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Rue the ROOs: Rules of Origin and the Gains (or Losses) from Trade Agreements

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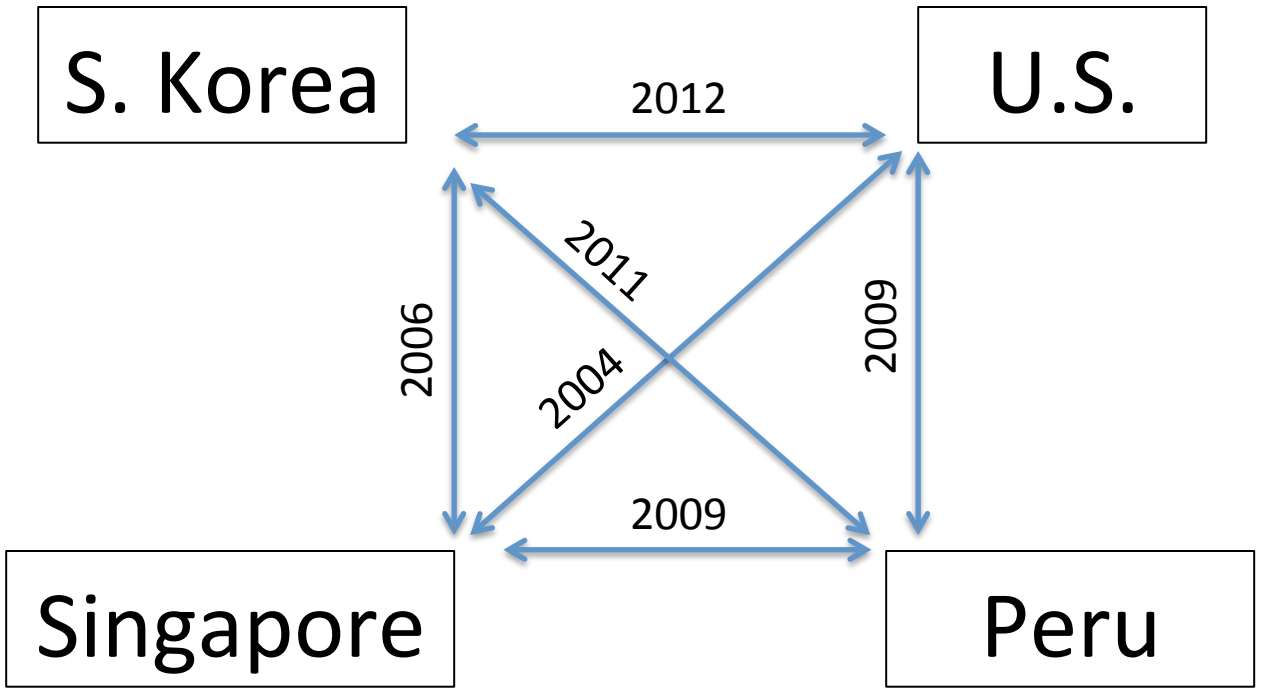
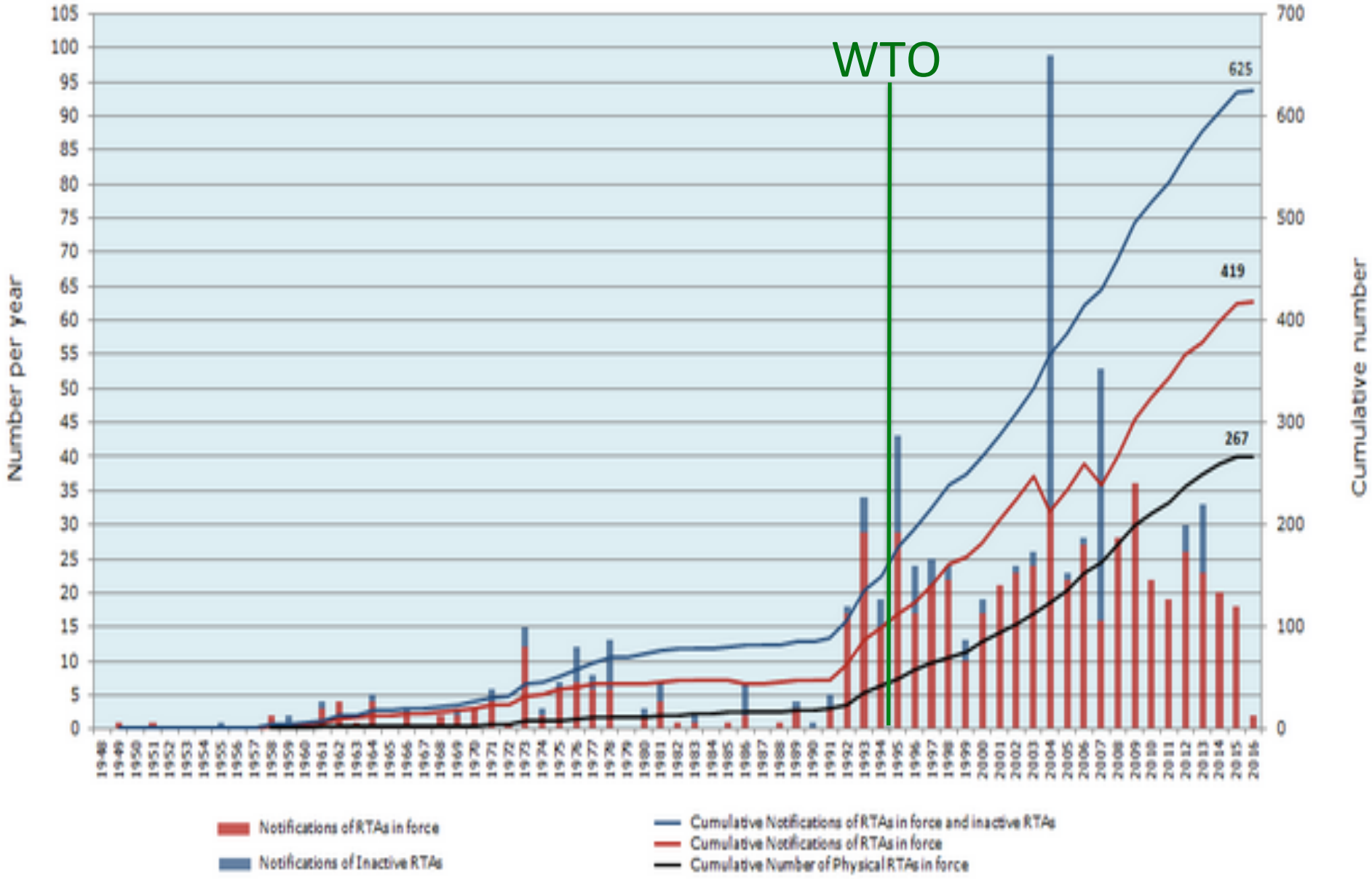
The Issue

- Can the proliferation of FTAs be harmful?
- Standard trade diversion suggests that
  - Individual FTAs could lower world welfare,
  - But if FTAs became ubiquitous, that would not happen.
    - If every country were to have an FTA with every other country, then there would be no trade diversion.
  - Examples:
    - US-Singapore 2004
    - Singapore-Korea 2006
    - US-Peru 2009
    - Singapore-Peru 2009
    - Korea-Peru 2011
    - US-Korea 2011


S. Korea
U.S.
2012
2011
2006
2004
2009
2009
Singapore
Peru

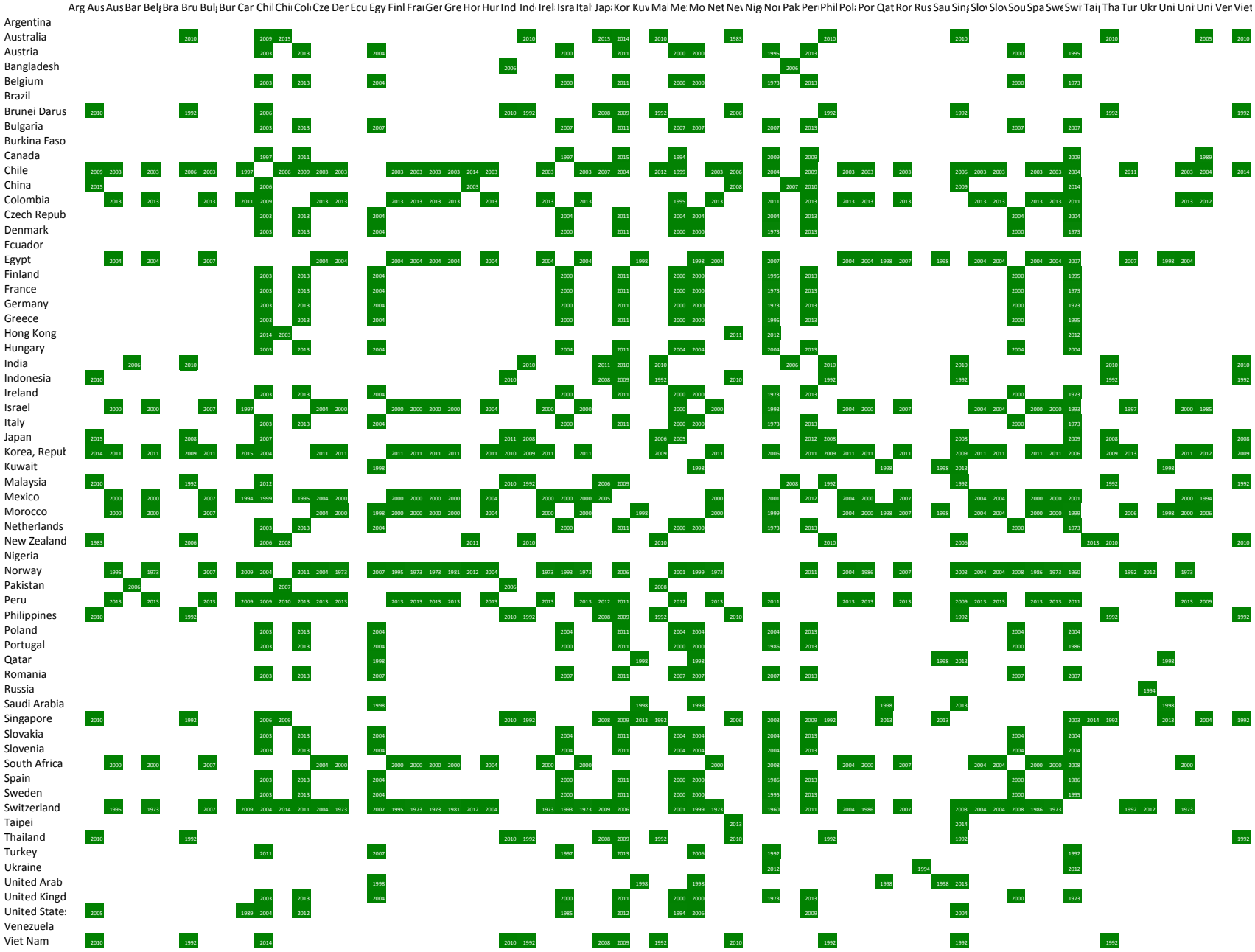
Evolution of Regional Trade Agreements in the world, 1948-2016



Note: Notifications of RTAs: goods, services & accessions to an RTA are counted separately. Physical RTAs: goods, services & accessions to an RTA are counted together.
Source: WTO Secretariat.

Countries connected by FTAs only, as of 2015

20%



The Issue

- But that is accurate only for final goods
- I will argue, via simple theoretical examples, that the presence of binding rules of origin (ROOs), in a world of traded intermediate inputs…
  - Can increase protection on intermediate inputs above even the tariffs on final goods.
  - Will reduce world welfare below that of global free trade, even if every country has an FTA with every other country.
  - May even reduce every country's welfare below what it would have achieved with no FTAs at all and positive tariffs.

    That is: All FTAs can be worse than No FTAs!

Rules of Origin

- Why an FTA must have ROOs
  - Countries' external tariffs differ
  - Without ROOs, goods will enter through the lowest-tariff country ("trade deflection")
    - If internal transport cost is less than tariff differential
- ROOs specify
  - Requirements for goods to be considered as "originating" either in a country or in an FTA
  - Only trade satisfying the ROO gets a zero tariff

Rules of Origin

- Types of ROOs
  - Substantial transformation
    - Change of "tariff heading"
      - The fewer the digits, the more restrictive.
    - Regional value added
      - Minimum % from inside
      - Maximum % from outside
  - Technical rules
    - E.g., "yarn forward" for textiles in NAFTA

Rules of Origin

- Originating where? The issue of "cumulation"
  - Bilateral cumulation: Inputs only within the FTA count, regardless of other existing FTAs
  - Diagonal cumulation: Inputs from selected other countries count (such as other FTA partners)
- In practice, many FTAs (and all involving the U.S.) use bilateral cumulation
  - That's most restrictive
  - TPP has
    - Diagonal to all members
    - But not to non-members
      - Relevant for China, wich has FTAs with several TPP countries

Why ROOs matter

- Some trade does not qualify, so tariffs remain in effect.
- Worse: Some producers will alter their choice of inputs in order to satisfy ROOs. This raises costs
- Examples will illustrate both

Why ROOs matter

- Outline:
  - Partial equilibrium model of a single input & output
  - General equilibrium example
  - Variations on the general equilibrium example

Why ROOs add protection

- Tariff triggered by violation of a ROO
  - applies to the full value of the final good,
  - rather than just the cost of the imported input
    - (That would be better, but it is never done.)
- Thus the $ cost of that violation,
  - measured as a % of the cost of the input,
  - is larger than the tariff itself.

Why ROOs add protection

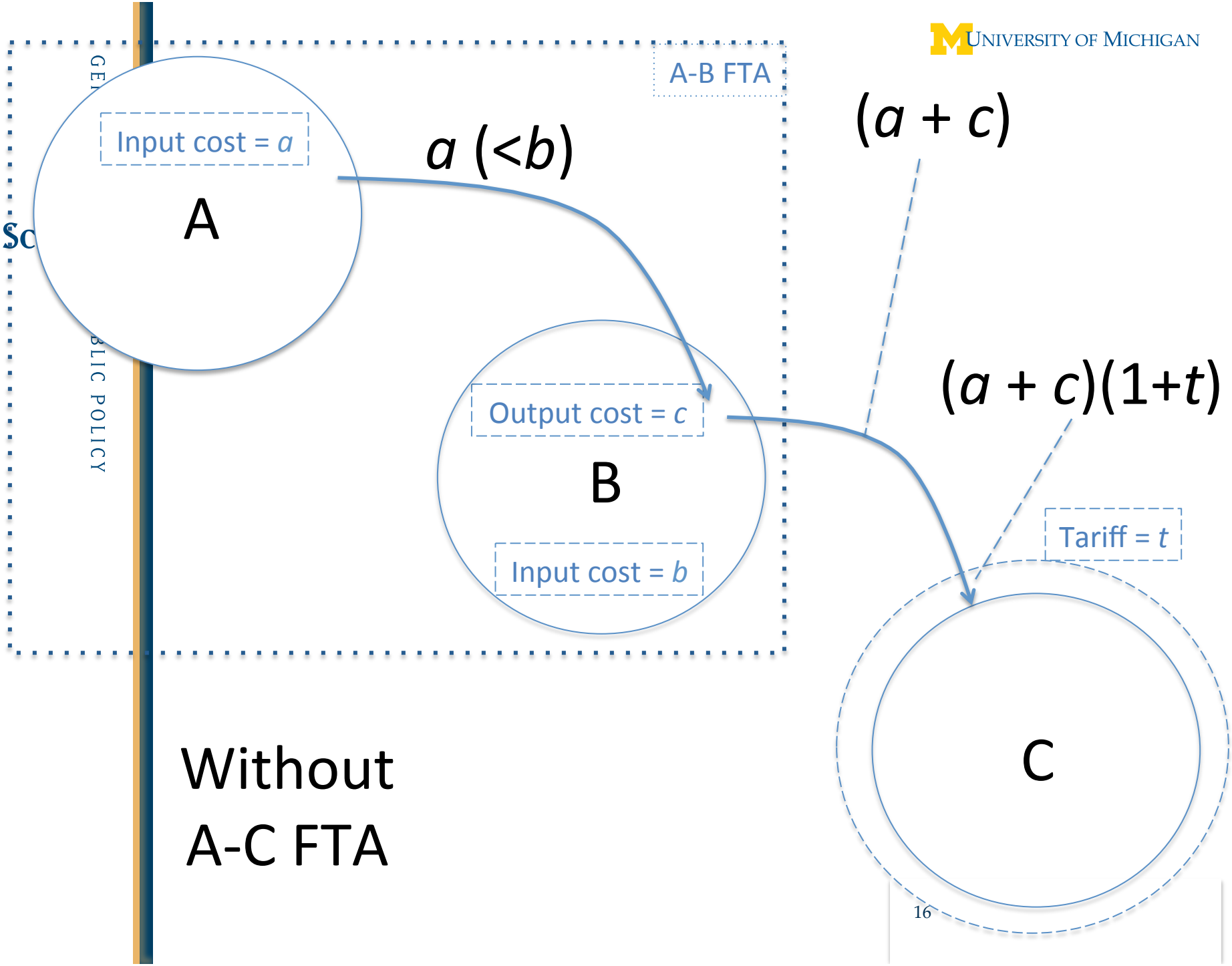
- Thus a ROO is like increasing the tariff on the input.
  - But its *ad valorem* effect on the input is larger than the *ad valorem* tariff on the output.
  - ROOs, when binding, therefore magnify effects of existing tariffs on input trade.
- A partial-equilibrium example illustrates this.

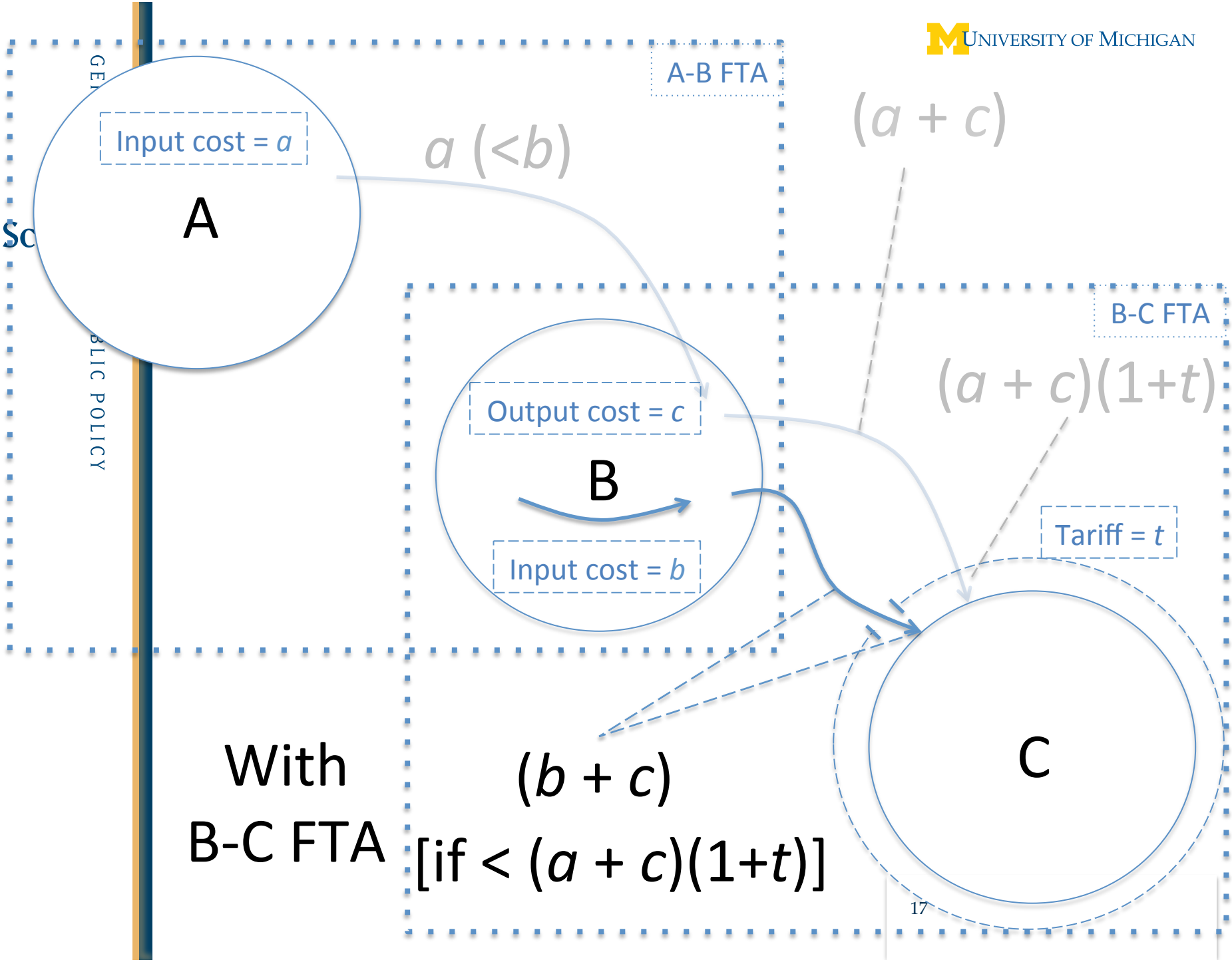
Example 1 (Partial equil.)

- Suppose country B imports input from A to produce final product (output) to sell to C
  - Initially, C has tariff *t* on imports
  - B has zero tariff on input, perhaps due to FTA with A
  - The input costs *b* in B, and *a* in A, with $b>a$
  - Output costs *c* plus cost of the input

Example 1

- Thus, producers in B have choice of costs:
  - $(a + c)$ with input imported from A
  - $(b + c)$ with input produced at home
  - Assume $(b + c) > (a + c)$
- Without B-C FTA, output sells in C for
  - $(1+t)(a+c)$
- With B-C FTA, output sells in C for
  - $(b+c)$ if sourced from B
  - $(1+t)(a+c)$ if sourced from A
- B will source from B if $(b+c)<(1+t)(a+c)$


A-B FTA
Input cost = a
A
a (<b)
Output cost = c
B
Input cost = b
(a + c)
(a + c)(1+t)
Tariff = t
C
Without
A-C FTA


A-B FTA
Input cost = a
A
a (<b)
(a + c)
B-C FTA
(a + c)(1+t)
Output cost = c
B
Input cost = b
Tariff = t
C
With
B-C FTA
(b + c)
[if < (a + c)(1+t)]

Example 1

- With B-C FTA and binding ROO,
  - If $(b+c) < (1+t)(a+c)$, then producer sources in B
- Define Input Protection (IP):
  - IP, due to ROO, is maximum by which b can exceed a and still be sourced in B:
    - $IP = \max\{(b-a)/a \mid (b+c) \leq (1+t)(a+c)\}$
    - $b^{max} + c = (1+t)(a+c)$
    - $IP = (b^{max}-a)/a = [(1+t)(a+c)-c-a]/a = t(a+c)/a$
    - => $\boxed{IP = t + t(c/a)}$

➢ Note: IP > t

Example 1

- IP = $t + t(c/a)$
- Thus the equivalent *ad valorem* protection provided by a binding ROO to an input is larger than the tariff in the FTA partner country on the output.
- e.g.,
  - if input is half the value of output, $c=a$ & IP = $2t$
  - If input is 1/x the value of output, IP = xt

Example 1

- Result: Input protection provided by ROO is larger the smaller is the input's share in value of final output.
- Caveat: This assumes that ROO is binding regardless of that share.
  - That is often not the case: some ROOs bind only beyond some fraction of value added.
  - But not all ROOs take that form.

Example 1

- Conclusion from Example 1
  - FTAs with ROOs can raise protection on inputs
  - But of course they reduce protection on outputs
  - So can they be, on net, harmful?
  - For that I turn to a different example, in general equilibrium

Example 2. (General equilibrium)

- 3 countries, each with same amount of labor
- 3 industries (but 6 goods)
- Goods demanded in fixed proportions (X=Y=Z)
- Each industry has separate input & output
- Constant labor requirements (*a la* Ricardo)

Country A					Country B					Country C			
	In	Out	Tot			In	Out	Tot			In	Out	Tot
X	1	2			X	3	1			X	2	3	
Y	2	3			Y	1	2			Y	3	1	
Z	3	1			Z	2	3			Z	1	2	

Example 2. (General equilibrium)

- 3 countries, each with same amount of labor
- 3 industries (but 6 goods)
- Goods demanded in fixed proportions (X=Y=Z)
- Each industry has separate input & output
- Constant labor requirements (*a la* Ricardo)

Country A					Country B					Country C			
	In	Out	Tot			In	Out	Tot			In	Out	Tot
X	1	2			X	3	1			X	2	3	
Y	2	3			Y	1	2			Y	3	1	
Z	3	1			Z	2	3			Z	1	2	

Cost of X=Y=Z=1	
Autarky	12

Country A				Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	1	2	3	X	3	1	4	X	2	3	5
Y	2	3	5	Y	1	2	3	Y	3	1	4
Z	3	1	4	Z	2	3	5	Z	1	2	3

- Comparative advantage if "fragmentation" not possible
  - input and output must be produced together,

Cost of X=Y=Z=1	
Autarky	12
FT, no frag	9

Country A			
	In	Out	Tot
X	1	2	3
Y	2	3	5
Z	3	1	4

Country B			
	In	Out	Tot
X	3	1	4
Y	1	2	3
Z	2	3	5

Country C			
	In	Out	Tot
X	2	3	5
Y	3	1	4
Z	1	2	3

- Comparative advantage if fragmentation is possible and there is multilateral free trade

Cost of X=Y=Z=1	
Autarky	12
FT, no frag	9
FT, frag	6

- Trade Flows: Inputs

Country A				Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	1	2	3	X	3	1	4	X	2	3	5
Y	2	3	5	Y	1	2	3	Y	3	1	4
Z	3	1	4	Z	2	3	5	Z	1	2	3

- Comparative advantage if fragmentation is possible and there is multilateral free trade

Cost of X=Y=Z=1	
Autarky	12
FT, no frag	9
FT, frag	6

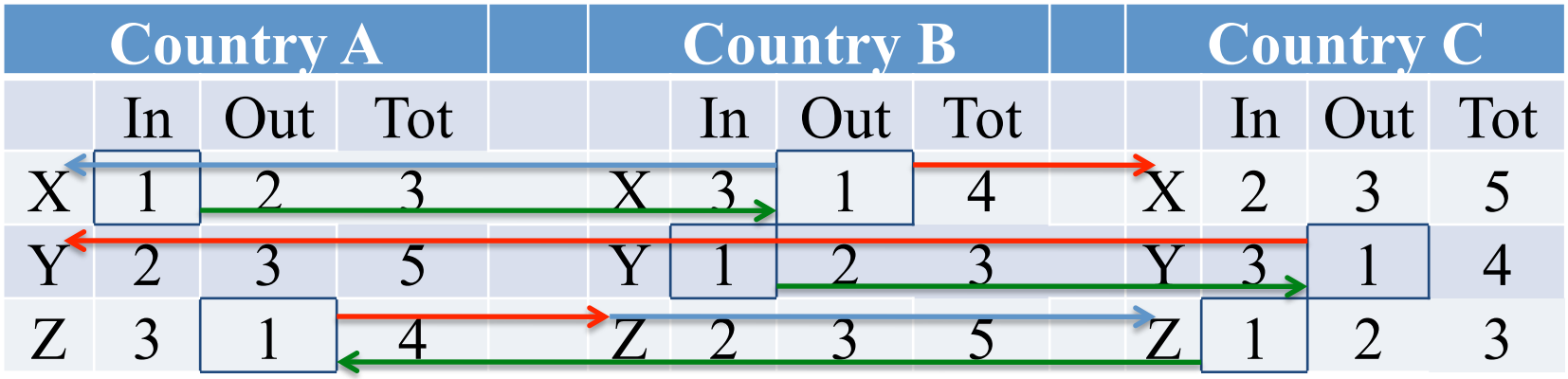
- Trade Flows: Inputs, Outputs

	Country A			Country B			Country C		
	In	Out	Tot	In	Out	Tot	In	Out	Tot
X	1	2	3	3	1	4	2	3	5
Y	2	3	5	1	2	3	3	1	4
Z	3	1	4	2	3	5	1	2	3

- Comparative advantage if fragmentation is possible and there is multilateral free trade

Cost of X=Y=Z=1	
Autarky	12
FT, no frag	9
FT, frag	6

- Trade Flows: Inputs, Outputs



	Country A			Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	1	2	3	X	3	1	4	X	2	3	5
Y	2	3	5	Y	1	2	3	Y	3	1	4
Z	3	1	4	Z	2	3	5	Z	1	2	3

- But note that some of these exports (in red) use inputs from a third country.
- They may not satisfy ROOs, once FTAs exist

- Trade Flows: Inputs, Outputs

Country A				Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	1	2	3	X	3	1	4	X	2	3	5
Y	2	3	5	Y	1	2	3	Y	3	1	4
Z	3	1	4	Z	2	3	5	Z	1	2	3

- Note: Even with *ad valorem* tariff, *t*, on all trade,

  if t < ~30%, result is same as with Free Trade (FT),

  since t is less than cost advantage

Cost of X=Y=Z=1	
Autarky	12
FT, no frag	9
FT, frag	6
t<30%, frag	6

- E.g., B's price of X to A: 1.3(1+1.3(1)) = 2.99 < 3

- Trade Flows:

Country A				Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	1	2	3	X	3	1	4	X	2	3	5
Y	2	3	5	Y	1	2	3	Y	3	1	4
Z	3	1	4	Z	2	3	5	Z	1	2	3

- Now suppose:
  - 3 bilateral FTAs
  - ROOs inhibit output-trades shown by red arrows
    - How? Depends on tariffs & ROOs. Assume:

      ROO content requirement > 50% and t > 50%
      - ROO > 50% since $In_A/P_X(In_A) = 50\%$
      - t > 50% raises $P_X(In_A) > 3 = P_X(In_C)$

- Trade Flows: Inputs, Outputs

	Country A				Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	1	2	3	X	3	1	4	X	2	3	5
Y	2	3	5	Y	1	2	3	Y	3	1	4
Z	3	1	4	Z	2	3	5	Z	1	2	3

- Those trades will instead be sourced within FTAs

- Cost rises by 1 unit; world loses.
- Cost for 1-unit bundle of X, Y, & Z rises 6➔7
- Loss of GDP due to FTAs, compared to free trade: 1/6

Cost of X=Y=Z=1	
Autarky	12
FT, no frag	9
FT, frag	6
t<30%, frag	6
ROOs	7

Implication (not surprising)

- ROOs can reduce the gains from ubiquitous FTAs below global free trade.

Implication?

- Question: Can ROOs actually cause the net welfare effect of FTAs to be negative (compared to positive tariffs and no FTAs)?
  - In this example, No.
    - Needed $t < 30\%$ to get free-trade welfare
    - Needed $t > 50\%$ to induce higher-cost sourcing
  - But with different numbers, Yes.

Example 3.

Country A				Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	10	30	40	X	20	10	30	X	15	40	55
Y	15	40	55	Y	10	30	40	Y	20	10	30
Z	20	10	30	Z	15	40	55	Z	10	30	40

- Numbers here are a different, but patterns of trade are the same.
- Tariff between 25% and 33% yields result
- E.g., t=30%

Cost of X=Y=Z=1	
Autarky	125
FT, no frag	90
FT, frag	60
t<33%, frag	60
ROOs, t>25%	65

Example 3.

Country A				Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	10	30	40	X	20	10	30	X	15	40	55
Y	15	40	55	Y	10	30	40	Y	20	10	30
Z	20	10	30	Z	15	40	55	Z	10	30	40

- Check that *t*=30% works:

  (Check for X only; Y and Z are symmetric)

- Without FTAs
  - B buys X_{IN} for 1.3(10) = 13
  - B's cost of X = 13+10 = 23
  - A&C buy X from B for 1.3(23) = 29.9 < 40, 55

    (A's, C's cost from self)

- With FTAs
  - If B buys X_{IN} from A for 10
  - B's cost of X = 10+10 = 20
  - If C buys X from B, it pays 1.3(20) = 26 > 25

    (B's cost with X_{IN} from C)

Example 3.

Country A				Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	10	30	40	X	20	10	30	X	15	40	55
Y	15	40	55	Y	10	30	40	Y	20	10	30
Z	20	10	30	Z	15	40	55	Z	10	30	40

X_{IN} from A

- Result of Example 3:
- With tariffs on all trade of 30%, consumption bundle requires 5/60 = ~8% more labor with FTAs than without.

Cost of X=Y=Z=1	
Autarky	125
FT, no frag	90
FT, frag	60
t<33%, frag	60
ROOs, t>25%	65

Implication (surprising?)

- ROOs actually can cause the net welfare effect of ubiquitous FTAs to be negative for all countries, compared to no FTAs and positive tariffs.

Are ROOs better than this, or worse?

- Better?
  - My examples all assumed that producers moved all inputs into the FTA.
  - If they only move just enough to satisfy a ROO, then harm will be less.

Are ROOs better than this, or worse?

- Worse? I had
  - Only two stages of production: input and output
  - Only three goods and countries
- Examples in the paper show that cost rises with
  - more stages of production, and
  - more than three goods and countries

Figure 4
An example with 3 stages of production

Case 2												
Country A				Country B				Country C				
	S1	S2	S3		S1	S2	S3		S1	S2	S3
X	1	2	3	X	3	1	2	X	2	3	1
Y	2	3	1	Y	1	2	3	Y	3	1	2
Z	3	1	2	Z	2	3	1	Z	1	2	3

- Cost rises from 9 to 11 (22%)

Figure 5
A 4-good, 4-country Example

Case 2												
Country A			Country B			Country C			Country D		
	In	Out		In	Out		In	Out		In	Out
W	1	2	W	4	1	W	3	4	W	2	3
X	2	3	X	1	2	X	4	1	X	3	4
Y	3	4	Y	2	3	Y	1	2	Y	4	1
Z	4	1	Z	3	4	Z	2	3	Z	1	2

- Cost rises from 8 to 11 (38%)

What to Do?

- First best: Multilateral free trade (of course)
- Second best: greater cumulation
  - Specify ROOs so that inputs originating in any FTA partner qualify under other FTAs
- Third best: Permit within-FTA tariffs only on portion not originating, not on full value

What to Do?

- Is there hope?
  - EU seems to use more cumulation than the US
  - The negotiated Transpacific Partnership (TPP) does include such cumulation (to my relief, as US didn't want that)
  - That's good, but note that TPP still doesn't have diagonal cumulation to countries outside TPP with bilateral FTAs