimited needs and wants.
- This scarcity of resources compared to needs and desires is key:
- By using stuff for ONE purpose, we sacrifice using it for any other purpose.
- The opportunity cost of doing something is the next-best-use you could have put those resources to.
- The economic cost of an activity isn't just the direct cost, but also this indirect opportunity cost.
- Multipliers don't capture this. Digging pot-holes on purpose and filling them up again has the same multiplier as genuine highway repair.

We're stuck reporting multipliers for now

- Reporting after-multiplier values is a lot like reporting before-tax prices.
- For any given industry or tax category, the tax/multiplier is just something that happens when you spend money, regardless of benefits.
- BUT 'framing' matters: people respond to how values are presented.
- Decision-makers are used to seeing multiplied values. Not showing them can make your report look bad in comparison to the thousands of others out there.
- Example: In 2015, BC's government liquor stores gave in and started showing before-tax prices, to match private liquor stores.
- Even though the after-tax price is the relevant one, people were comparison-shopping based on before-tax prices.

Is there ANYTHING good about multipliers?

- Yes! There's a reason StatCan spends so much effort tracking them.
- They summarize linkages in the economy.
- They inform fiscal (government spending) policy.
- They can help choose *between* industries: on the margin, should BC focus discretionary spending on forestry or tourism?
- Linkages can be important for environmental purposes: StatCan publishes multipliers for greenhouse gases due to fossil fuel manufacturing.
- "What use, however, are ratio multipliers as a guide for policymakers and planners? The answer is very little. What they do provide is a useful picture of the *degree of internal linkage* which exists between the various sectors of the economy". (Archer, 1982)

AFTER HOURS

- The Paradox of Thrift (1 slide)
- Where do the numbers come from? (2 slides)
- How are multipliers actually reported? (4 slides)
- Induced effects and their dangers (2 slides)
- A clockwork economy (2 slides)

In reverse: the paradox of thrift

- Spending an extra $Y will lead to more than $Y of economic activity.
- BUT this also means reducing spending by $Y will lead to a loss of more than $Y in economic activity.
- If everyone decides to be thrifty (save more), then less money is passed on, and people who would have been paid/hired, aren't.
- Too much saving can lead to widespread unemployment!
- Can't see it? Think of the limit: what if everyone stuffed ALL their money under the mattress, and somehow didn't starve?
- With lower income, people can save less →
- Higher individual saving can lead to lower total savings.
- This was first pointed out by John Maynard Keynes.

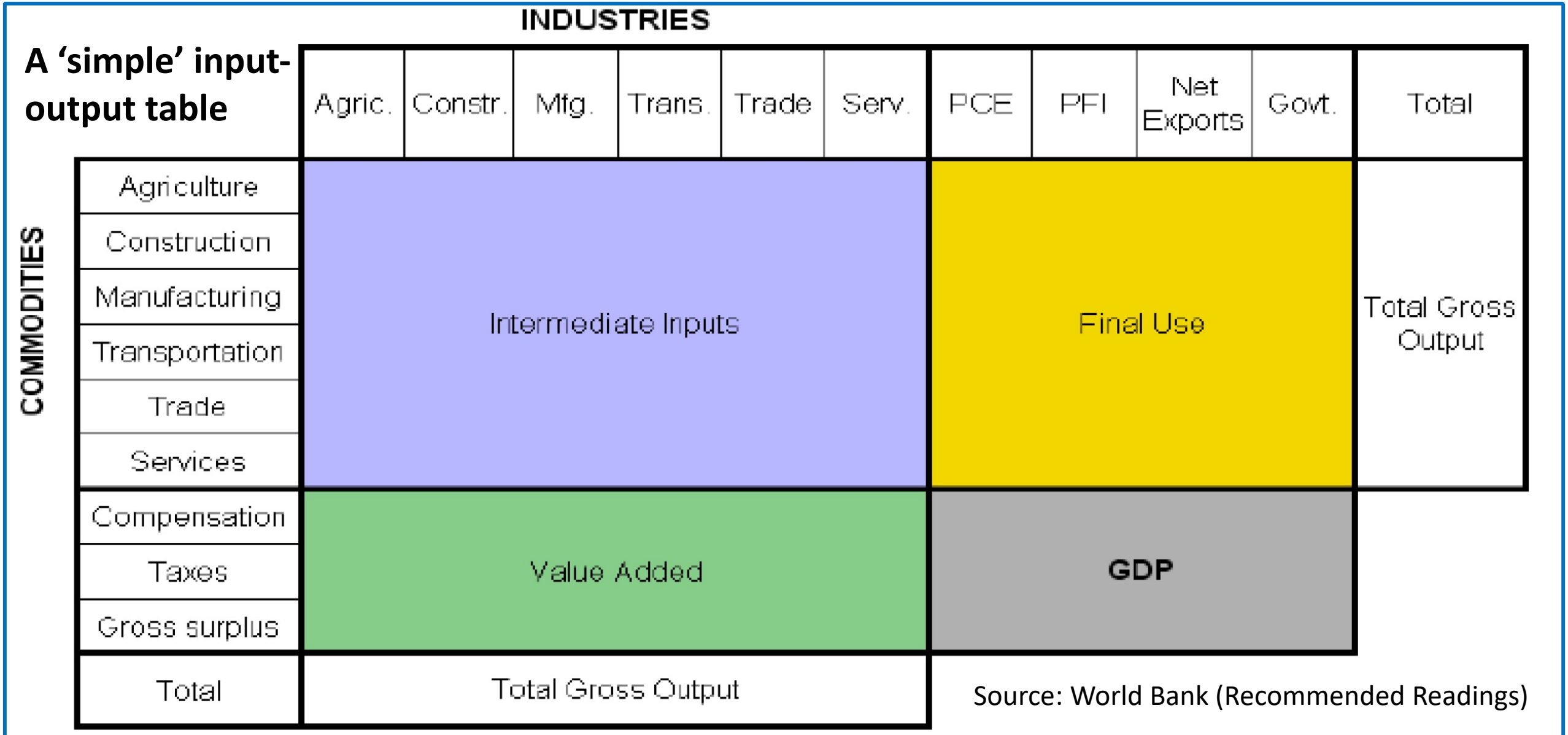
Where do the numbers come from?

- Often, **Input-Output models** are used to determine the indirect and induced effects
- They consist of matrices connecting different industries and players in the economy.
- One example is shown to the right.
- A full set of these help us predict and trace indirect and induced effects of spending more on any given industry.

		To	
	Industry	**Food**	**Services**
From	**Food**	$10,000	$7,500
	Services	$1,000	$5,000
Total	**Output**	**$25,000**	**$20,000**

- $10k of Food were used in the production of Food (e.g. milk for TimBits)
- $1k of services (e.g. cashiers) were used in the production of Food.
- Total Food output was valued at $25,000 (not an addition of the column values)

A 'simple' input-output table



Source: World Bank (Recommended Readings)

Note: PCE is Personal Consumption Expenditures, PFI is Private Fixed Investment, and Govt - Government final consumption expenditures.

How are multipliers actually reported?

$f(x)$

- Last time: M = 1/(1 – MPC), which measures only direct + induced effects.
- BUT Total Impact = Direct + Indirect + Induced
- In practice, economists give induced effects the side-eye…
- Induced effects are the LEAST reported:
- Most reported multipliers are only measures of direct + indirect effects.
- StatCan's 'simple multiplier' is
- $\text{Simple Multiplier} = \frac{\text{Direct+Indirect Effects}}{\$1 \text{ Exogenous Final Demand}}$
- 'Exogenous' = 'generated outside the model' – similar to the $10 'first round' spending at Tim Horton's last lecture.

Sample 2004 Multipliers for BC

SN = Safety Net
NSN = No Safety Net

Industry	OUTPUT Own Indir	Total Indir	SN Induc	NSN Induc
1 CROP AND ANIMAL PRODUCTION	0.11	0.73	0.18	0.36
2 FORESTRY AND LOGGING	0.06	0.66	0.17	0.32
3 FISHING, HUNTING AND TRAPPING	0.00	0.48	0.06	0.12
4 SUPPORT ACTIVITIES FOR AGRICULTURE AND FORESTRY	0.00	0.44	0.19	0.39
5 MINING AND OIL AND GAS EXTRACTION	0.02	0.35	0.09	0.15
6 UTILITIES	0.00	0.24	0.09	0.15
7 CONSTRUCTION	0.00	0.54	0.17	0.35
8 MANUFACTURING	0.13	0.65	0.14	0.28
9 WHOLESALE TRADE	0.02	0.46	0.22	0.46
10 RETAIL TRADE	0.01	0.47	0.21	0.48
11 TRANSPORTATION AND WAREHOUSING	0.16	0.58	0.20	0.40
12 INFORMATION AND CULTURAL INDUSTRIES	0.07	0.42	0.15	0.31
13 FINANCE, INSURANCE, REAL ESTATE AND RENTING AND LEASING	0.14	0.44	0.13	0.24
14 PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES	0.09	0.51	0.25	0.52
15 ADMINISTRATIVE AND OTHER SUPPORT SERVICES	0.02	0.48	0.26	0.55

Direct Effect is always 1, so not listed.
Here you have a 'build a multiplier' bar.

Types of Reported Multiplier

- **Simple, or 'Open'**: only Direct + Indirect effects included
- 'Open' because the model is open (with regards to consumption).
- Indirect effects obtained from Input/Output tables

- **Closed**: Direct + Indirect + Induced effects included
- 'Closed' because the model is closed: induced consumption is modeled via some estimate of MPC.

- 'True' effect is somewhere in between the two.

Induced effects are seductive and dangerous!

- Due to potential for mis-use, StatCan typically reports closed multipliers only at the national level.
- Why mis-use? The potential for double-counting.
- **One industry's direct effect is another's induced effect.**
- As a former student once put it, "In real life, there's no 'first round'."

- BC Stats example: Sports Fishing wages are both a direct effect of the sports fishing industry, and an induced effect of the forest sector.

“What if I really, really want them?”

- Two types of induced effect models: Safety Net and No Safety Net

- **No Safety Net (NSN, Long Run, Migration)**:
- Income only comes from jobs. New jobs are filled by unemployed resources. Equivalently: new jobs are filled by migrants. Job losers leave the region.

- **Safety Net (SN, Short Run, No Migration)**:
- Employment Insurance (EI) exists. New jobs are filled by EI claimants. Job losers mostly stay in the region.

A clockwork economy

- Even the ‘best’ multipliers come from Input/Ouput tables.
- These are updated every few years, are static, and empirical.
- → The multipliers are a local approximation to the economy.
- They work okayish for small changes over a short time period.
- Think of a tourist map of downtown Victoria:
- Great if you only need to go a few blocks from the harbour, right now.
- Not so great if you plan to drive 50 km, 10 years from now!
- Another analogy: polynomials can fit data points to arbitrary precision… BUT these fits blow up outside the fitted range.

Demand data and a 5th-order polynomial fit