GERALD R. Ford School OF PUBLIC POLICY

UNIVERSITY OF MICHIGAN

The Simple Analytics of Trade Creation and Diversion

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For presentation at

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To Willi

- Known since his year at Michigan in the 1980s
- Visited him and Gabi in Essen, Linz, and Tübingen
- Have admired his work throughout
- Delighted to be here to honor him

My Topic

- FTAs
- Willi has touched on these throughout his career, as have most of us in the trade field

Outline

- Background
- 3-country case, in graphs
- Somewhat more general case, in equations
- 4-country case, in graphs

Background

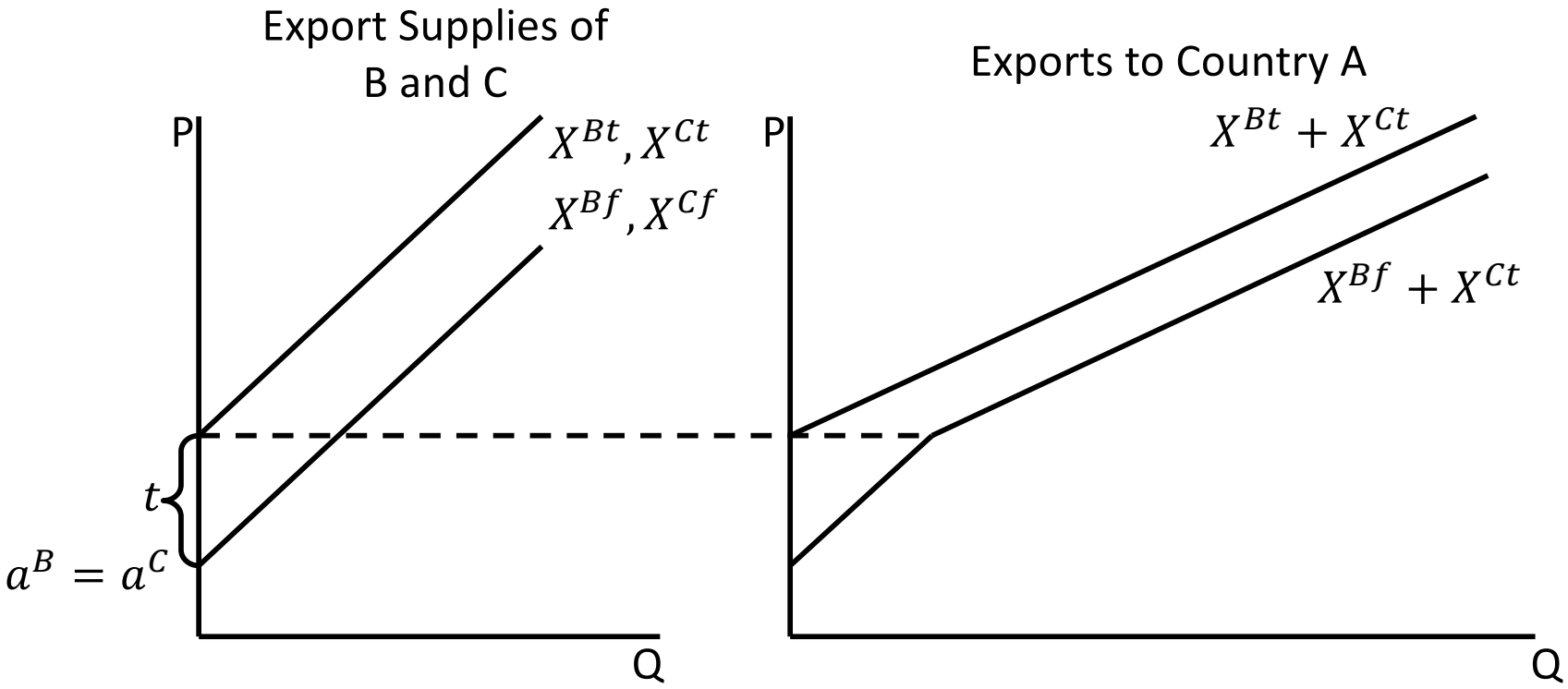
- Viner's (1950) trade creation and trade diversion are usually illustrated with
  - Constant costs
  - 2-country FTA or CU plus rest of world
- We'll look here at cases with
  - Upward sloping supplies
  - And in the last case, an FTA with pre-existing other FTA

3-country case*

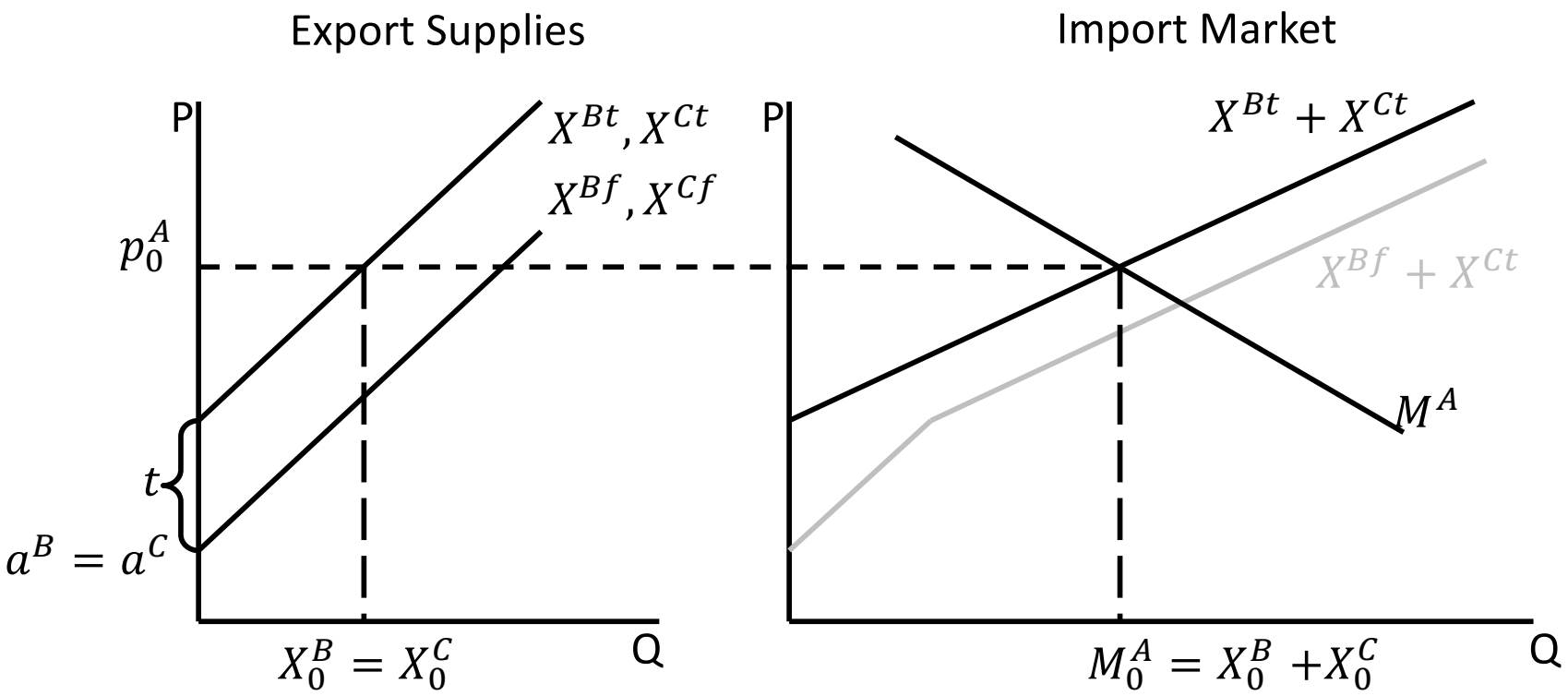
- Three countries, importer A, and exporters B, and C
- Export supply and import demands are linear
- Countries B and C are identical — For simplicity
- Two equilibria
  - 0: MFN specific tariff t on exports of both B and C
  - 1: FTA of A and B:
    - tariff t on exports of C;
    - zero tariff on exports of B

*Much of this is an elaboration of material in World Trade Organization, "Causes and Effects of PTAs: Is it all about preferences?", Ch. C: *World Trade Report 2011*, pp. 92-121.

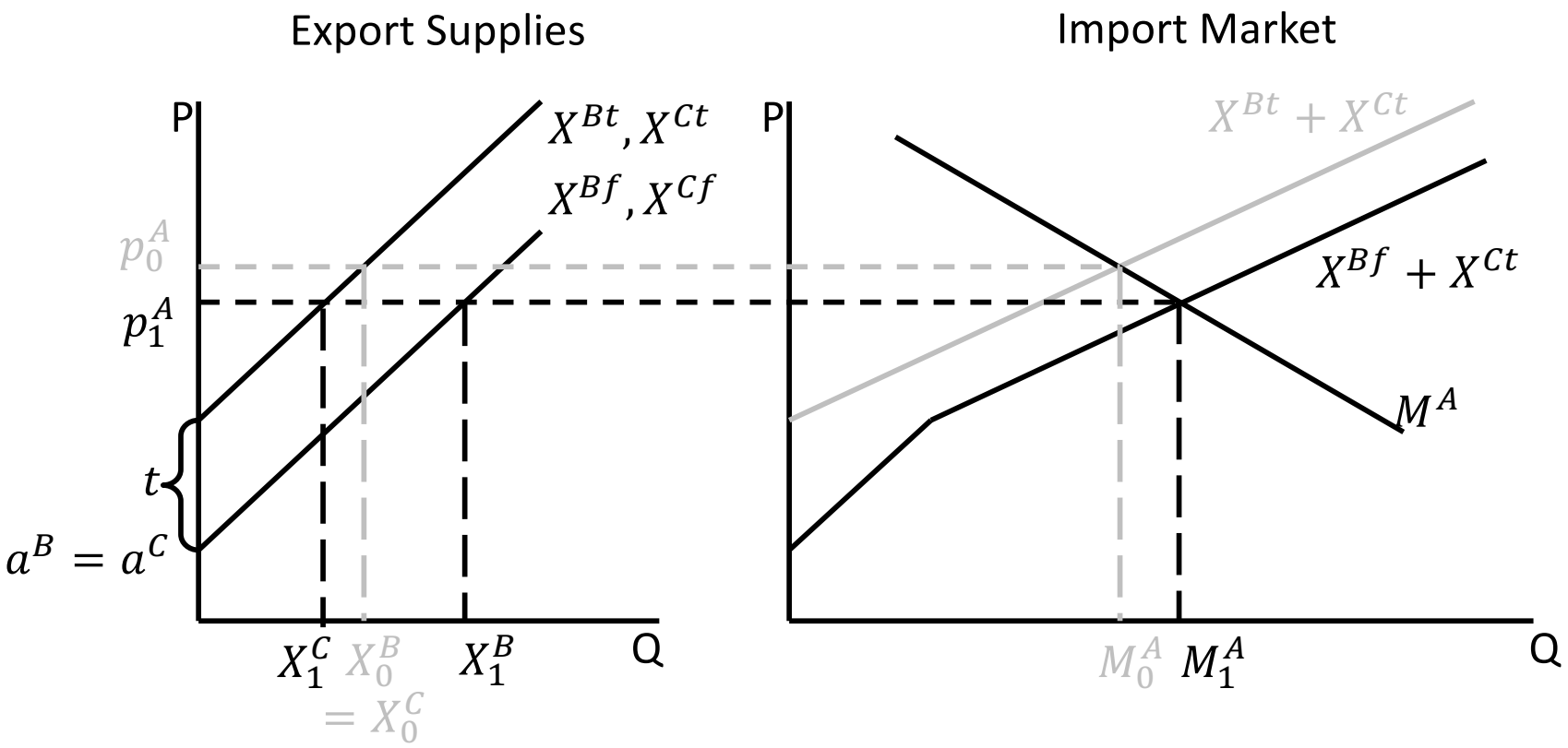
Export Supplies



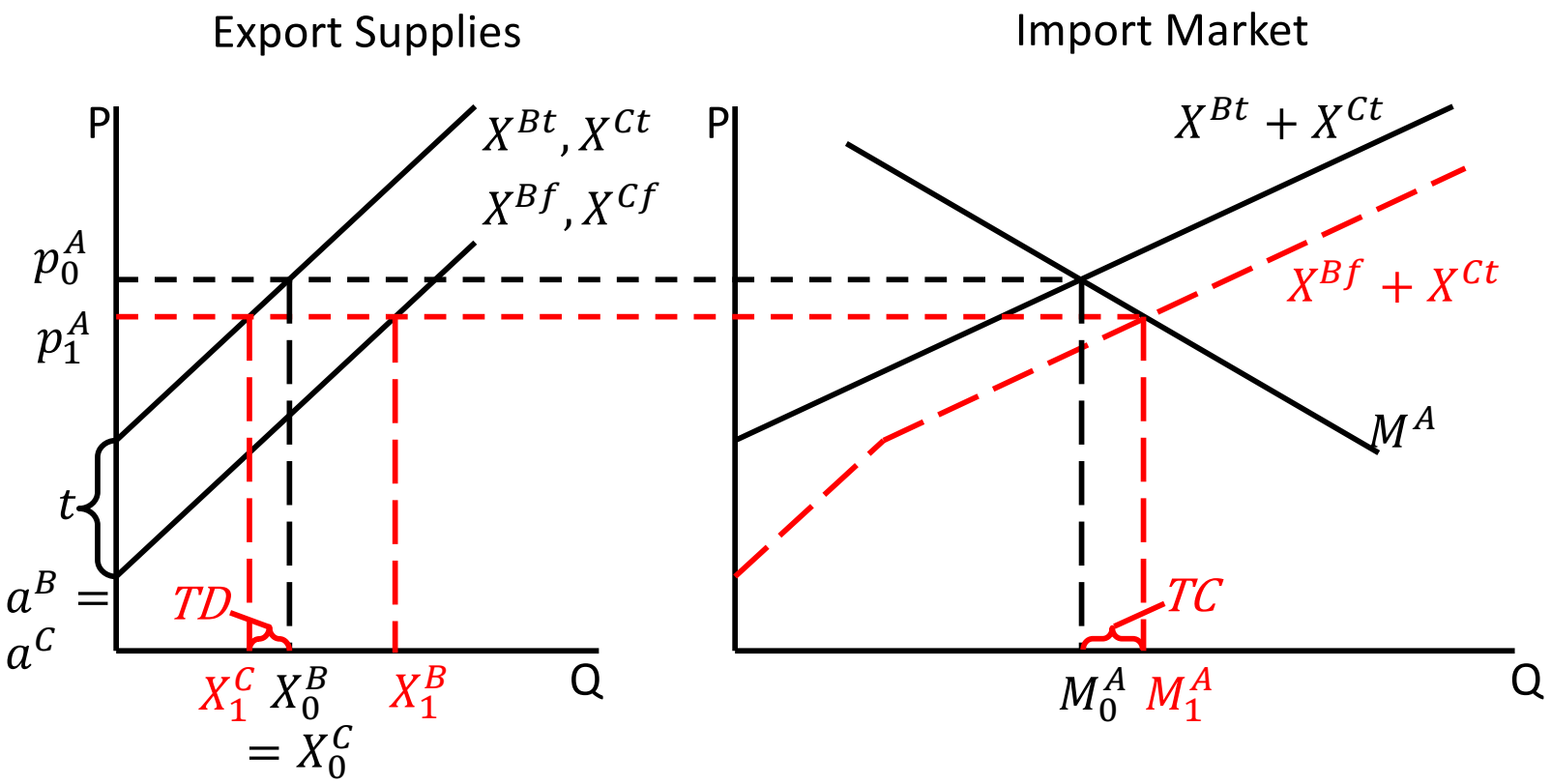
MFN Equilibrium



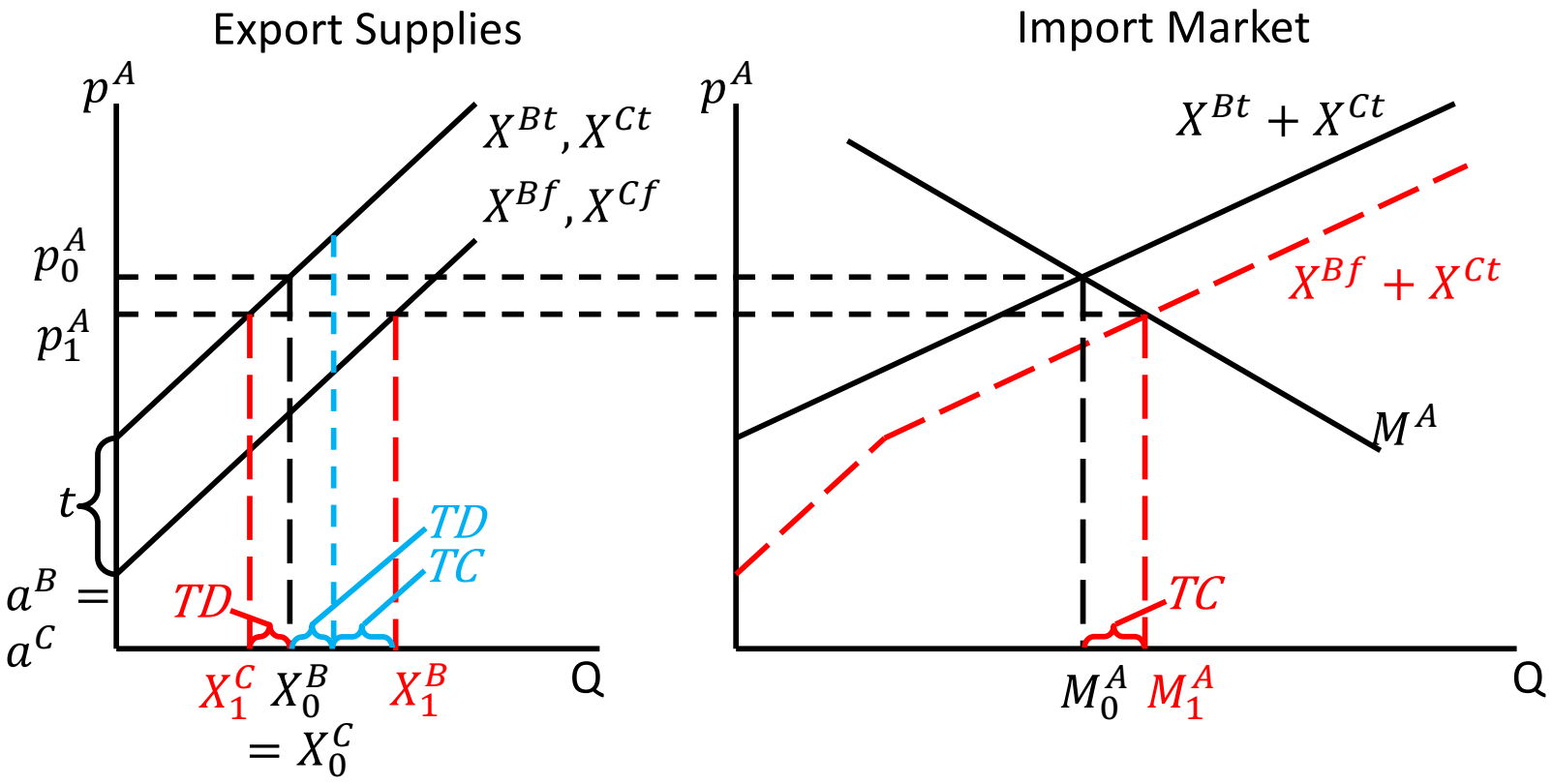
FTA Equilibrium



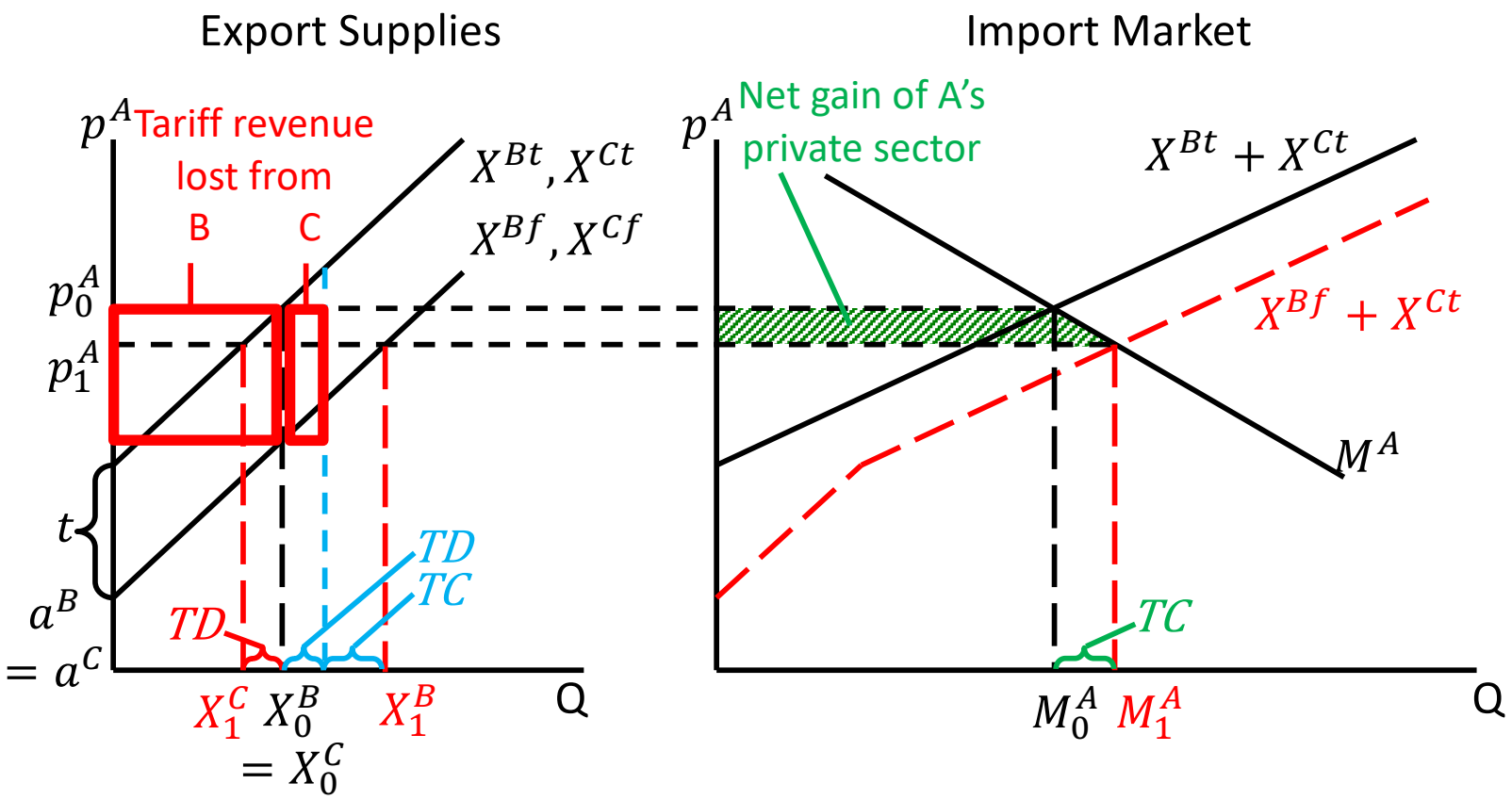
Trade Creation and Diversion



TC & TD, another View



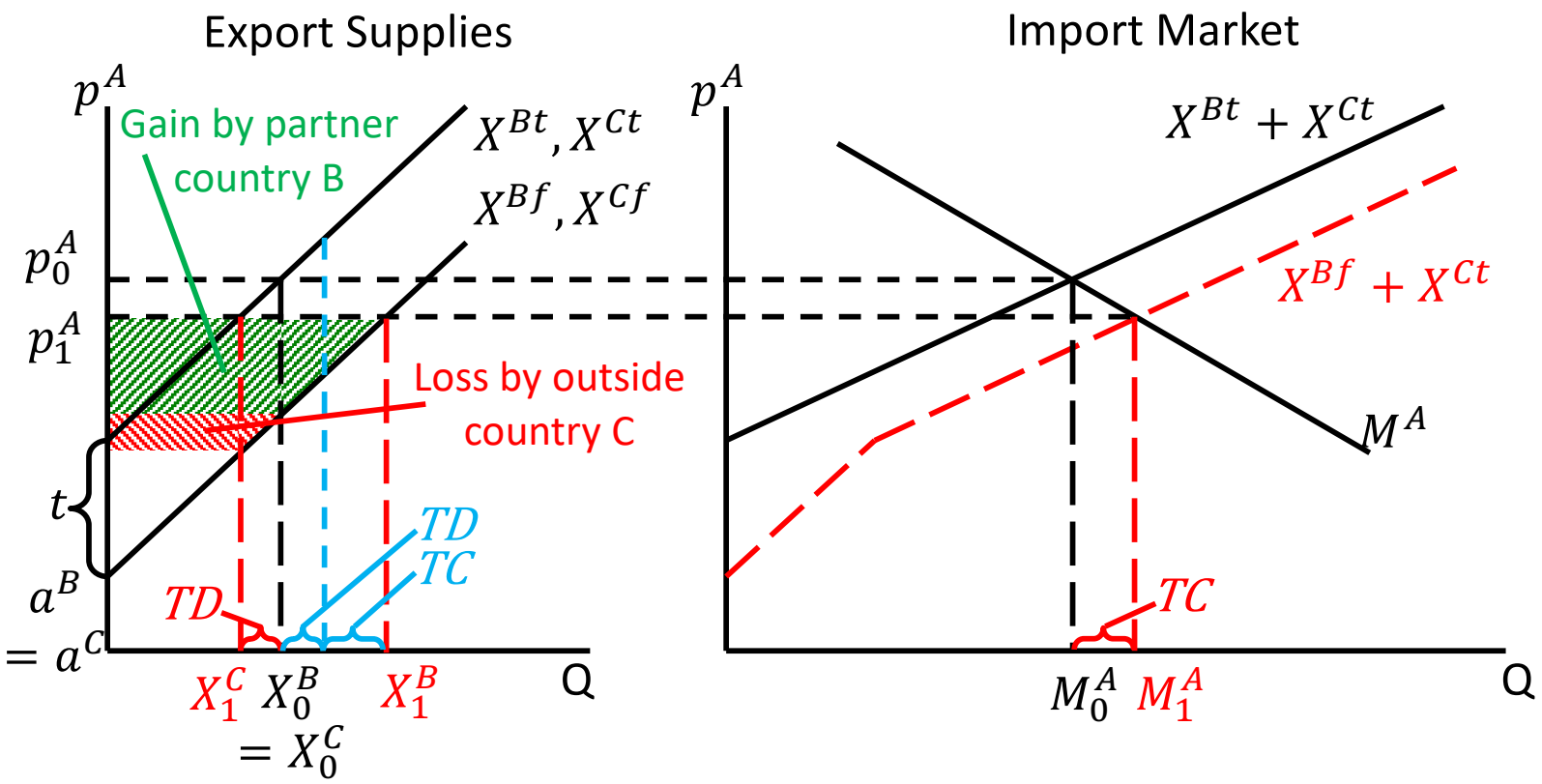
Welfare Effects on Country A



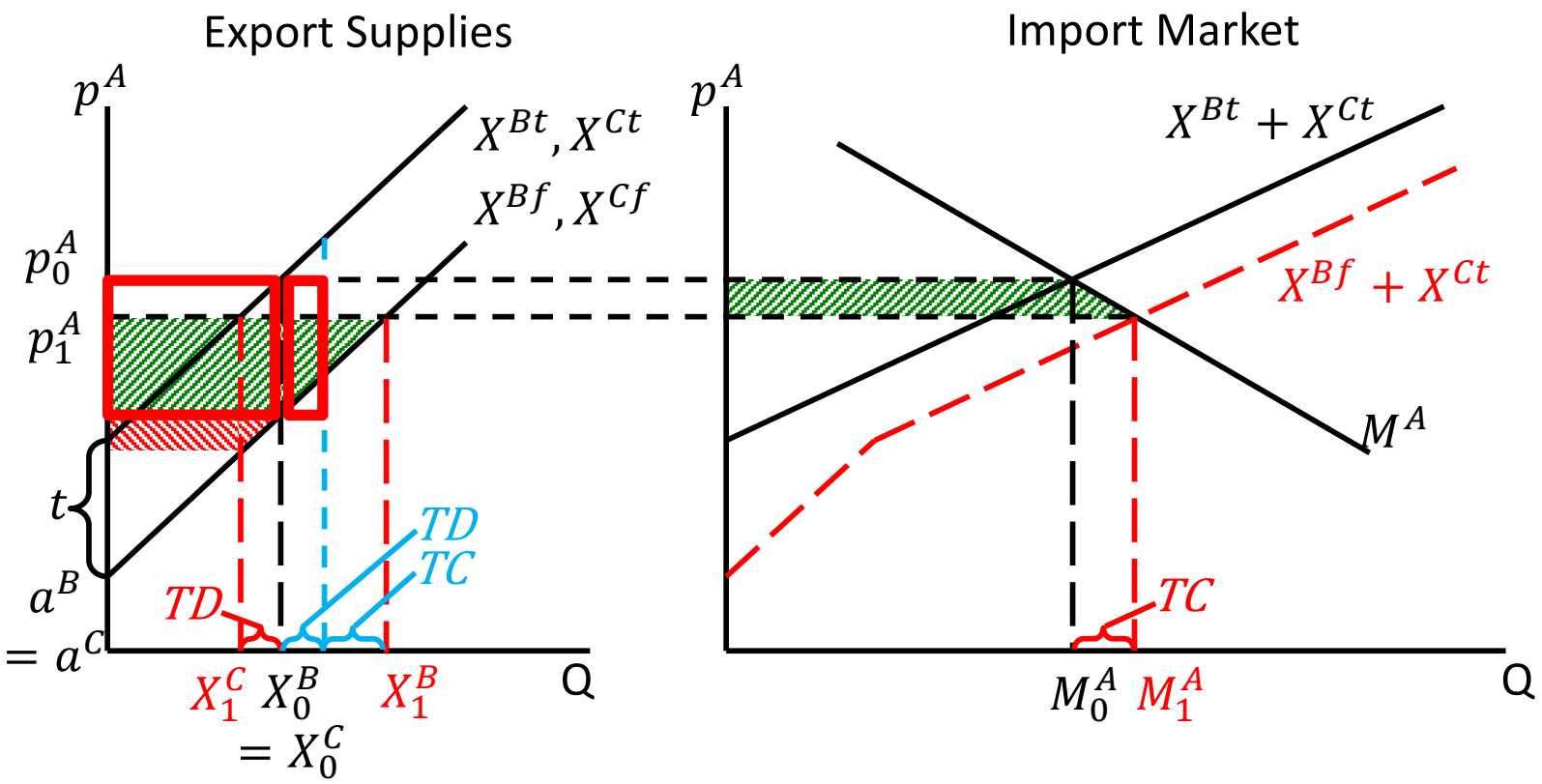
See immediately that country A

- Gains from trade creation
- Loses from trade diversion
- As well as from lost revenue from country B

Welfare Effects on Countries B and C

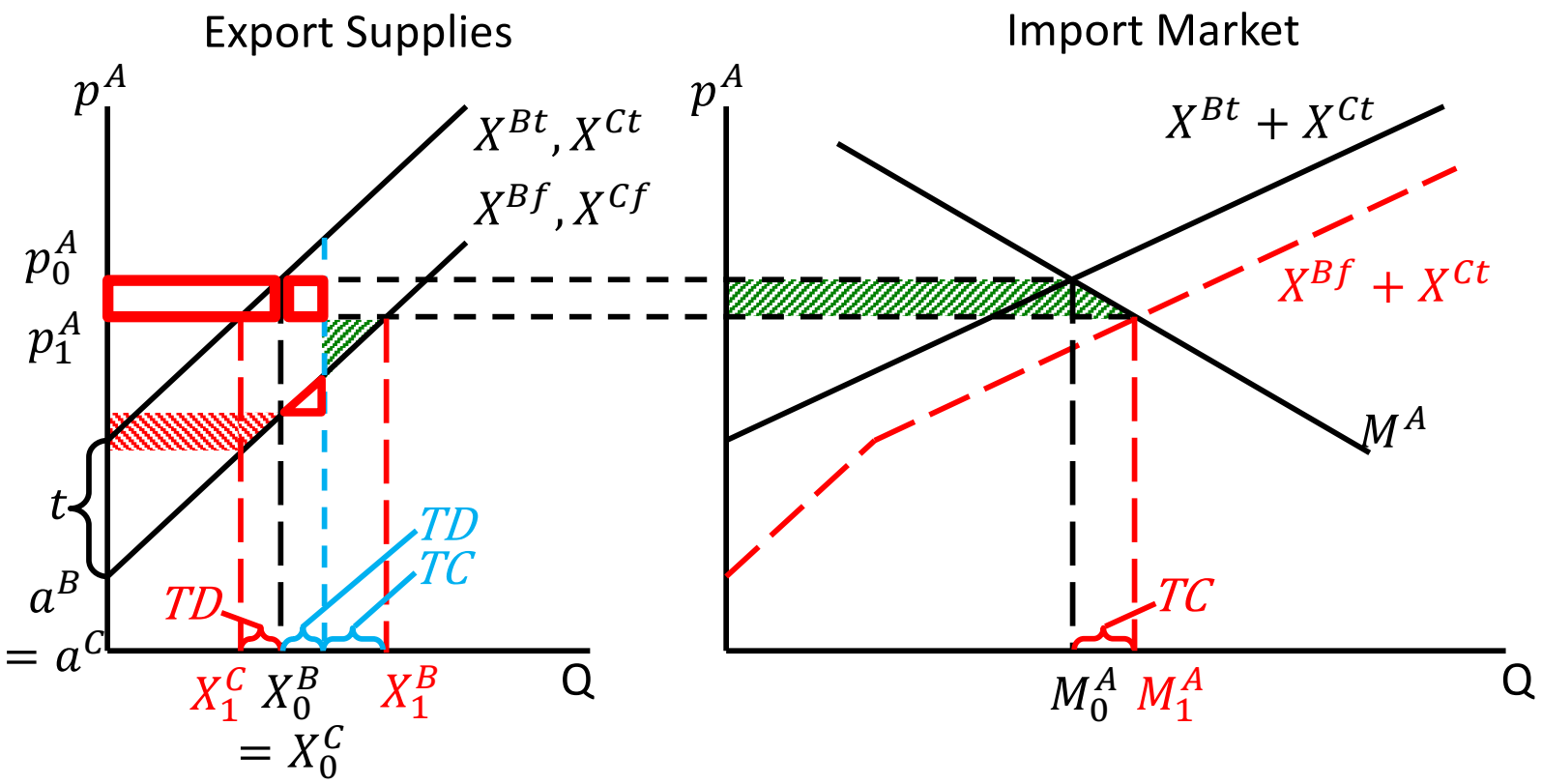


Welfare Effects on the World



These add up, with much cancellation to yield the following:

Welfare Effects on the World



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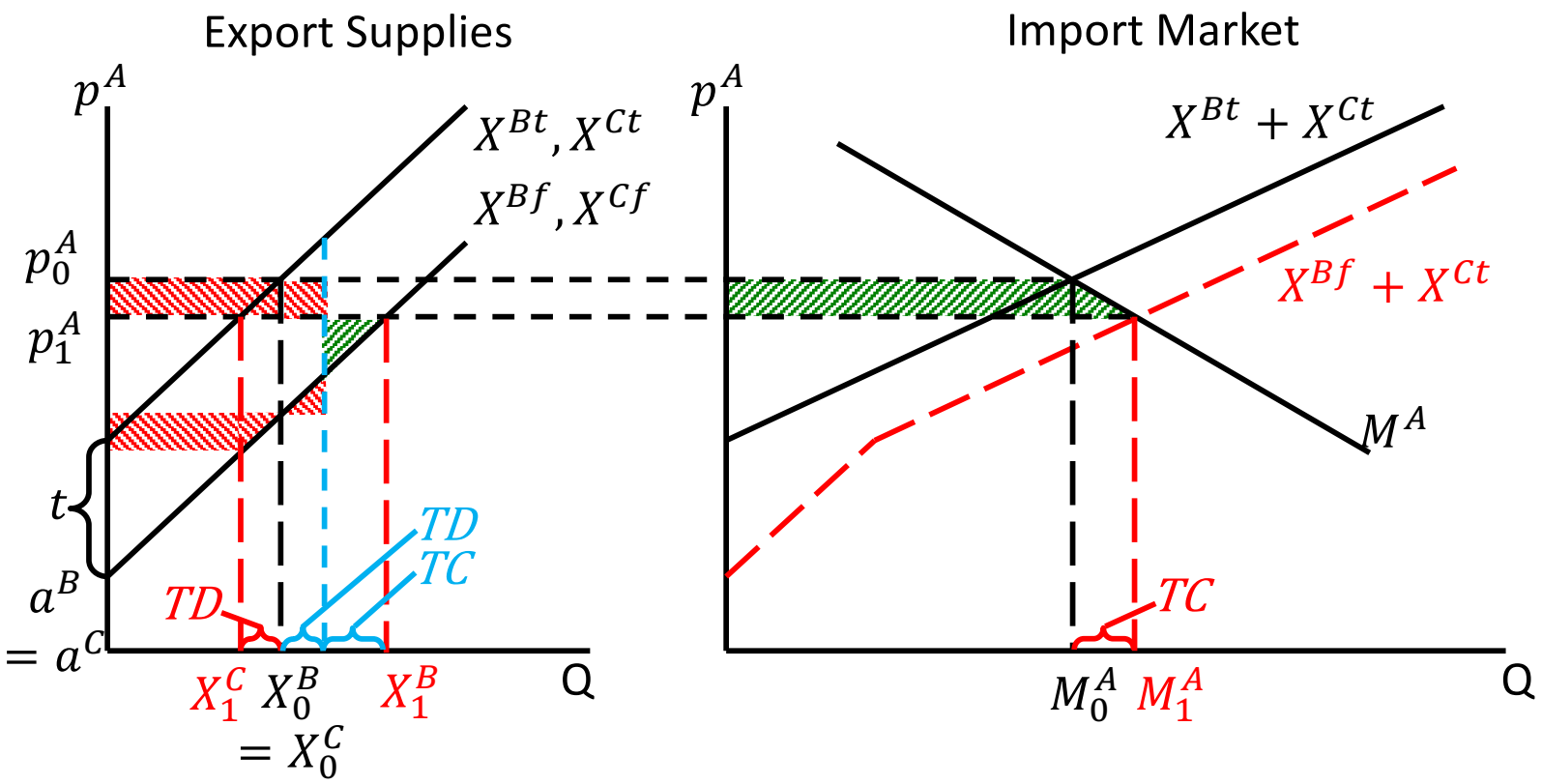

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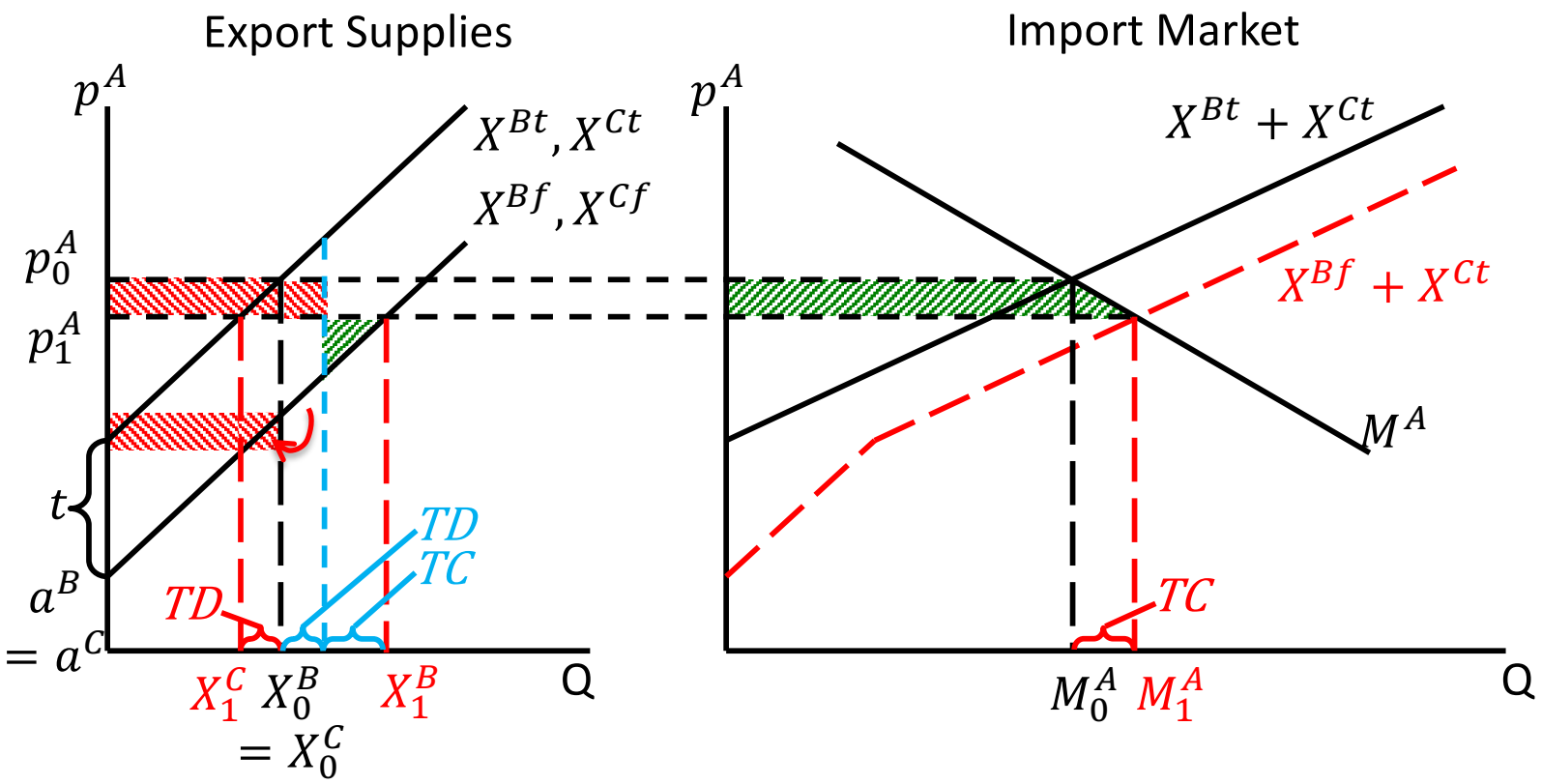

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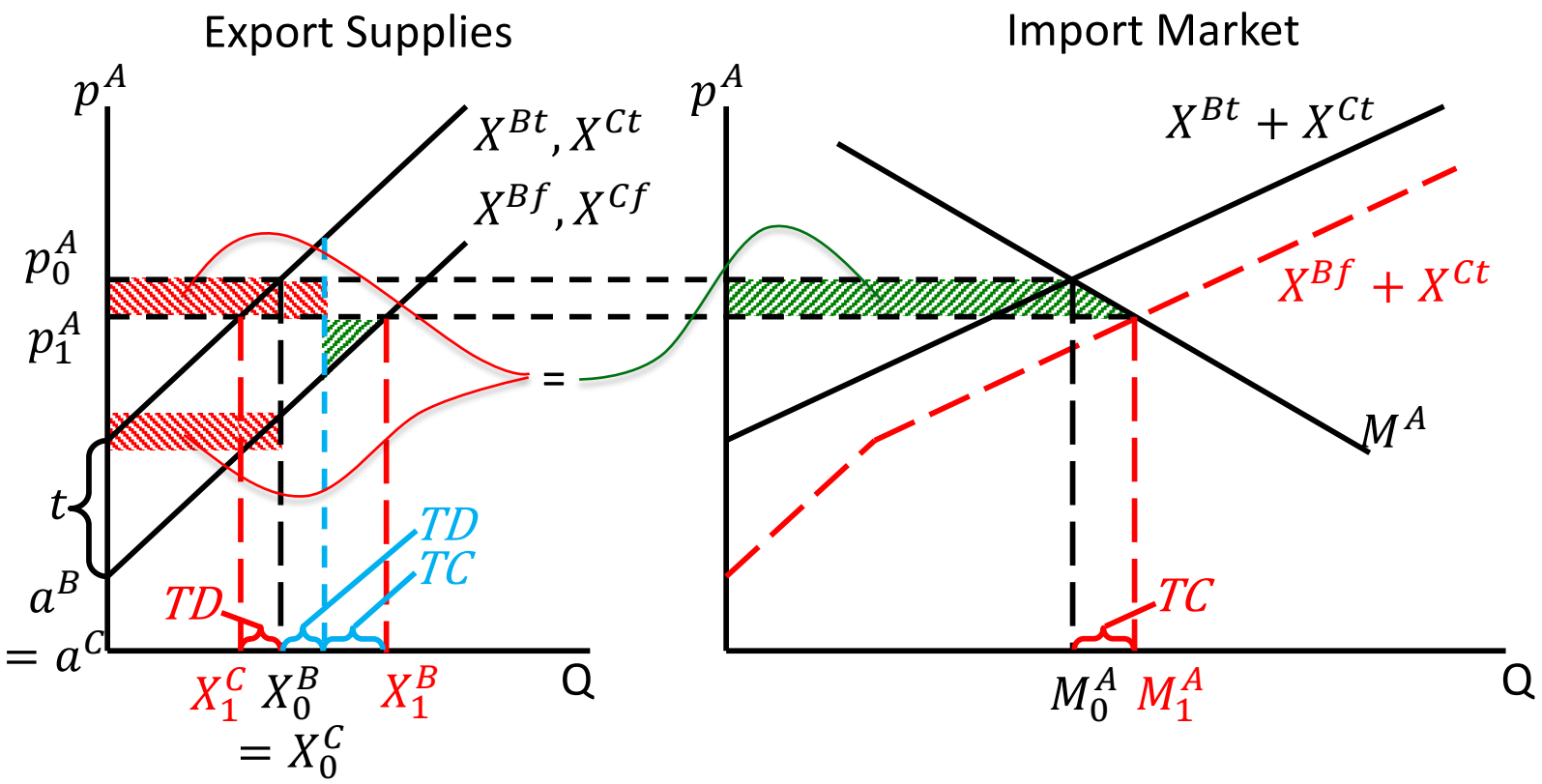

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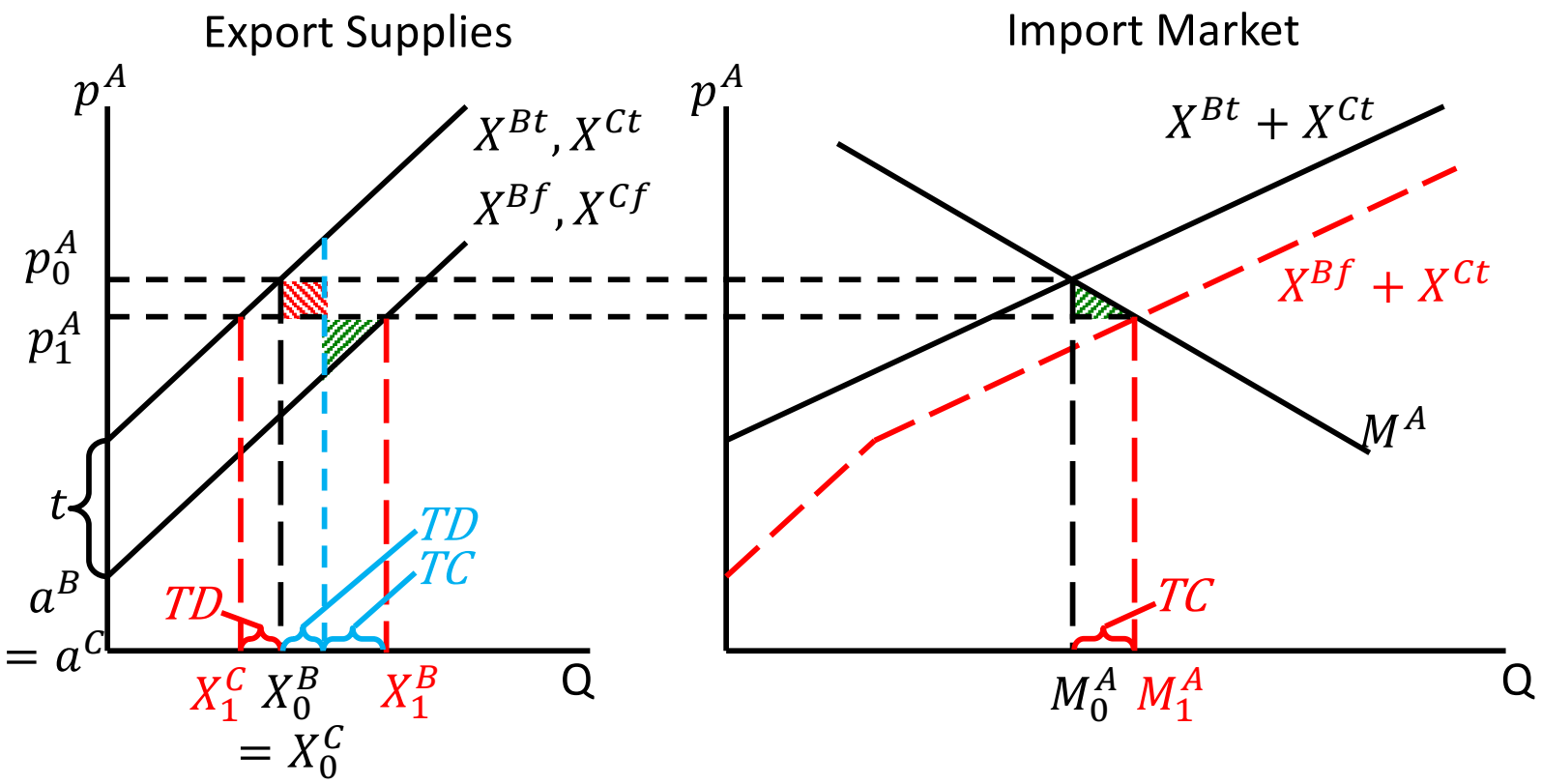

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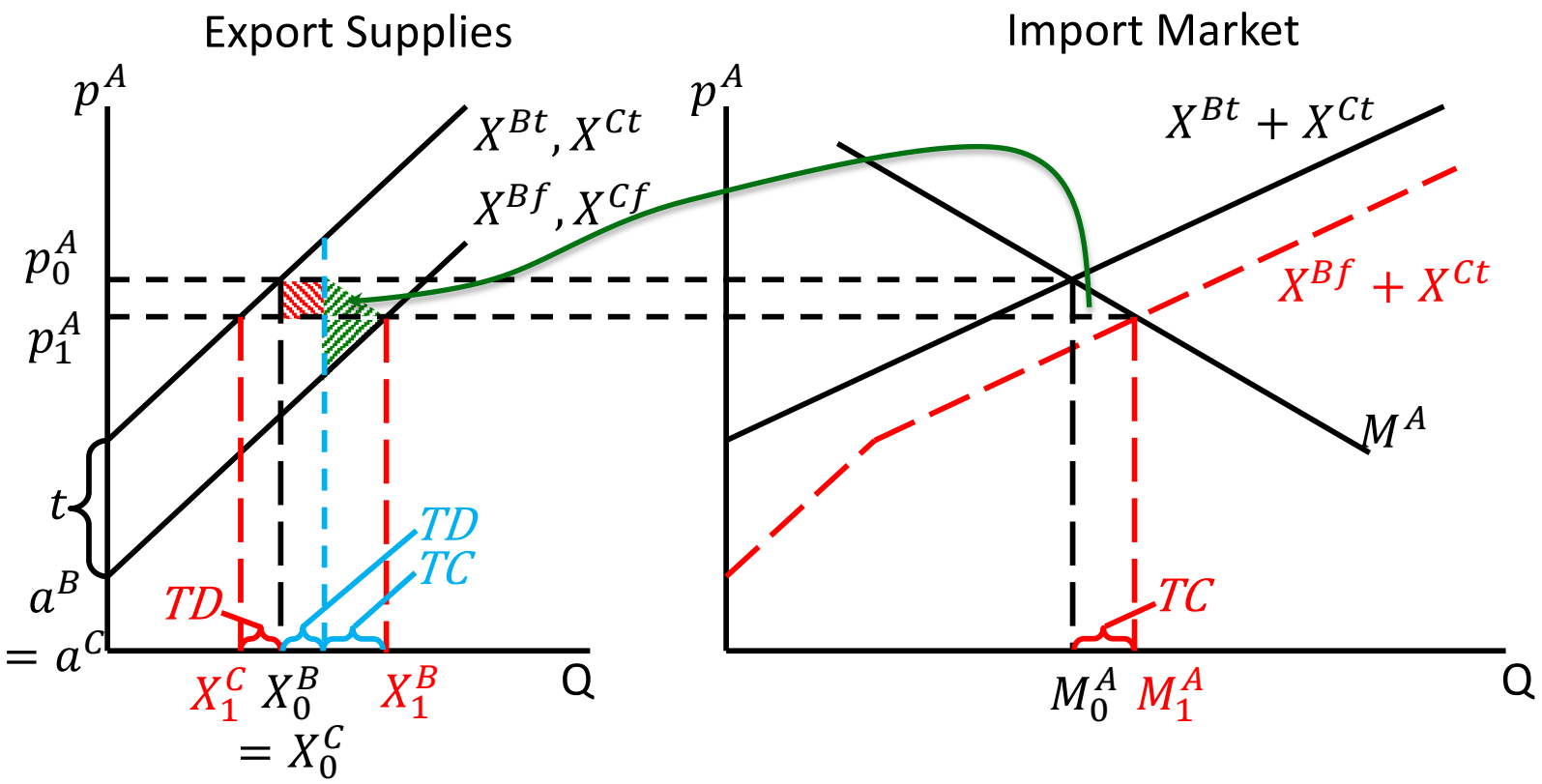

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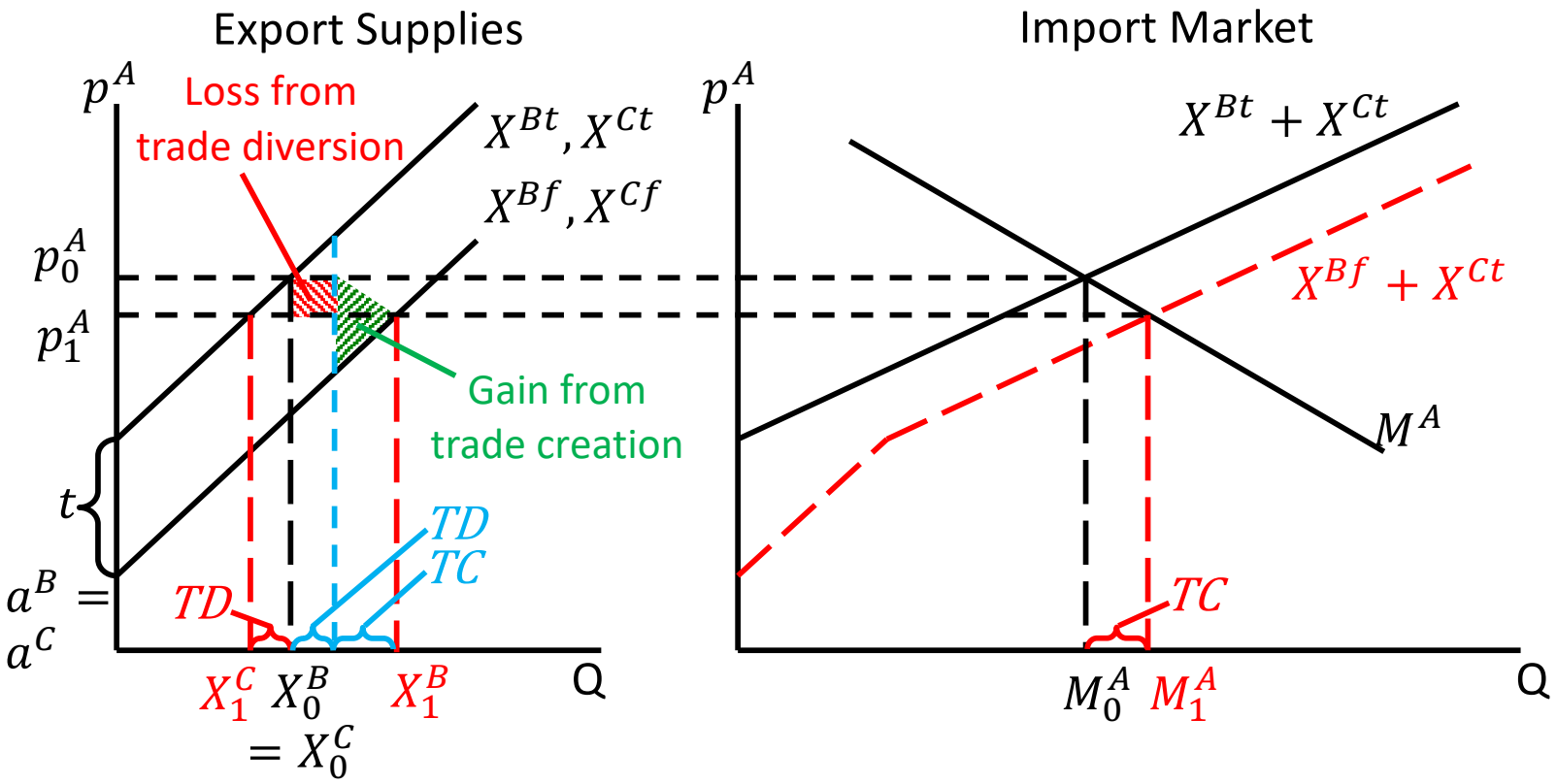
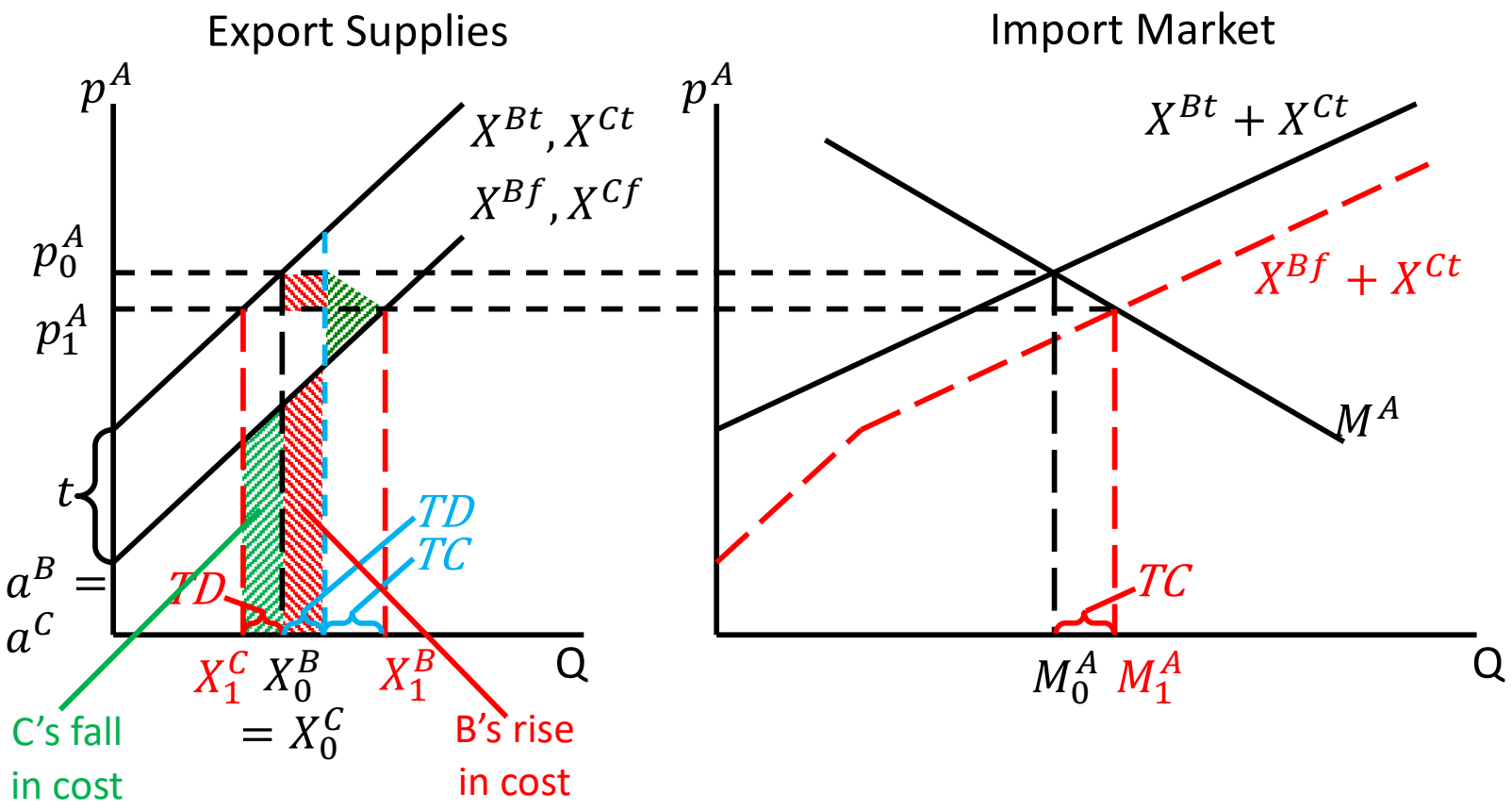


Why the Loss from Trade Diversion



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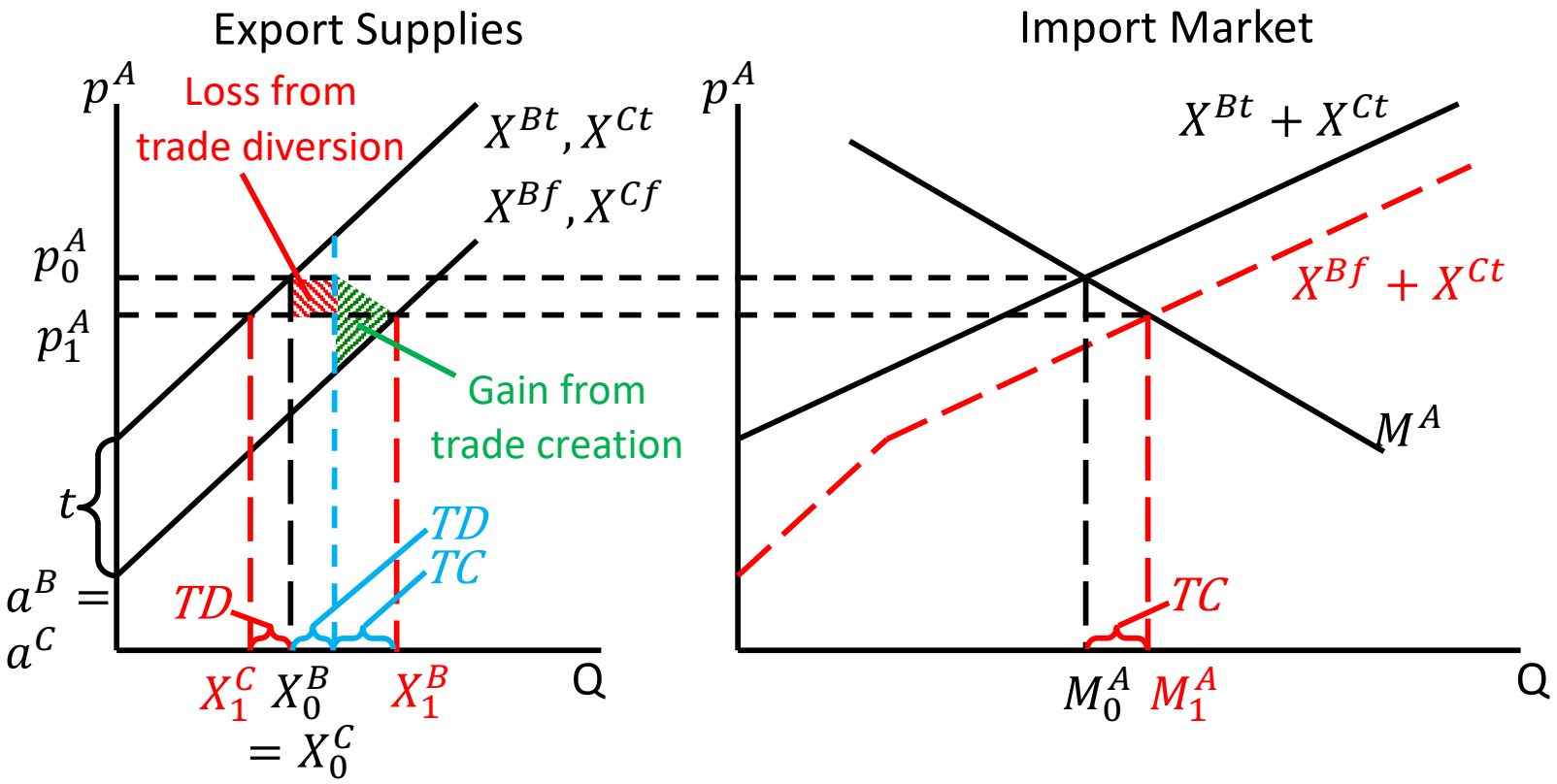


- Loss is an area, product of the price change and the quantity of trade diversion, with the latter depending on the former.
- So the loss rises with the square of trade diversion.

The Model

- Four countries:
  - Importer A
  - Exporters B, C, and D
- Export supply and import demands are linear
- Three equilibria
  - 0: MFN tariff t on exports of B, C, and D
  - 1: FTA of A and D:
    - Tariff t on exports of B and C;
    - Zero tariff on exports of D
  - 2: FTA of A with B, keeping FTA with D
    - Tariff t on exports of C only
    - Zero tariff on exports of B and D
- Consider only cases with $X^i > 0, i = B, C, D$

The Model

Exports:

$$X^i = b^i\left(p^i - a^i\right), \qquad i = B, C, D, \qquad p^i \geq a^i$$

Imports:

$$M^A = b^A(a^A - p^A), \qquad p^A \leq a^A$$

Equilibrium:

$$M^A = X^B + X^C + X^D$$

The Model

Let:

$$\beta = b^A + b^B + b^C + b^D$$

$$\theta^i = b^i / \beta$$

$$\gamma = \theta^A a^A + \theta^B a^B + \theta^C a^C + \theta^D a^D$$

Then solution is:

$$p^A = \gamma + \theta^B t^B + \theta^C t^C + \theta^D t^D$$

The Model

- With more assumptions, b^i are proportional to country size
  - (See paper)
- Therefore θ^i is country i's share of world economy
  - (This is not really right, as it assumes both demanders and suppliers in proportion to population. Exporters will in fact have more firms, and thus greater weight, than importers.)

The Model

Effect of new FTA between A and B

(in presence of A's FTA with D)

Let Δ be change from equilibrium 1 to equilibrium 2

$$\Delta p^A = -\theta^B t$$

Thus price in A falls by a fraction of the tariff, in proportion to size of new partner compared to world.

Country B's price rises by the rest of the tariff

$$\Delta p^B = (1 - \theta^B)t$$

Because A's tariff on C and D does not change

$$\Delta p^C = \Delta p^D = \Delta p^A = -\theta^B t$$

The Model

From the price changes, one derives the following changes in quantities of trade:

$$\Delta M^A = \theta^B b^A t > 0$$

$$\Delta X^B = \theta^B (b^A + b^C + a^D) t > 0$$

$$\Delta X^C = -\theta^B b^{\boldsymbol{C}} t < 0$$

$$\Delta X^D = -\theta^B b^{\boldsymbol{D}} t < 0$$

The Model

As must be from market equilibrium

$$\Delta X^B = \Delta M^A - \Delta X^C - \Delta X^D$$

Thus the added exports of the partner country include the new imports of country A plus the reduced exports of countries C and D. The latter trade may be said to be "diverted," but we label

$-\Delta X^C$ as "trade diversion"

and

$-\Delta X^D$ as "trade reversion"

because it is reversal of trade diversion from the prior FTA.

The Model

Thus

$$Trade\ Creation = TC = \theta^B b^A t > 0$$

$$Trade\ Diversion = TD = \theta^B b^C t > 0$$

$$Trade\ Reversion = TR = \theta^B b^D t > 0$$

The Model

Welfare effects of new FTA

Lost tariff revenue

Country A (home):

$$\Delta W^A = \left(M_0^A / b^A + \theta^B t/2\right) TC - tTD - tX_0^B$$

Country B (new partner):

$$\Delta W^B = \Delta NS^B = \left[X_0^B + \frac{1}{2}(TC + TD + TR)\right](1 - \theta^B)t$$

Country C (outside world):

$$\Delta W^C = \left[-X_0^C + \frac{TD}{2}\right]\theta^B t$$

Country D (old partner):

$$\Delta W^D = \left[-X_0^D + \frac{TR}{2}\right]\theta^B t$$

The Model

Welfare effects of new FTA on the World

World (A+B+C+D):

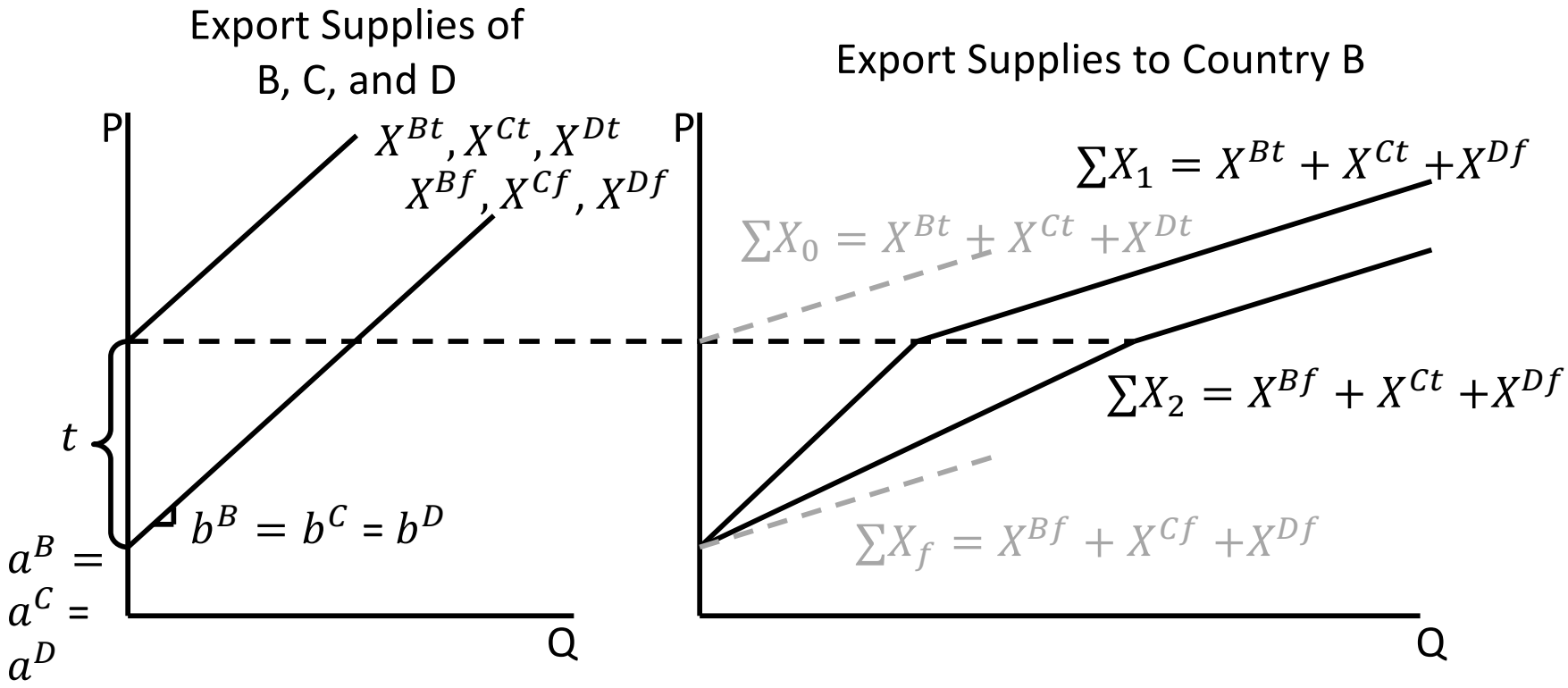
$$\Delta W^W = \frac{1}{2} TCt + \frac{1}{2}(TR - TD)t$$

4-country case

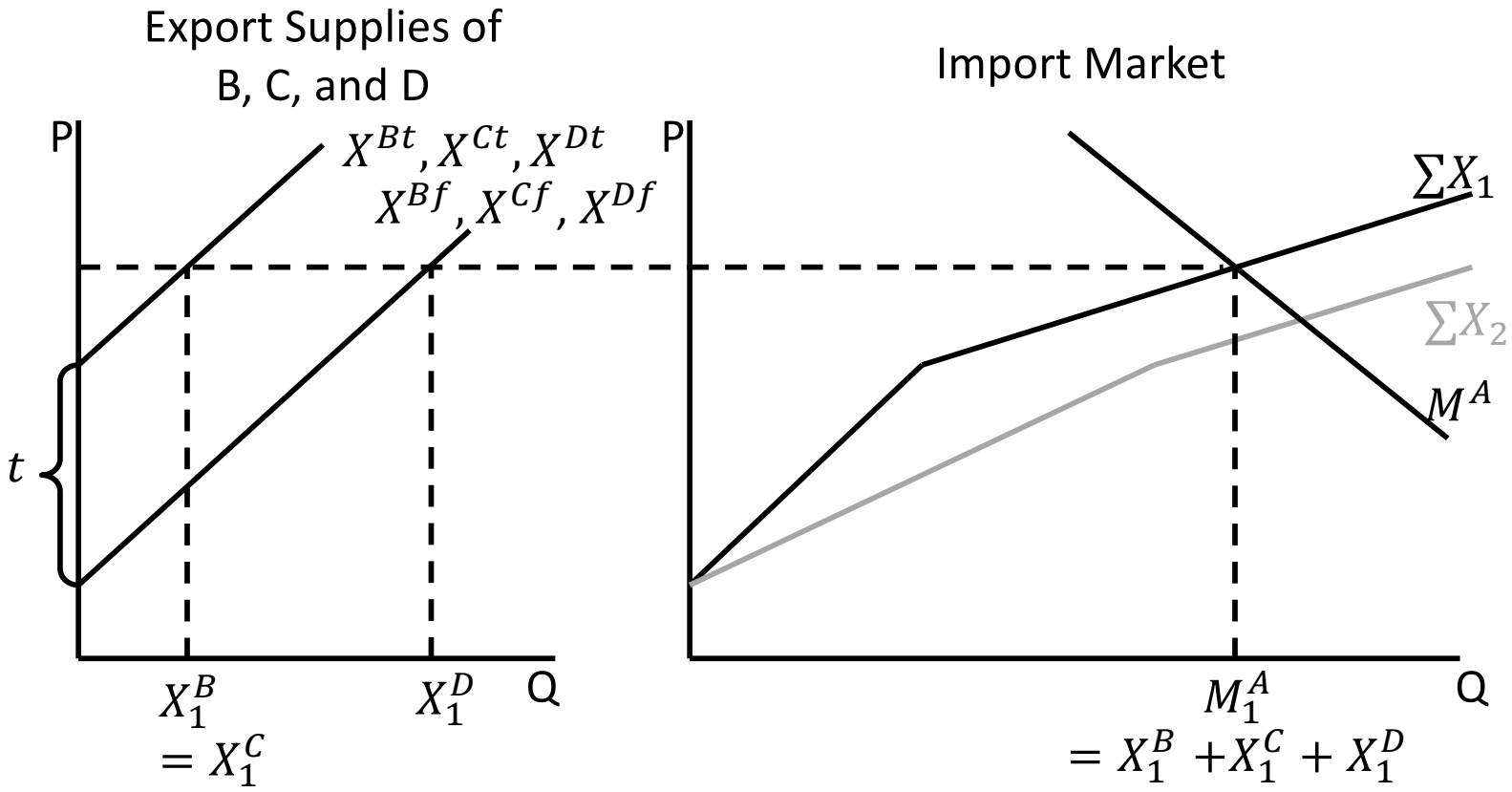
- Three countries, importer A, and exporters B, C, and D
- Export supply and import demands are linear
- Countries B, C, and D are identical
- Two equilibria
  - 1: MFN tariff t on exports of both B and C
    - Zero tariff on exports of old FTA partner D
  - 2: New FTA of A and B:
    - tariff t on exports of C only;
    - zero tariff on exports of two FTA partners B and D

For simplicity

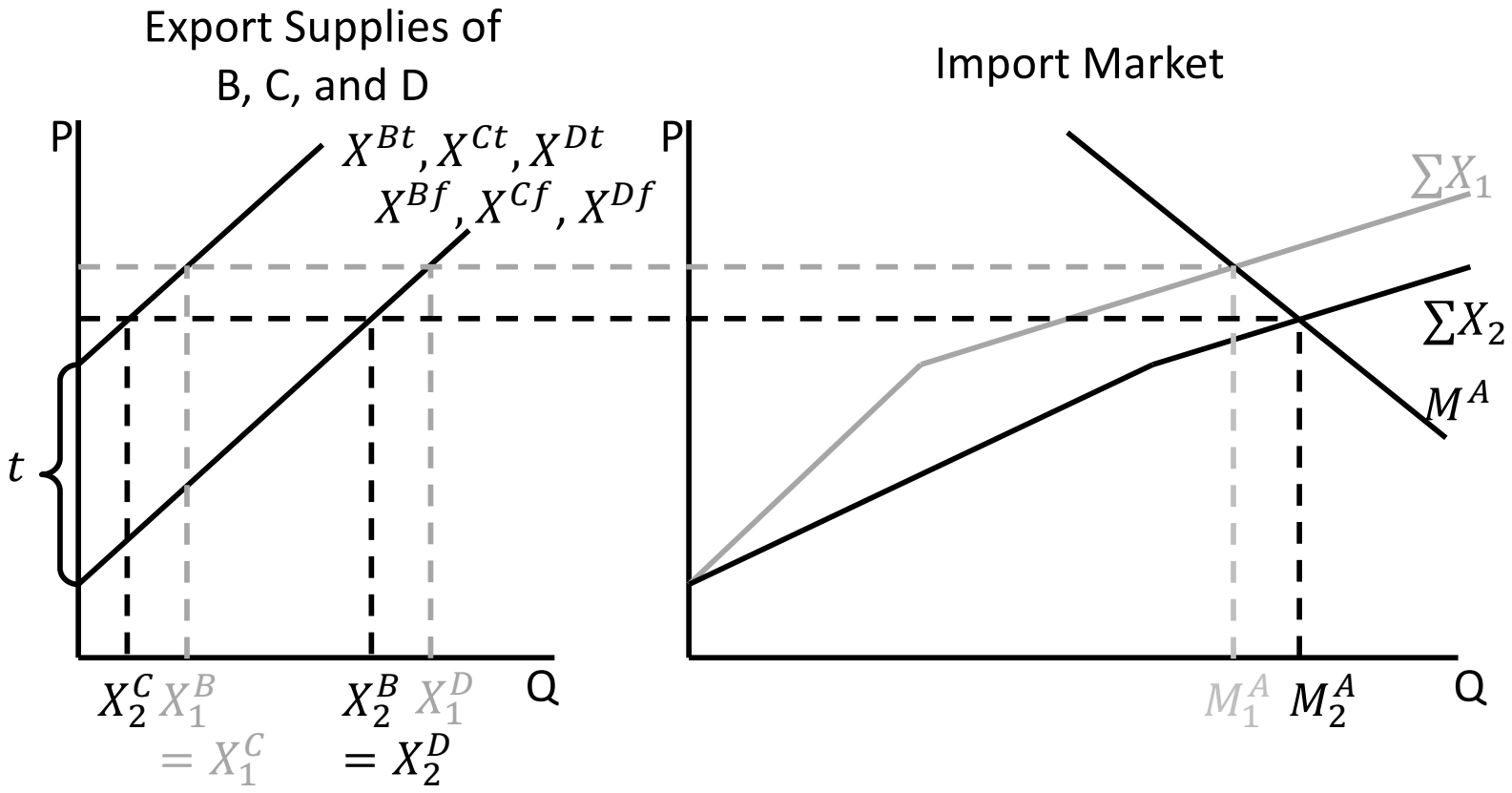
Export Supplies



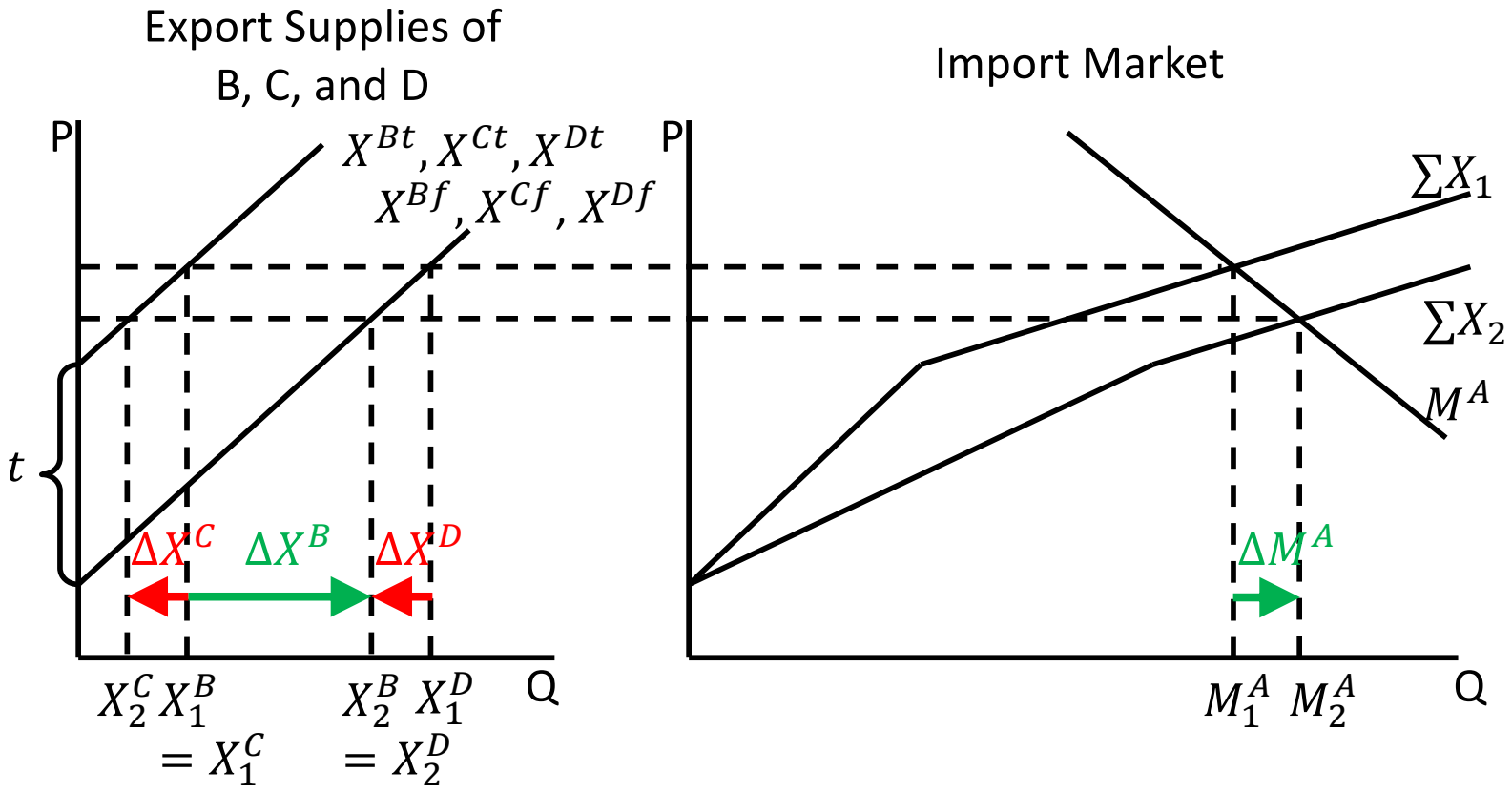
Equilibrium 1: A has FTA with 1 country, D



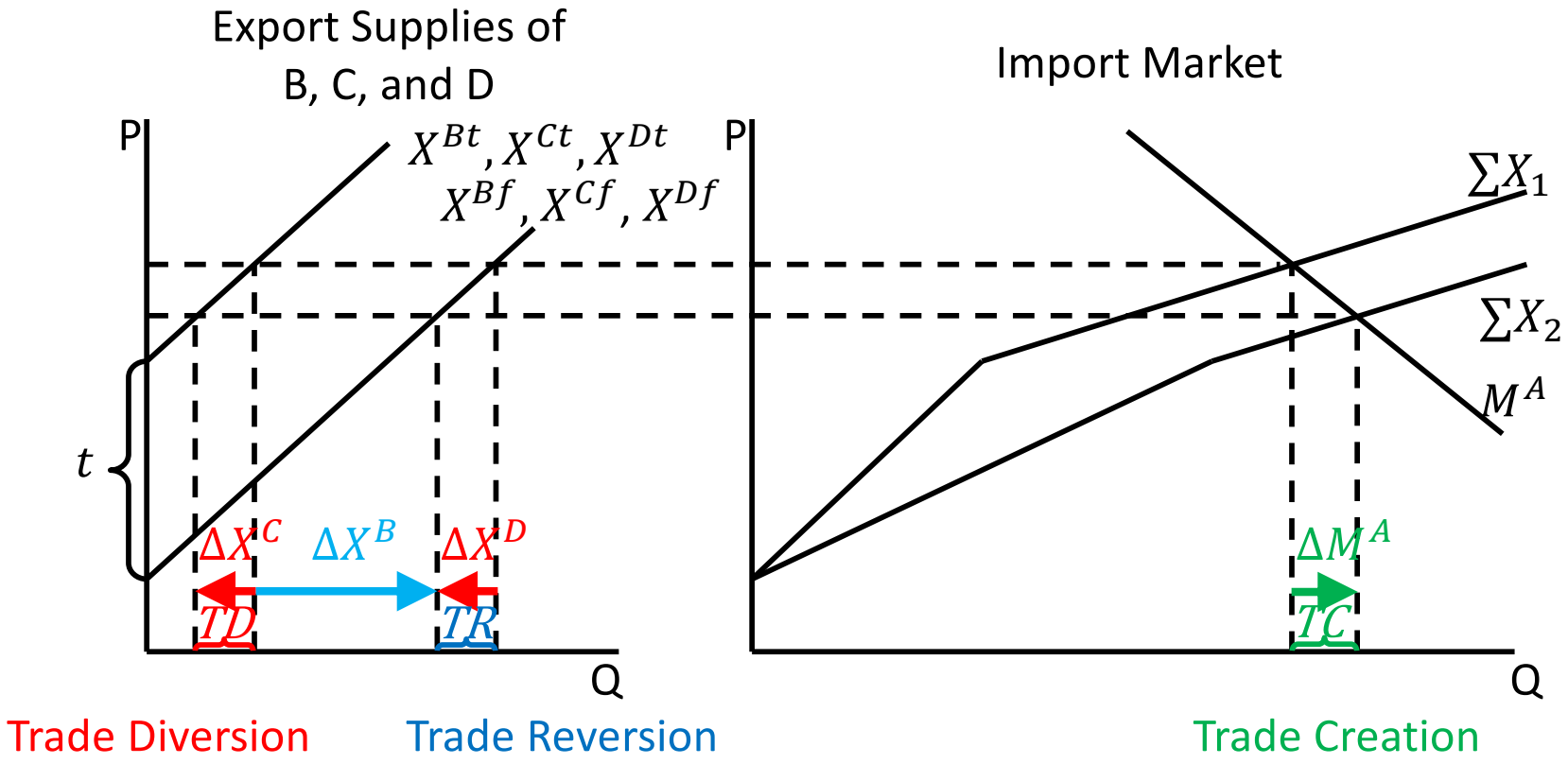
Equilibrium 2: A has FTA with 2 countries, B & D



Changes in Trade from expanding FTA to Country B



Trade Creation (TC), Diversion (TD), and Reversion (TR)



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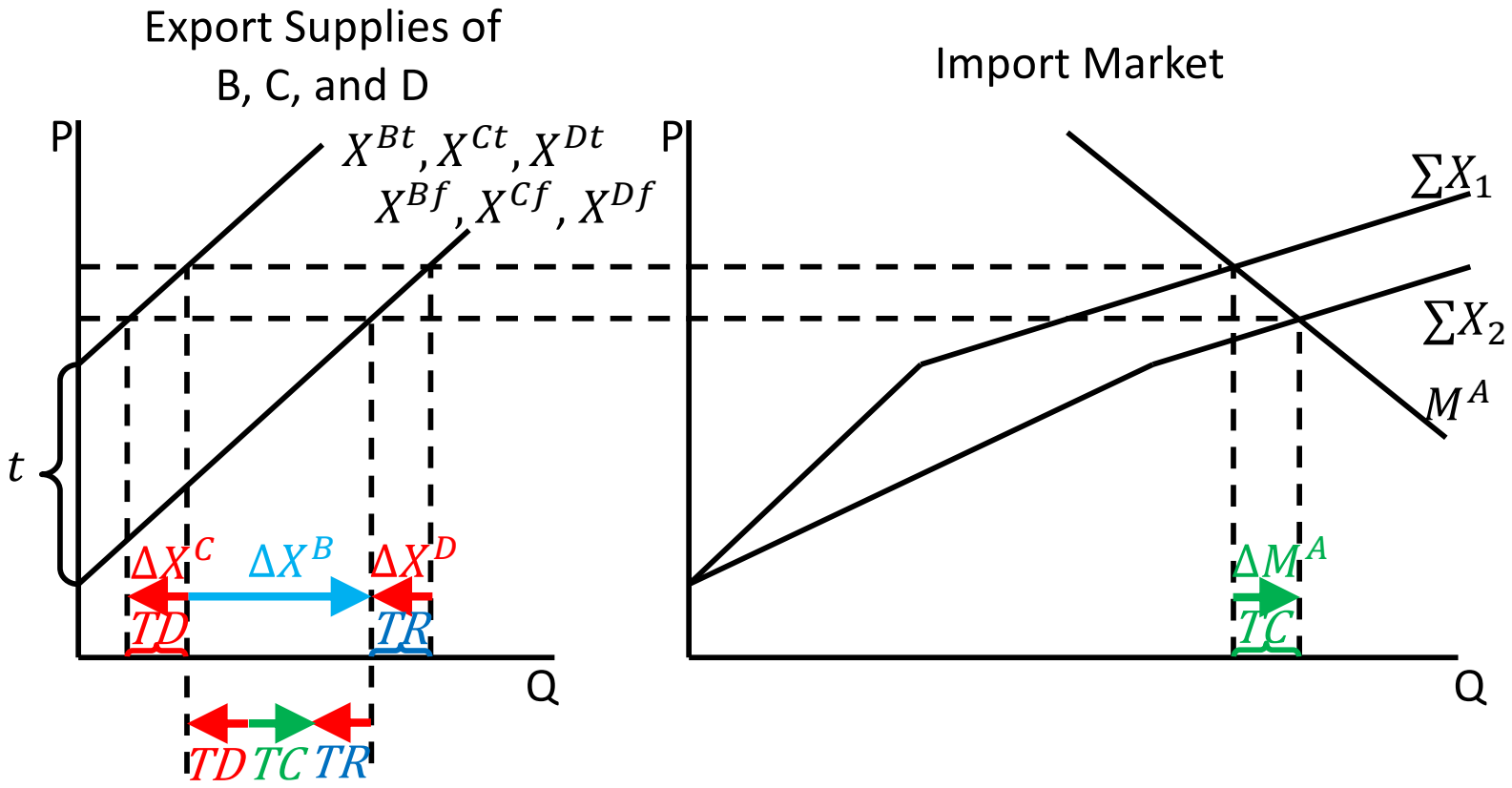
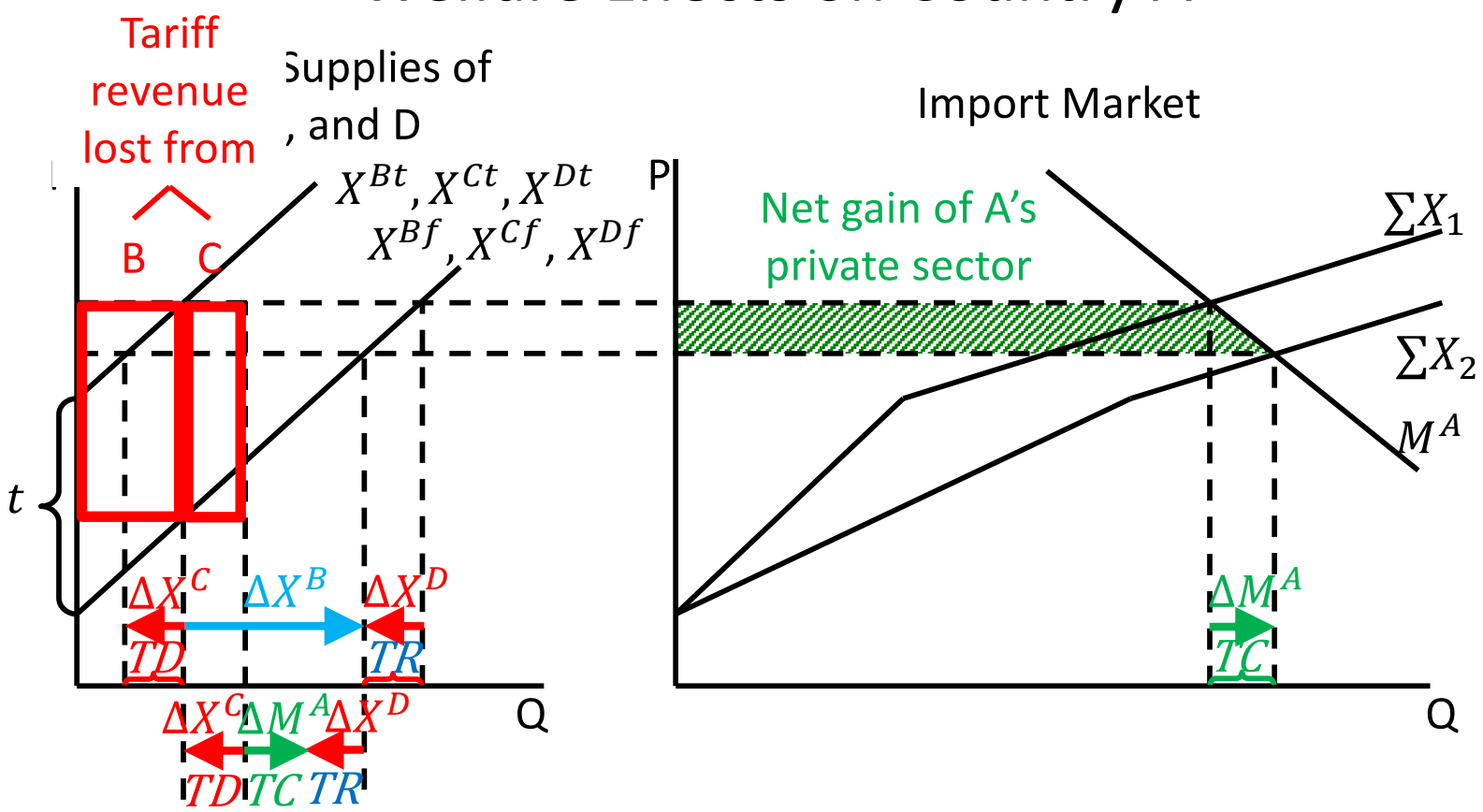


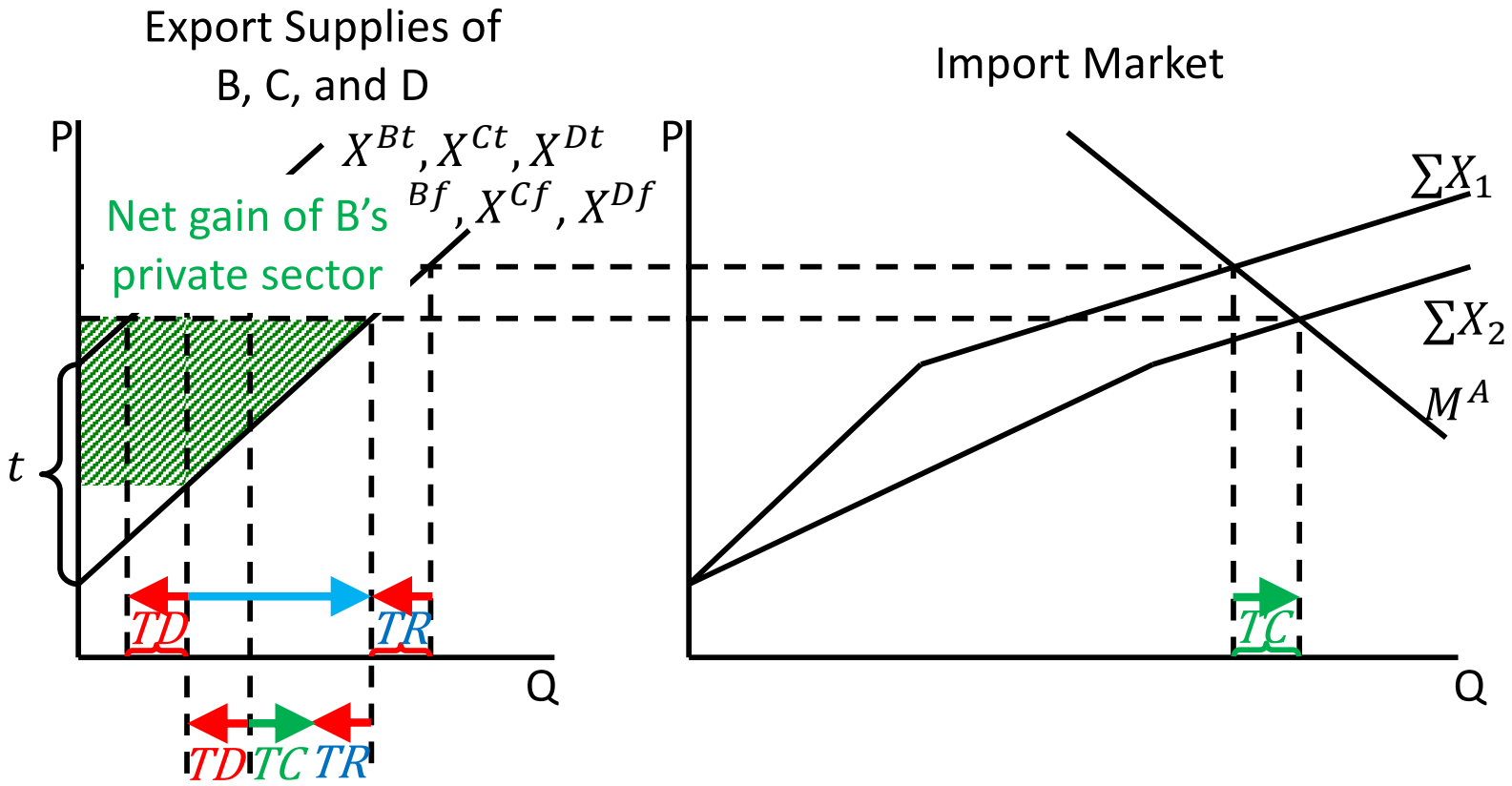
Note that ΔX^B, while a gain to Country B, is the sum of *TC*, *TD*, & *TR*, since $\Delta X^B = \Delta M^A - \Delta X^C - \Delta X^D$

Welfare Effects on Country A

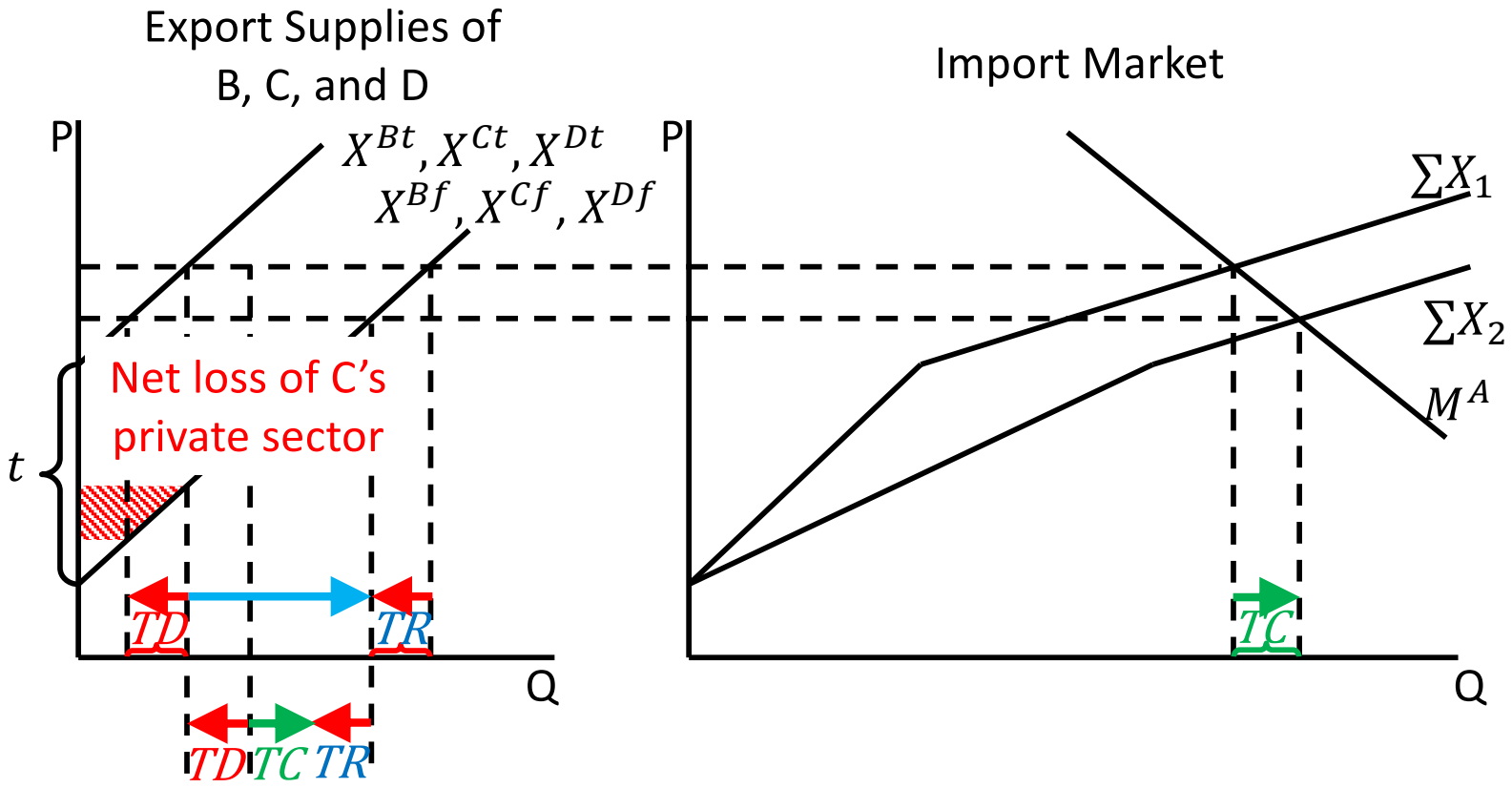


Note that trade reversion does not appear to affect A's welfare. I suspect this is an artifact of making export supplies from B and D the same.

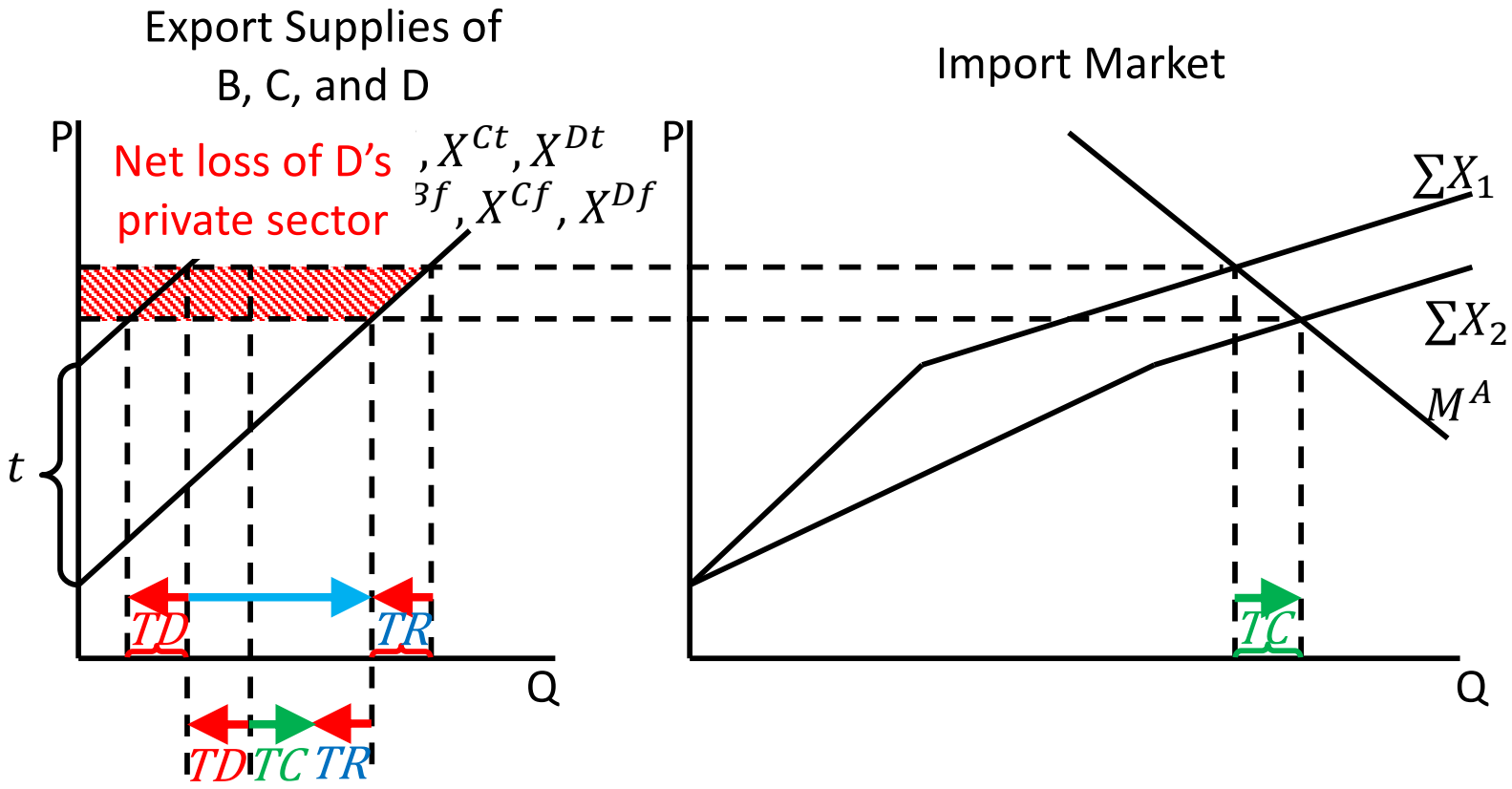
Welfare Effect on Country B



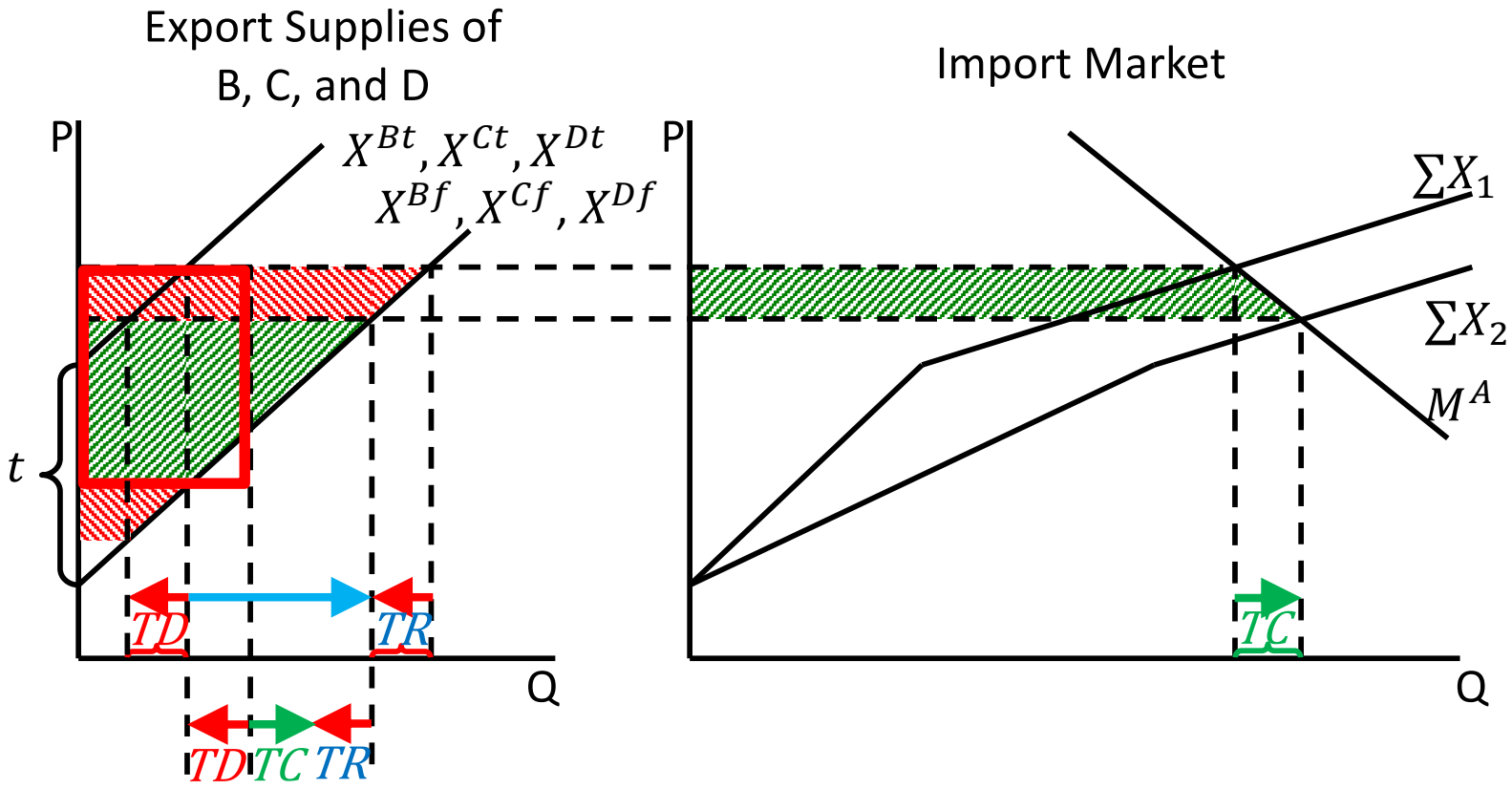
Welfare Effect on Country C



Welfare Effect on Country D

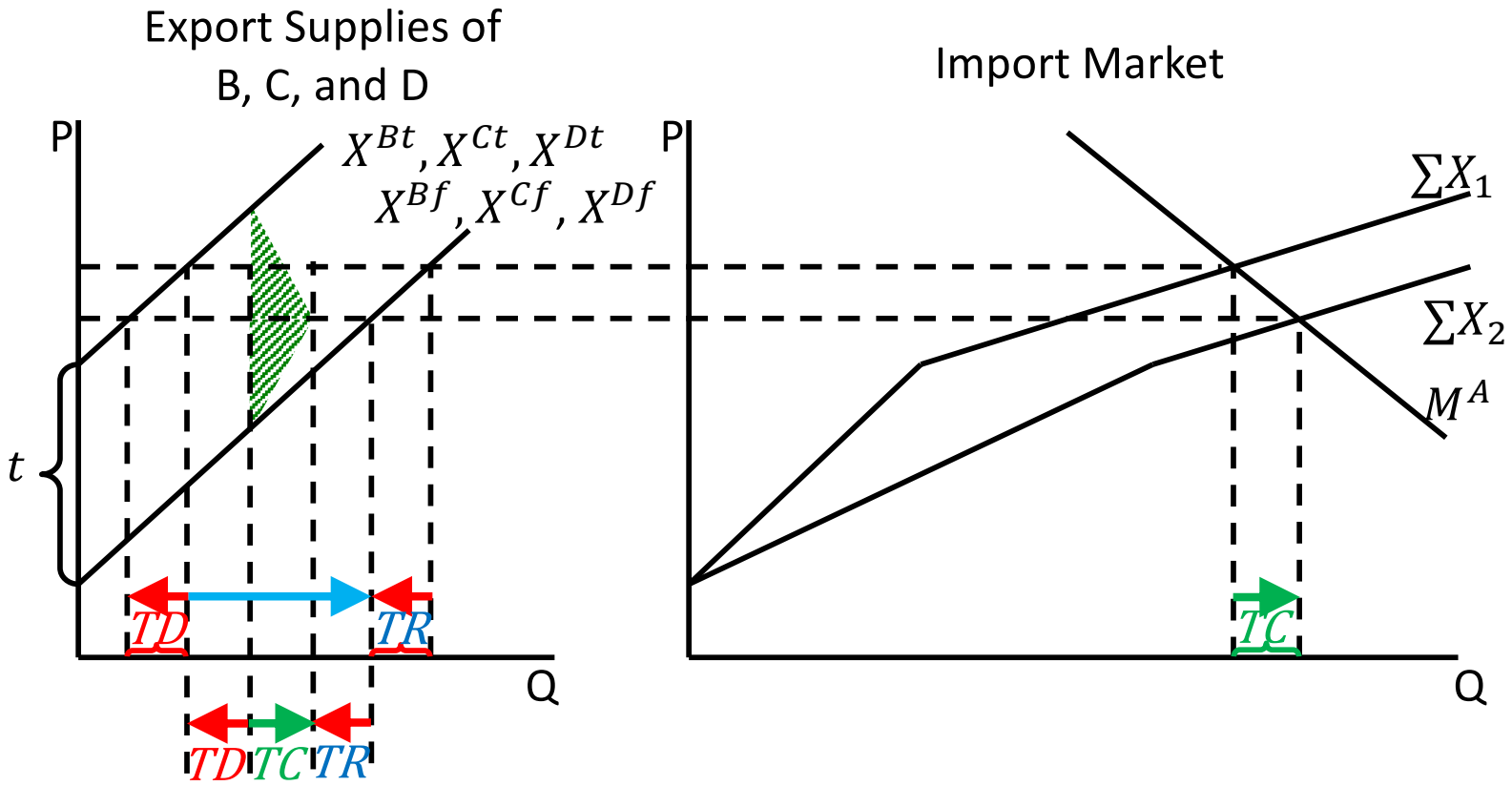


Welfare Effects on World



I claim that these gains and losses mostly cancel out to reduce to the following:

Welfare Effect on World



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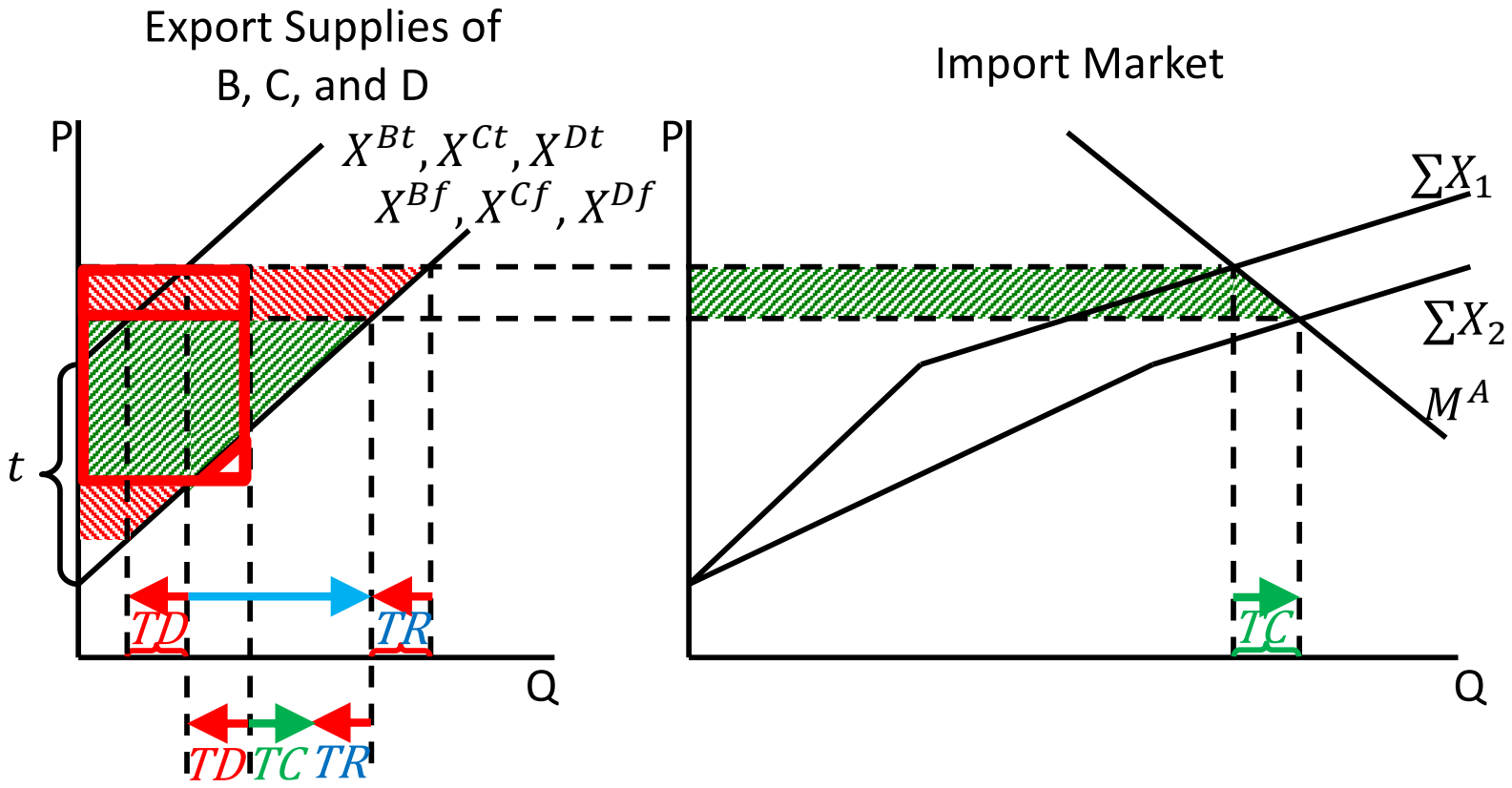

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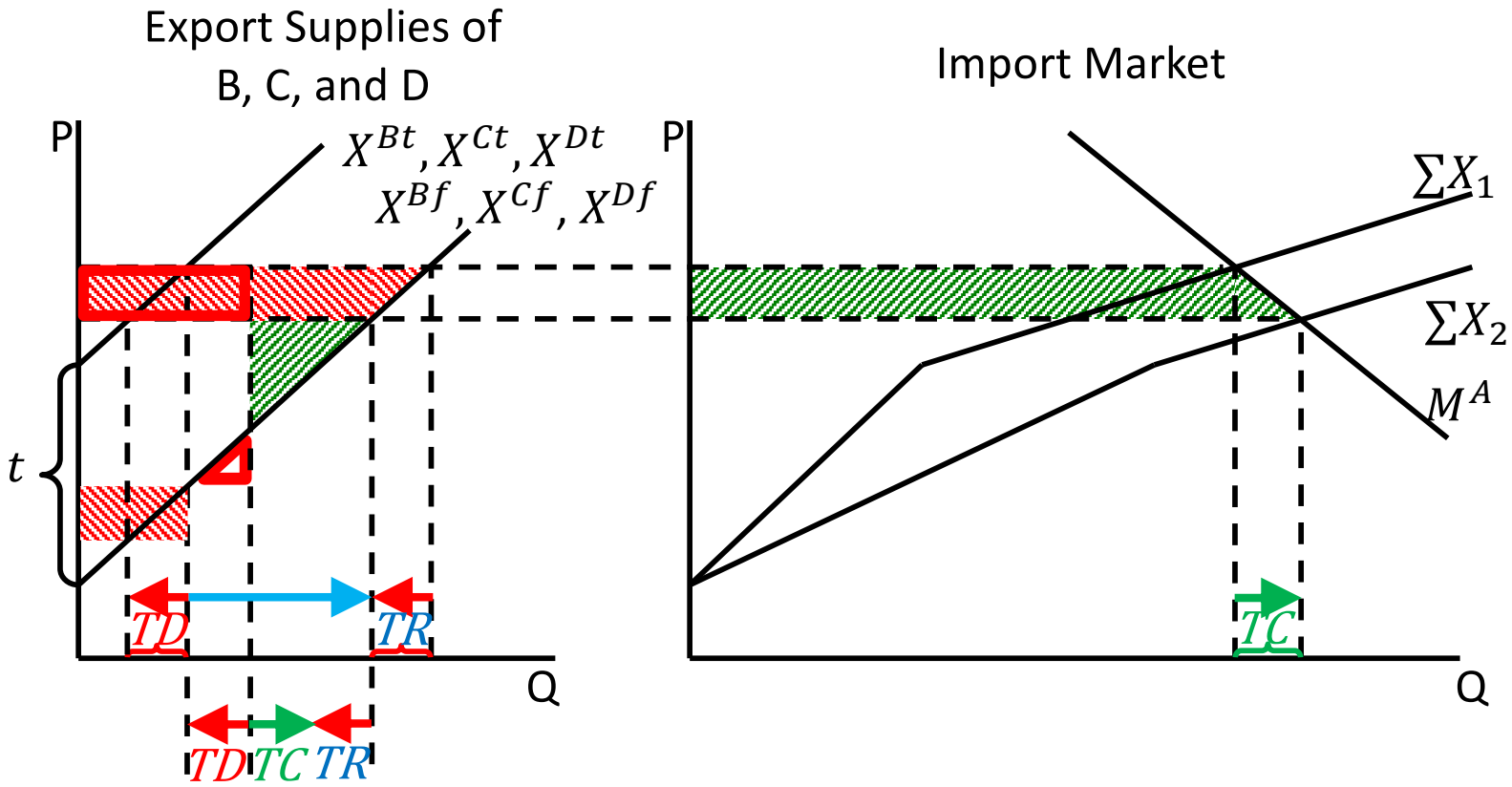

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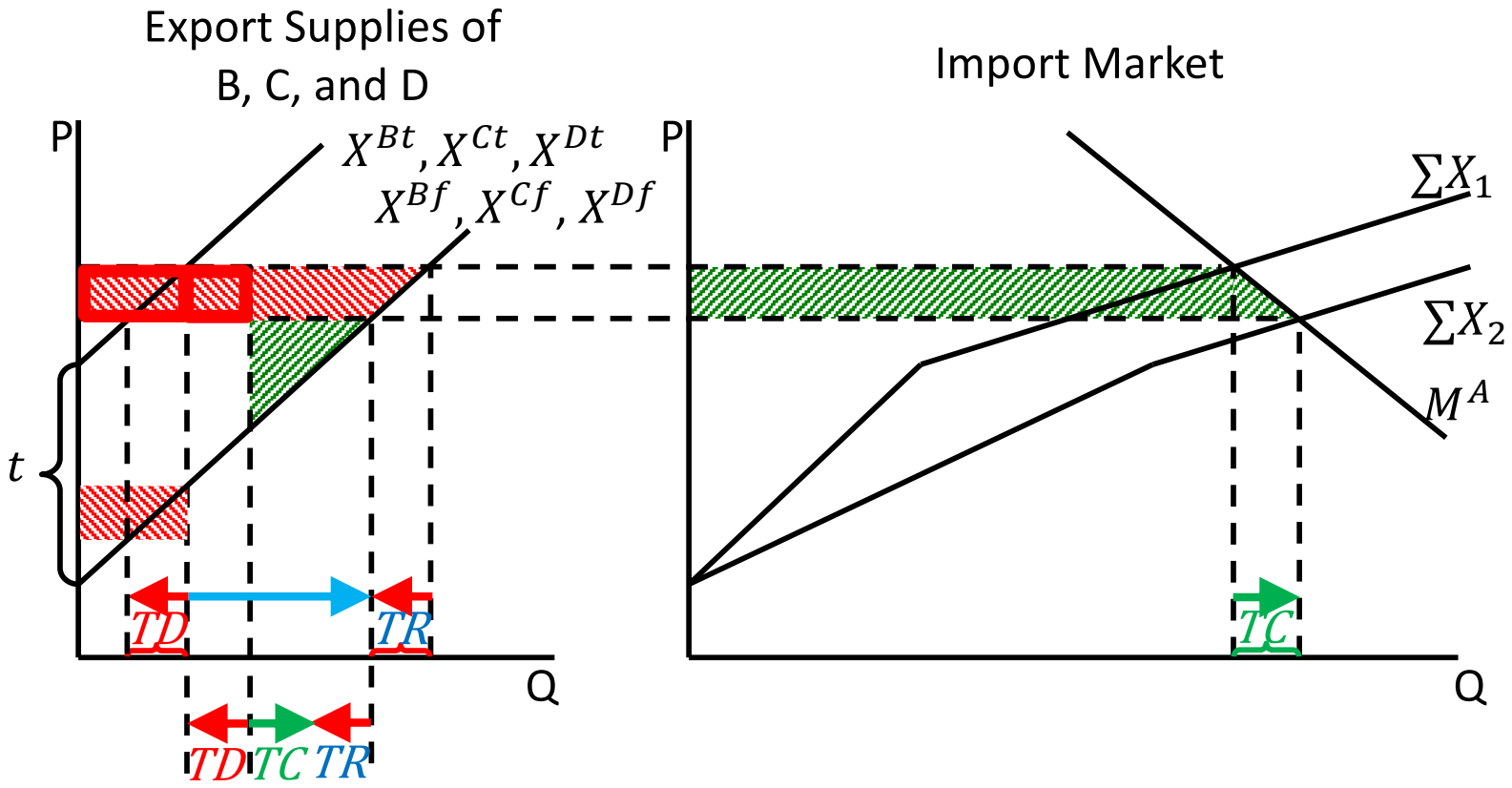

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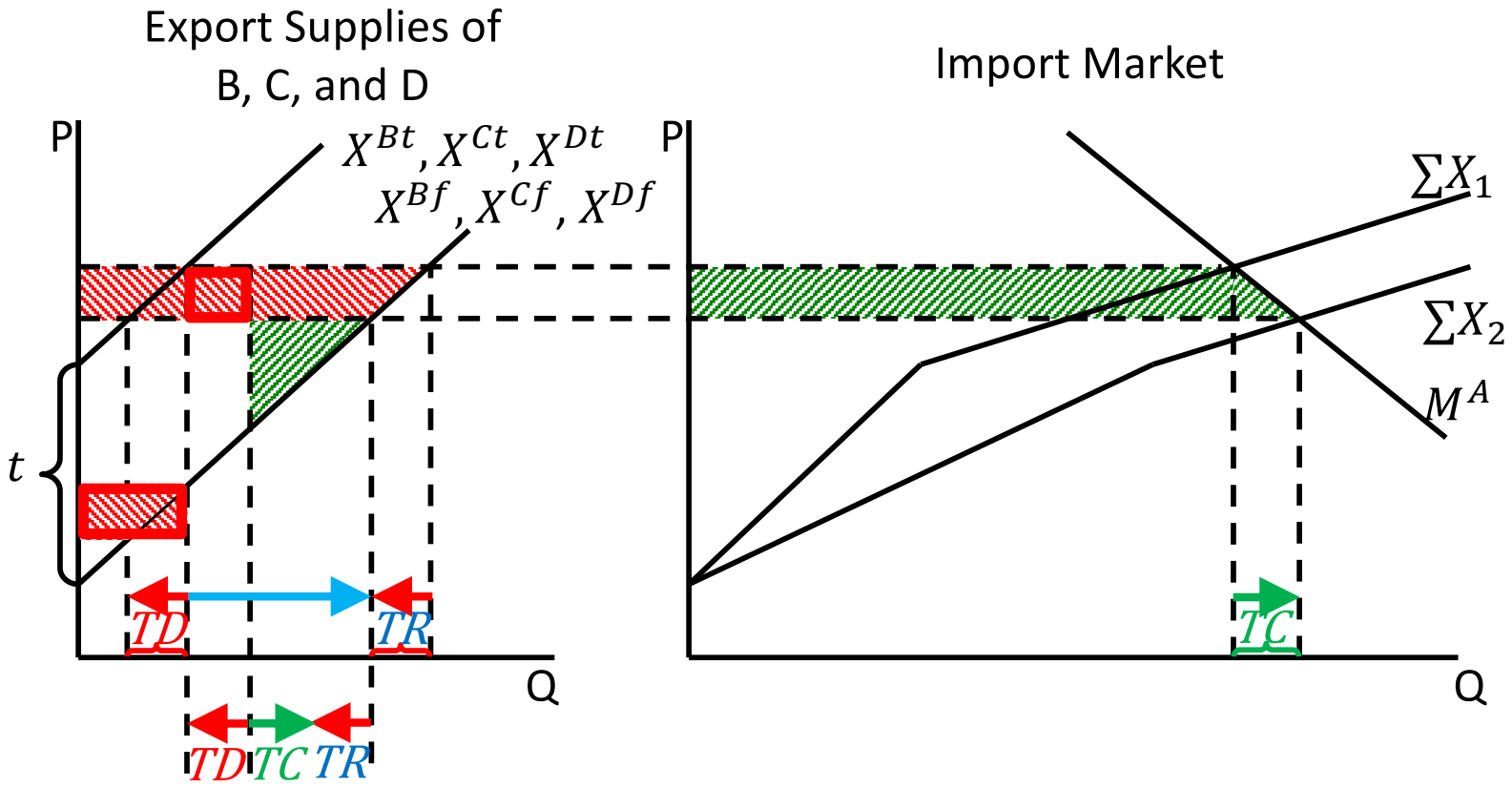

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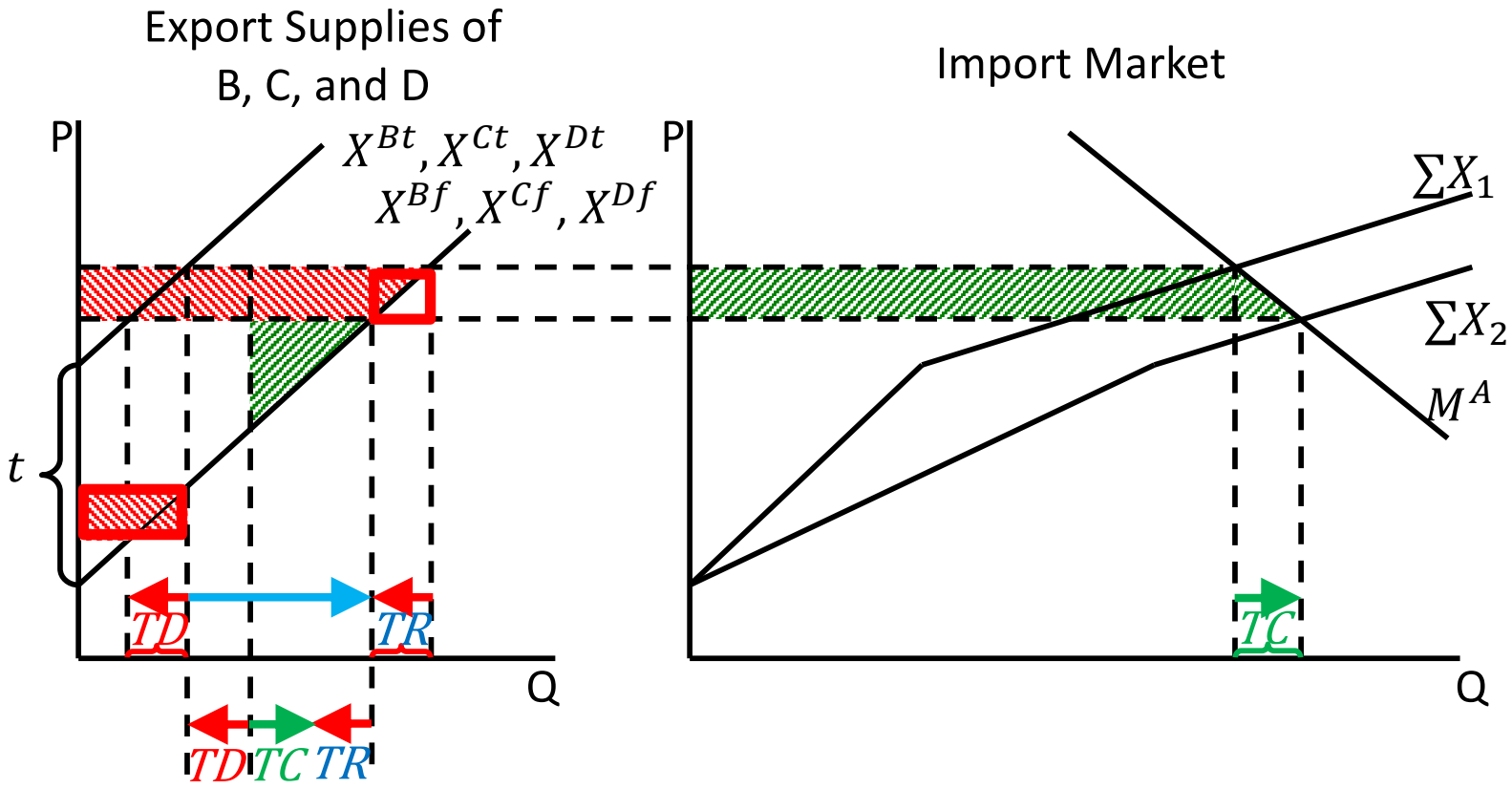

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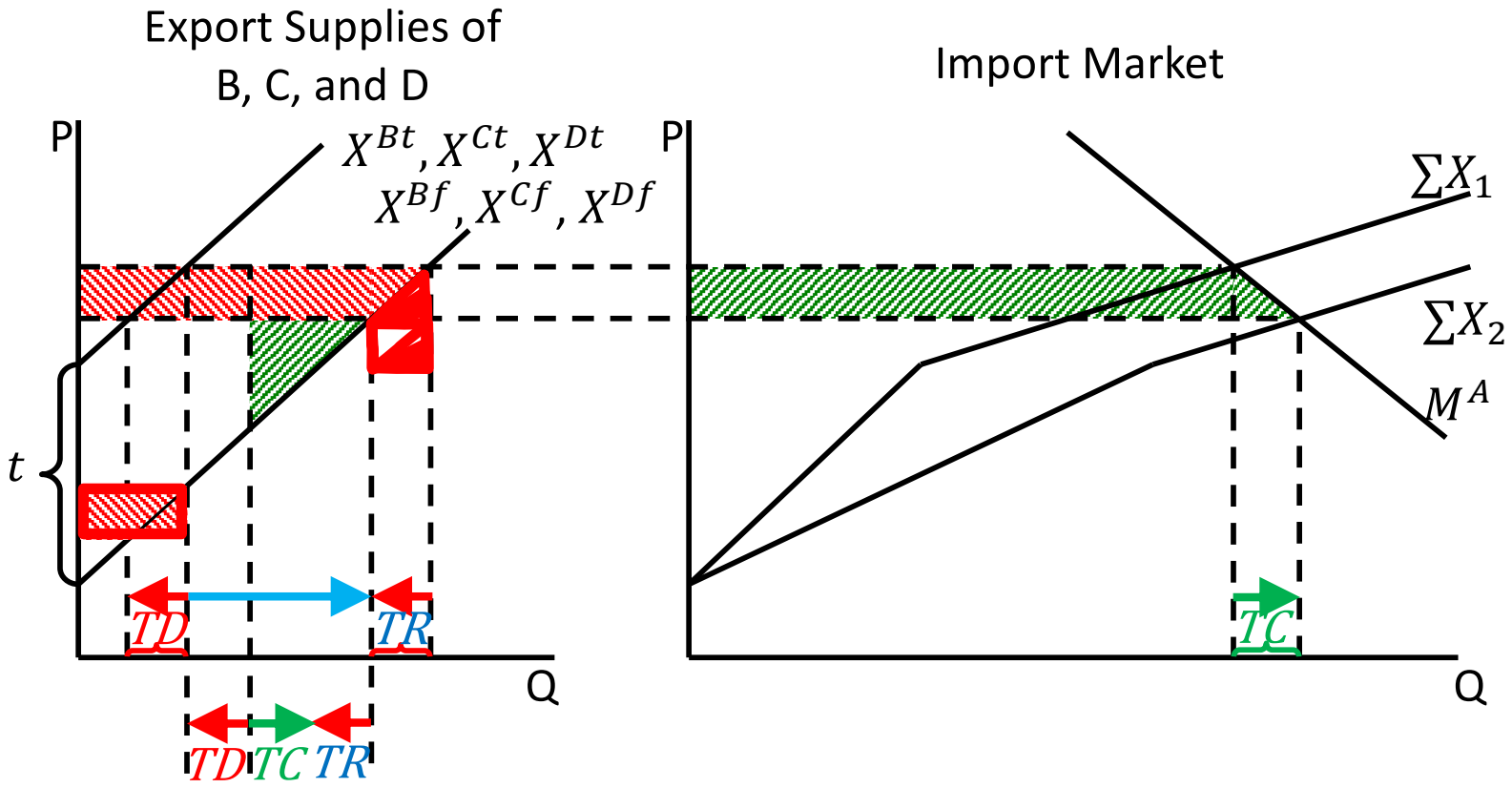

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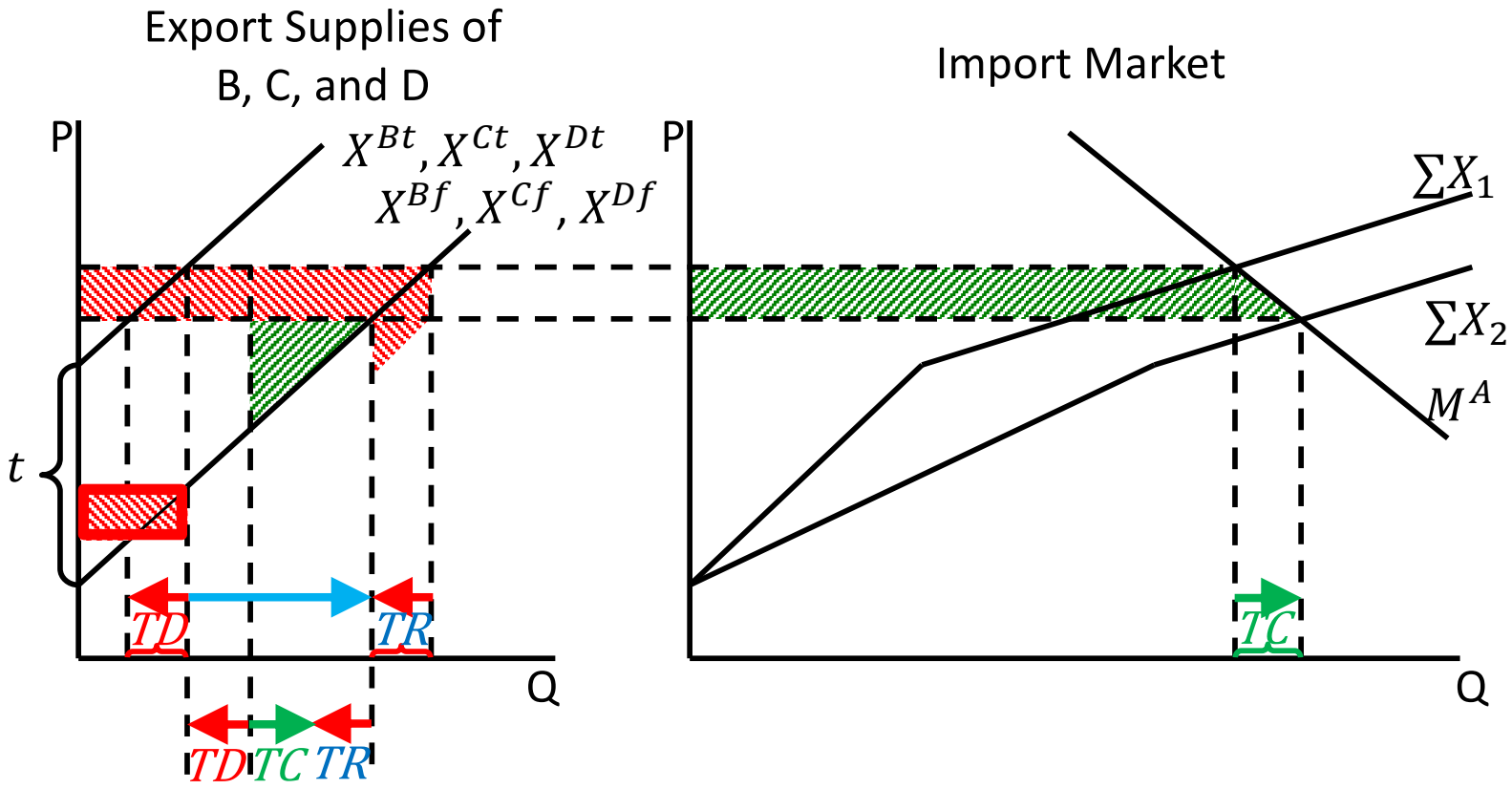

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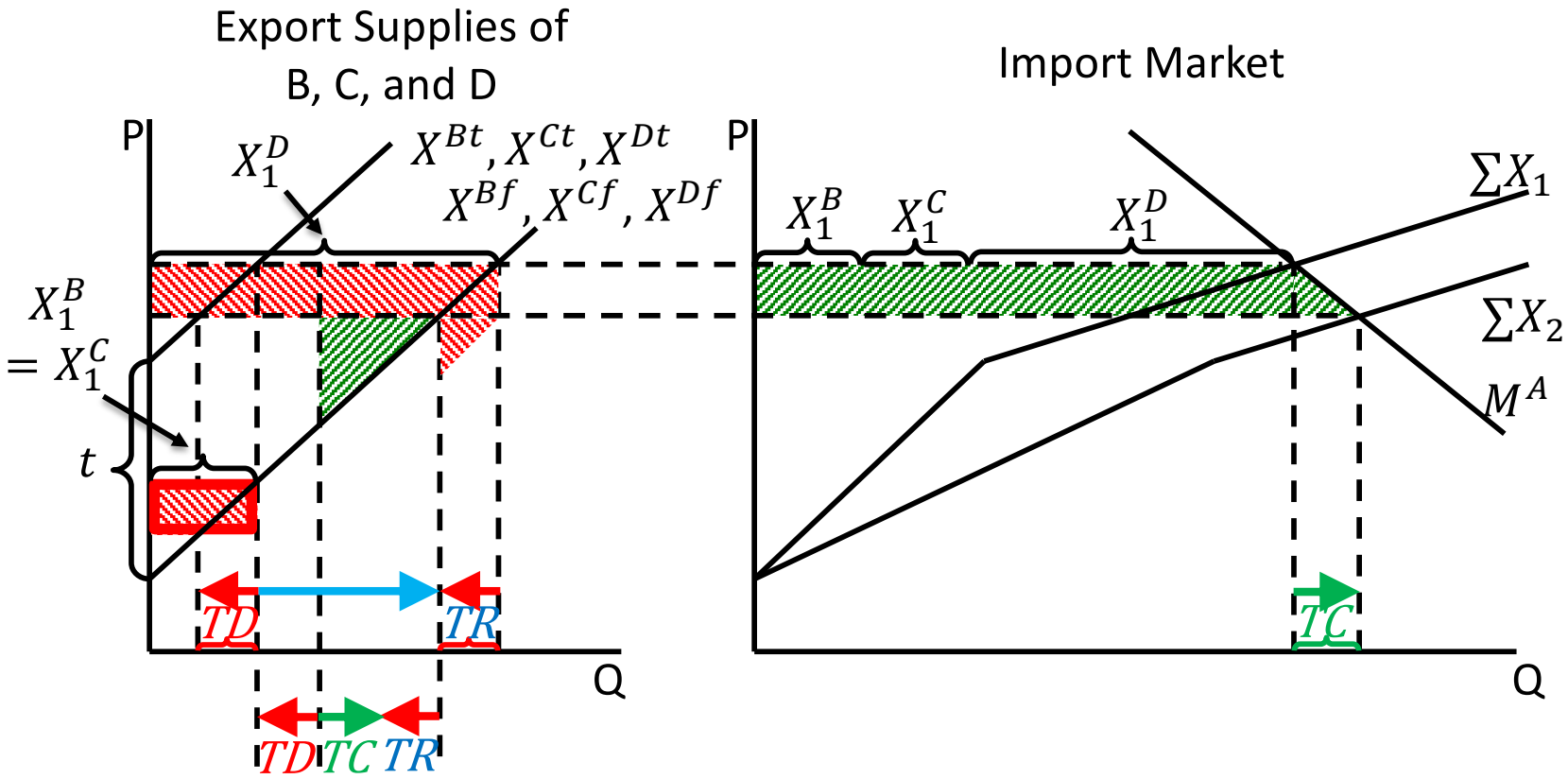

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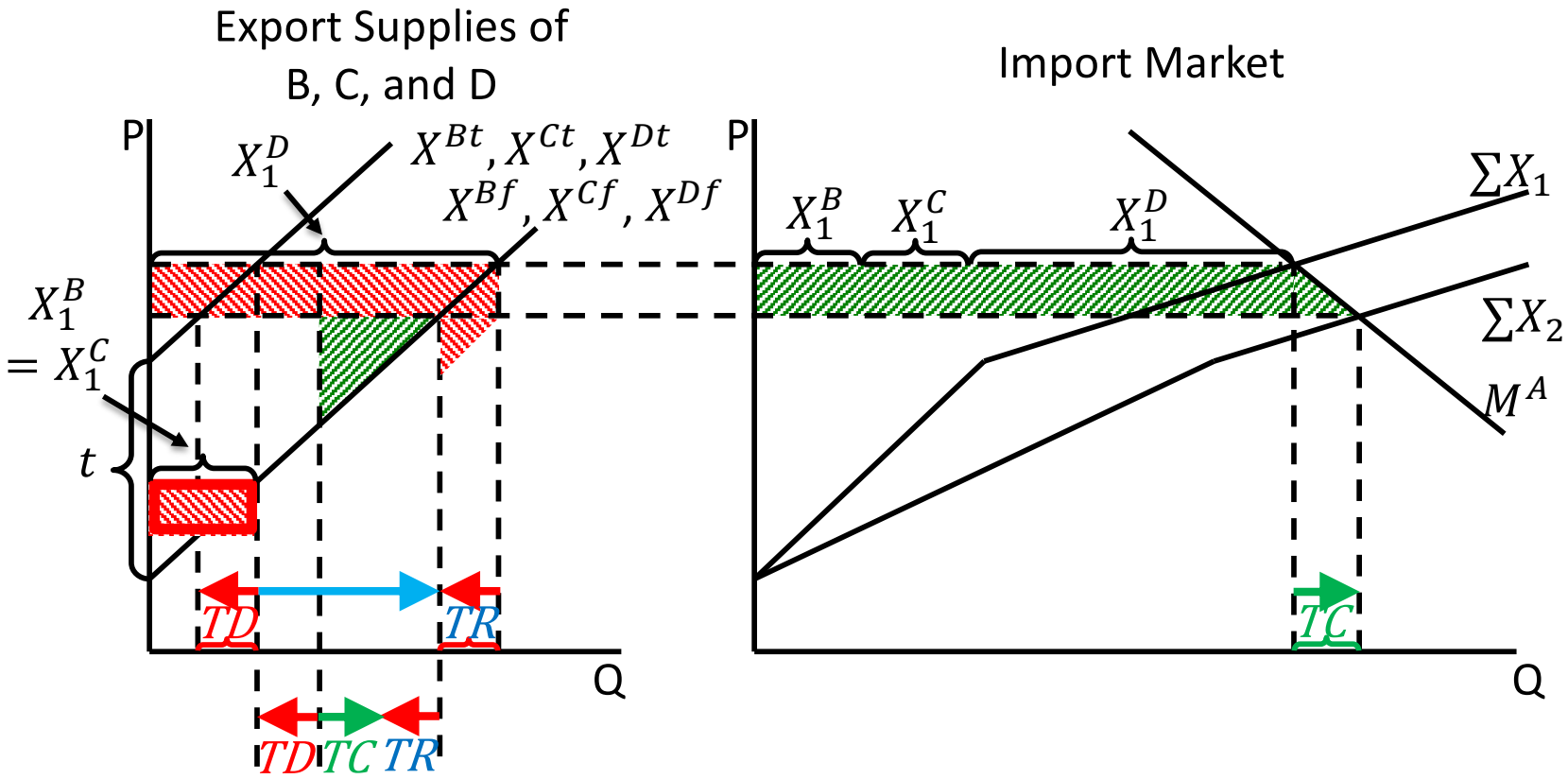

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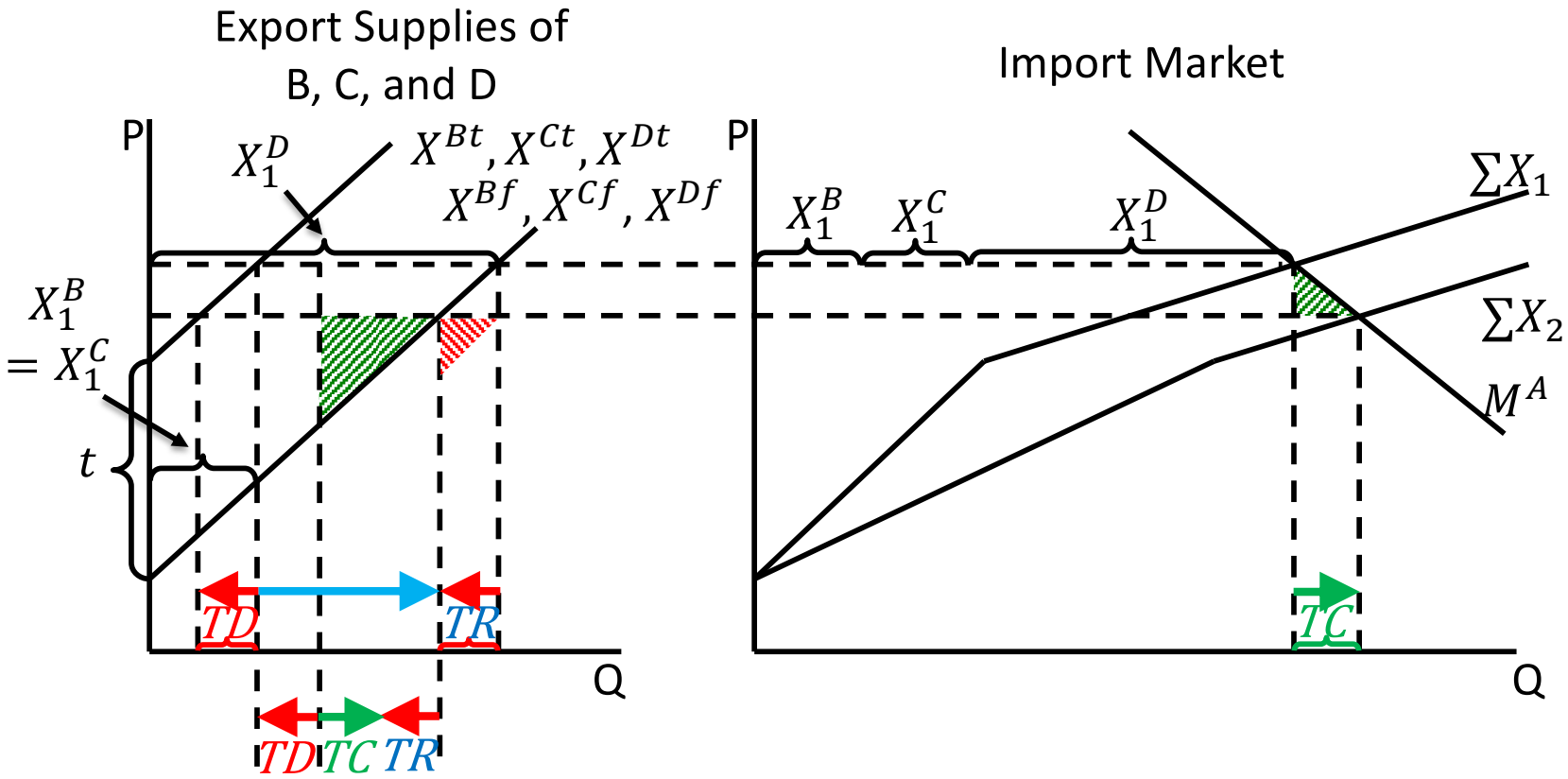

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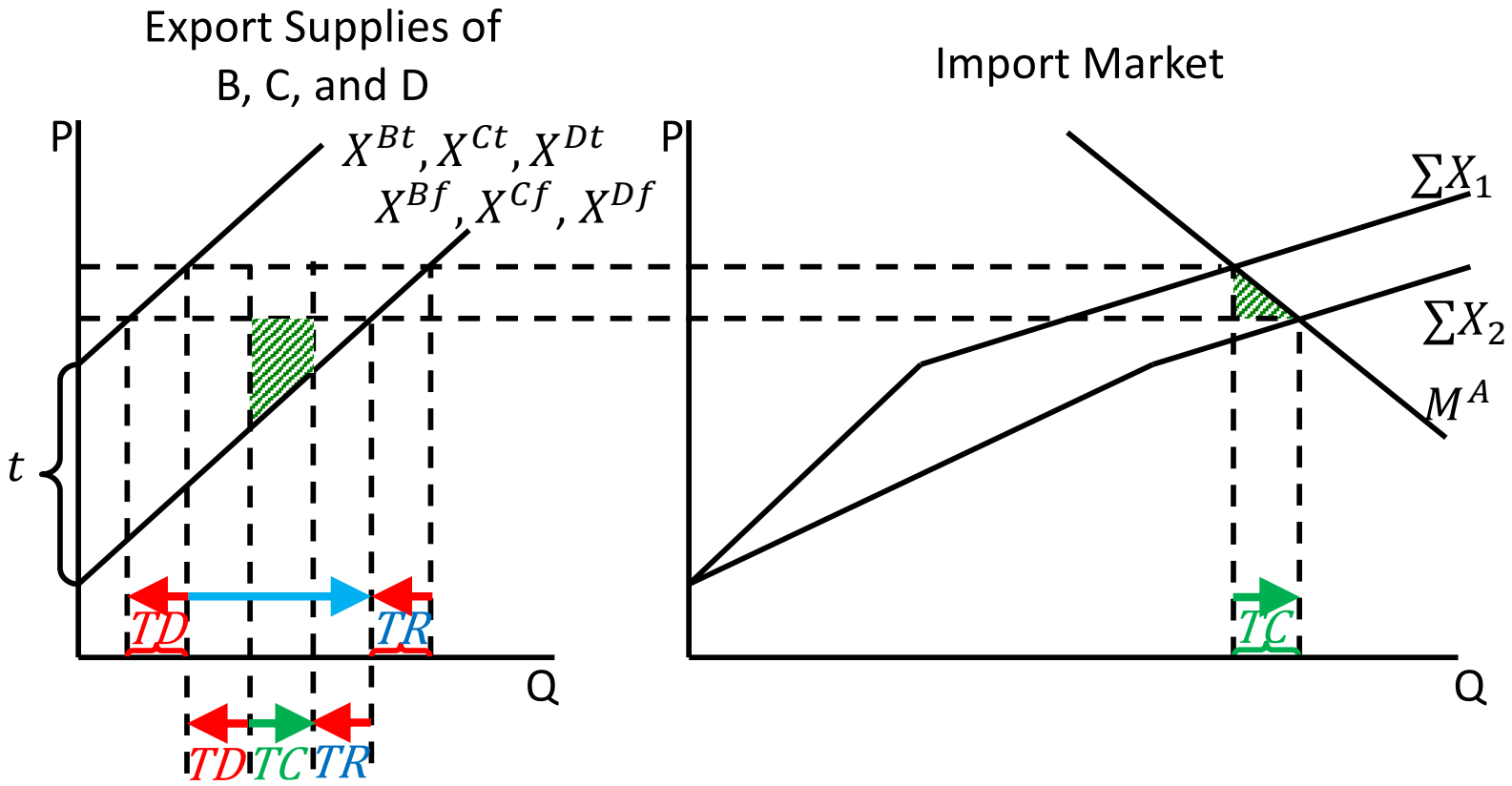

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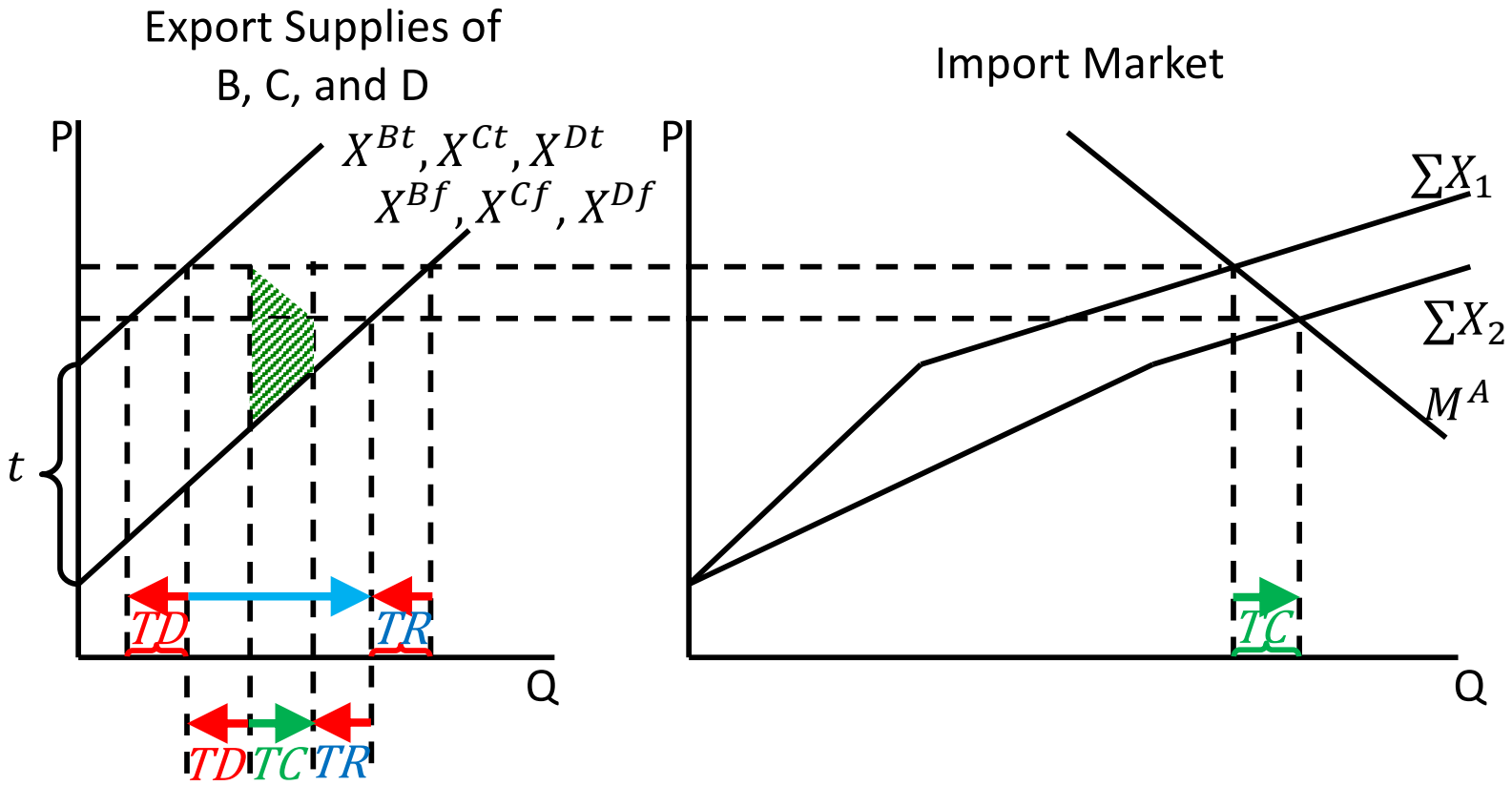

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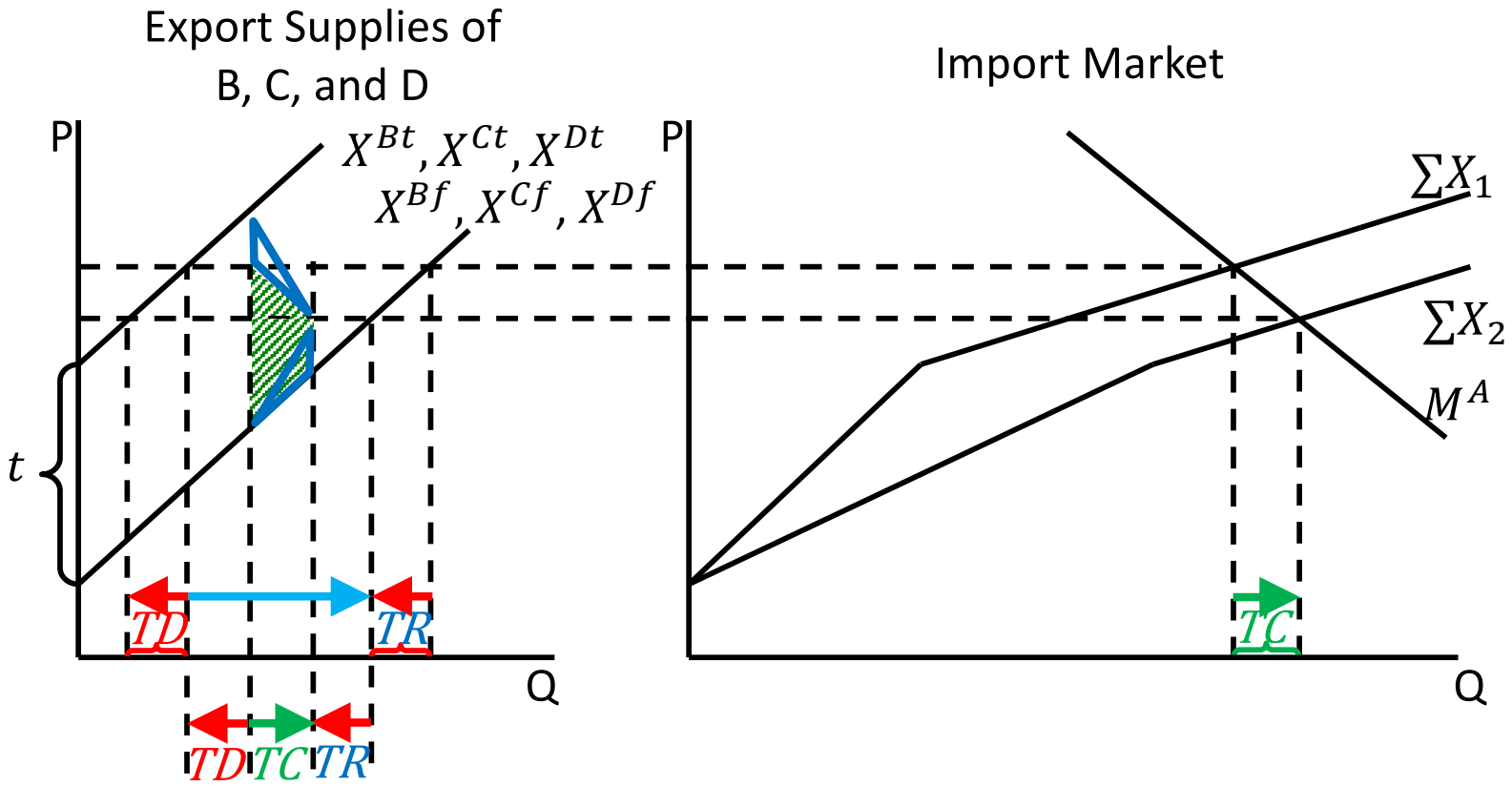

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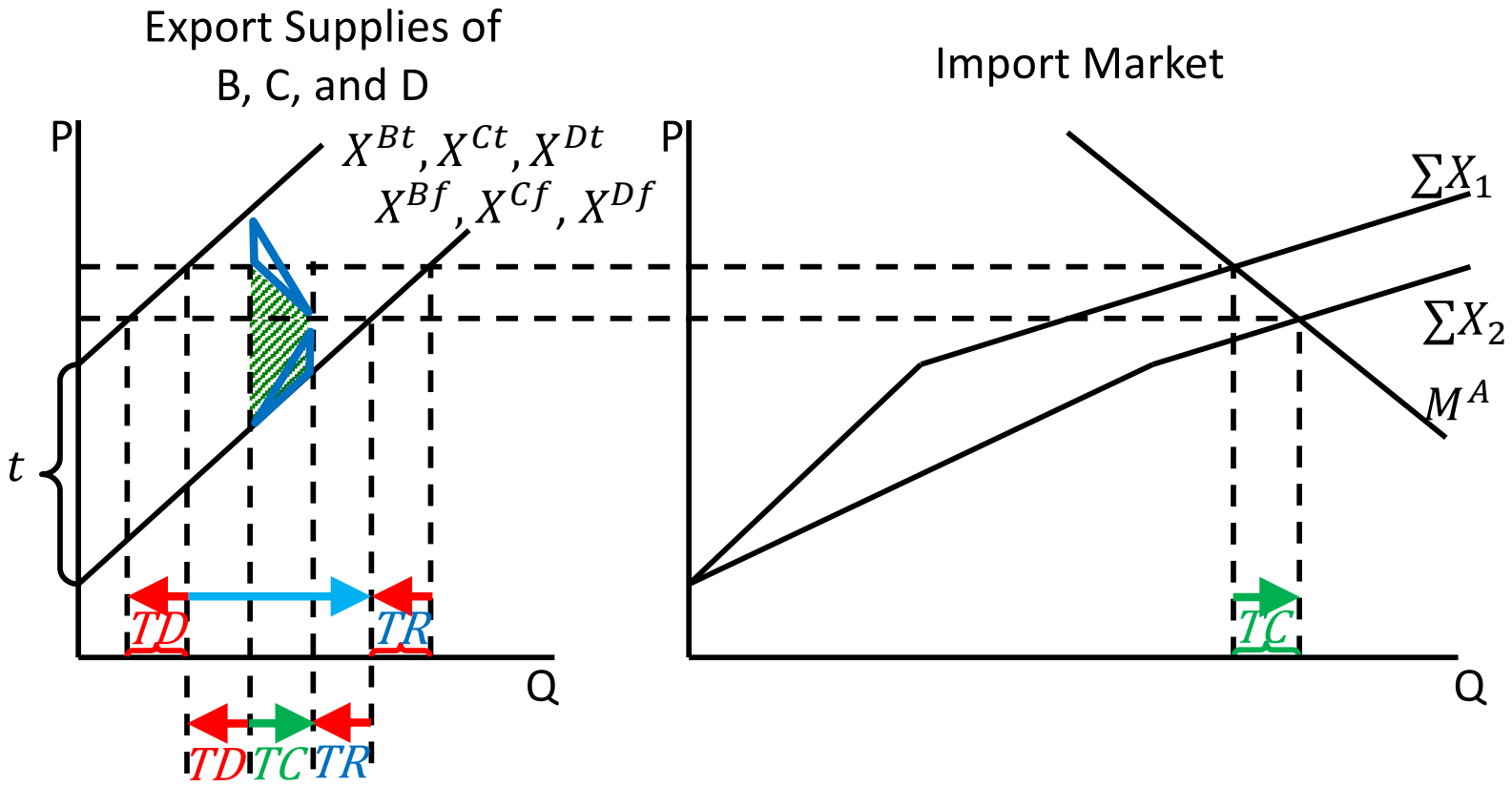

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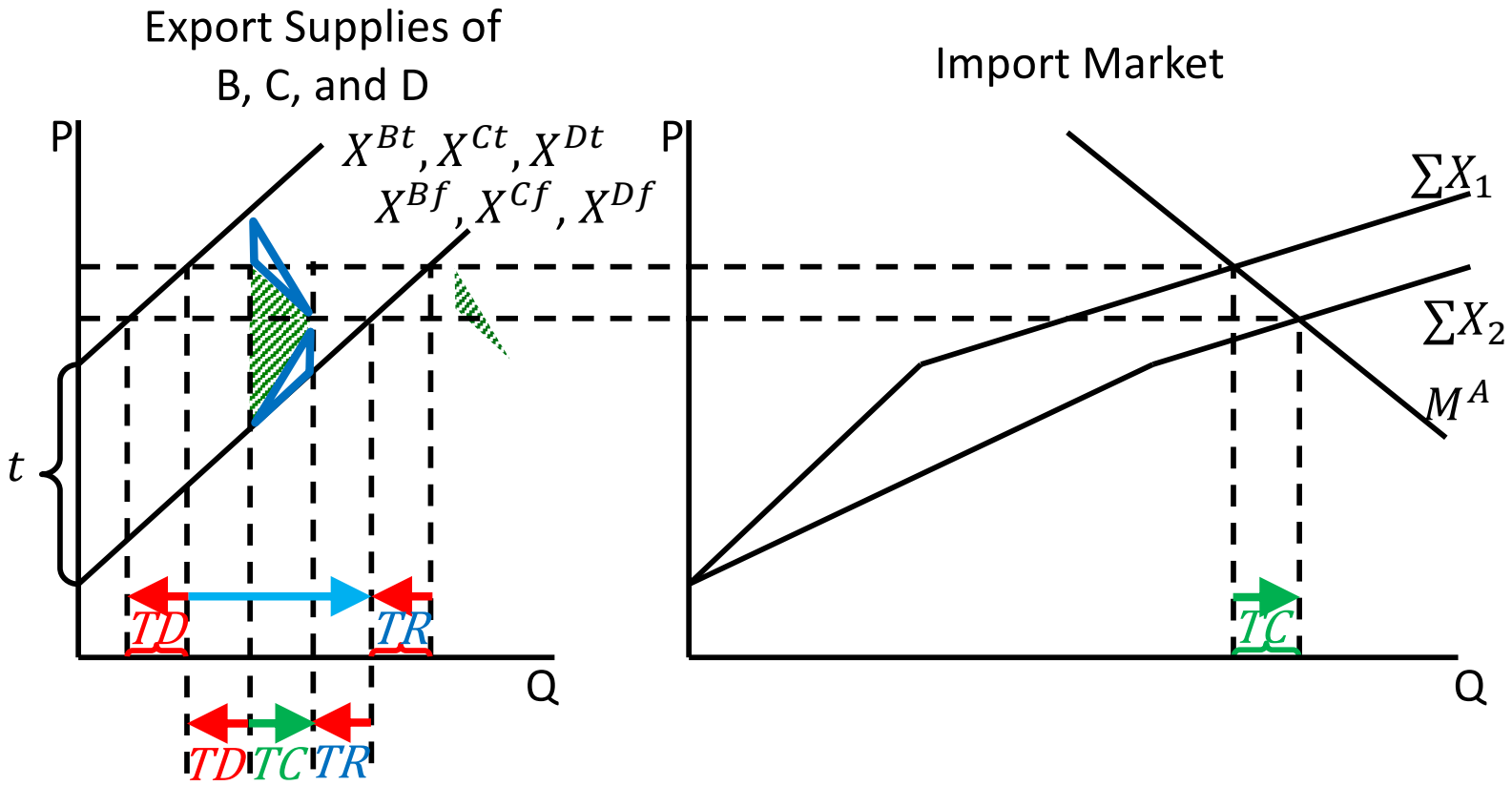
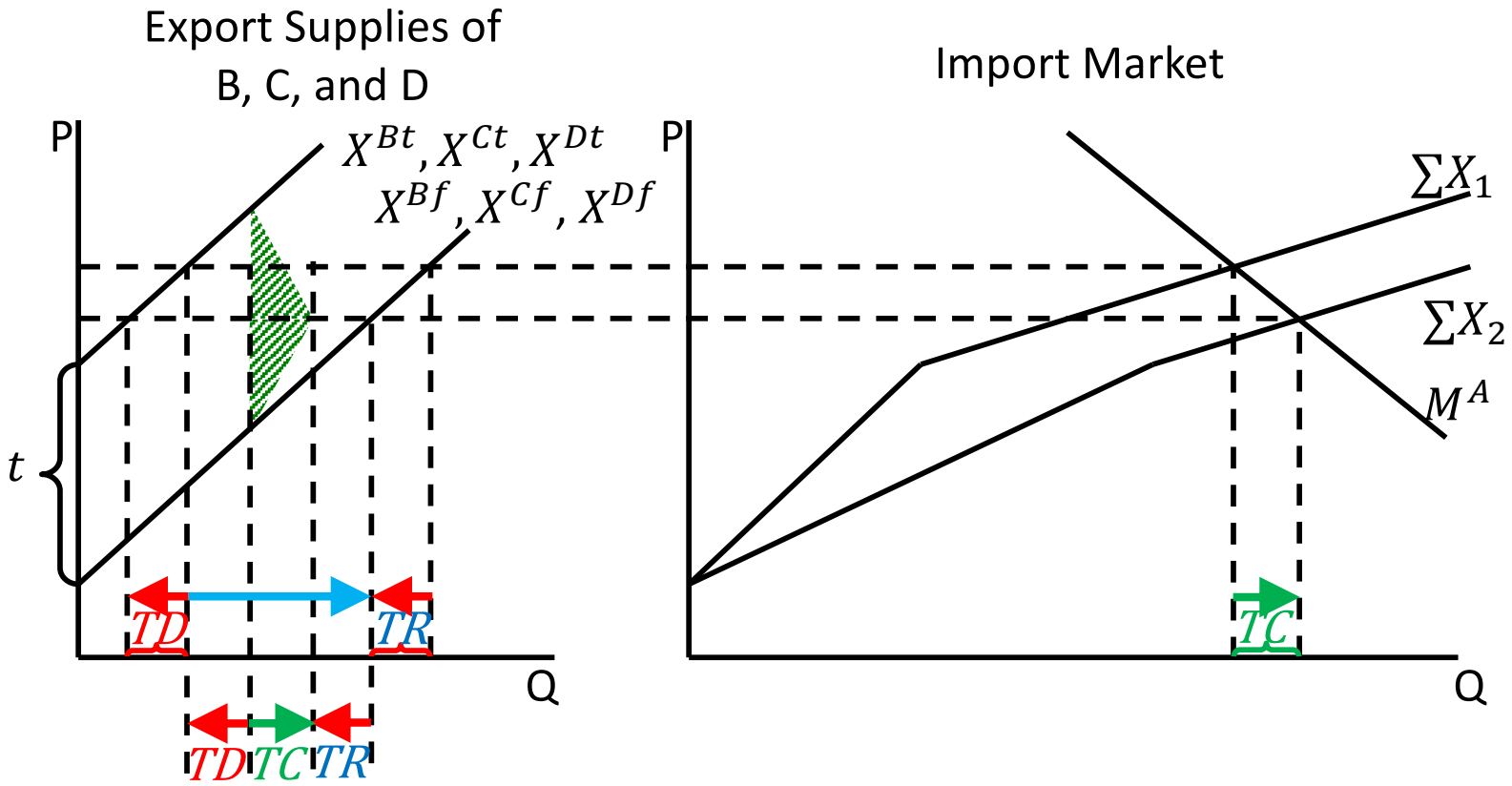
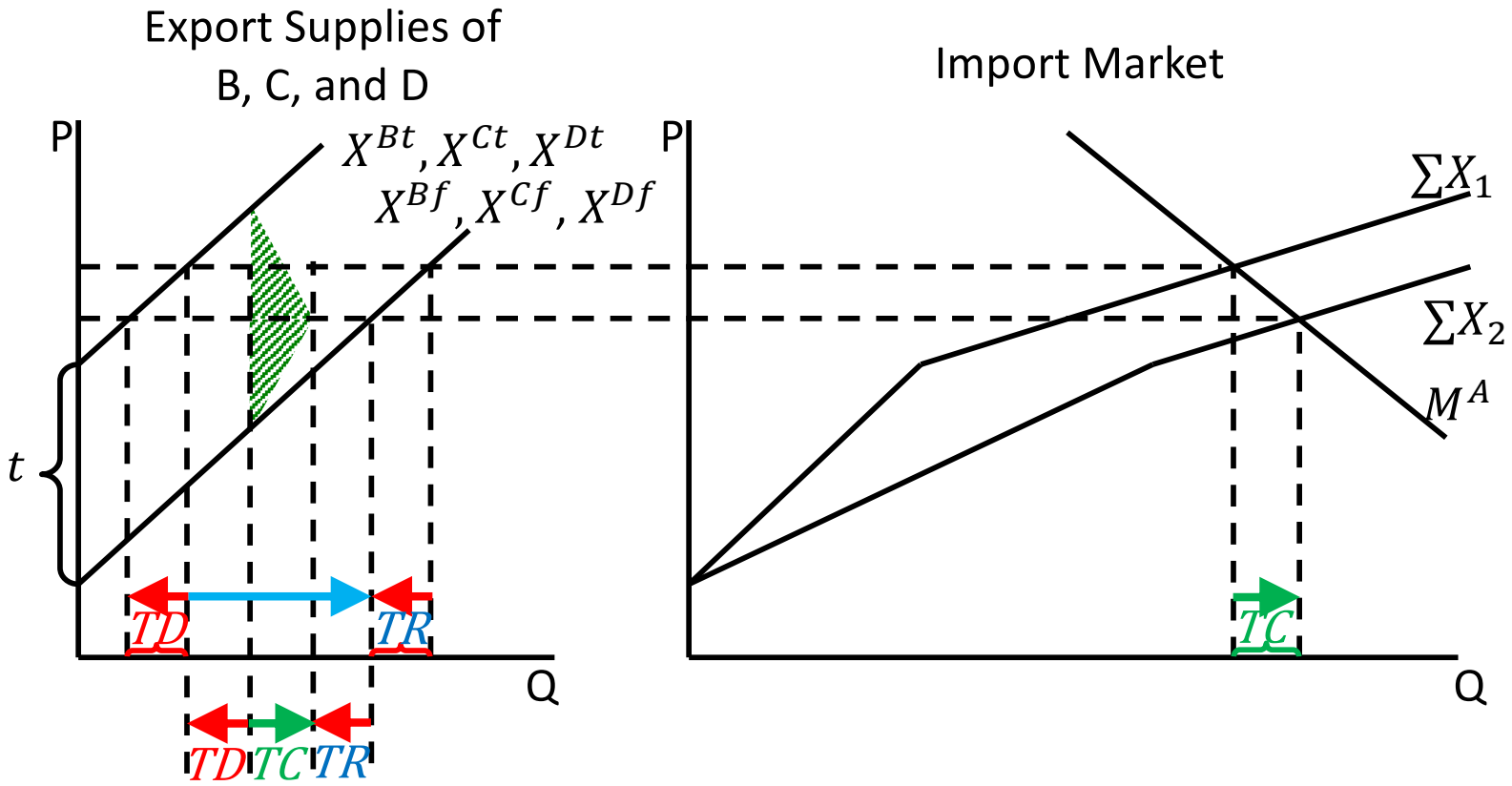


Welfare Effect on World



Welfare Effect on World



4-country case

- Result:
  - World welfare rises with second FTA, by amount depending on trade creation and the tariff
- Recall from model:

$$\Delta W^W = \frac{1}{2} TCt + \frac{1}{2}(TR - TD)t$$

- Here, because we've assumed countries B and D are the same, *TR=TD*

$$\Delta W^W = \frac{1}{2} TCt$$

4-country case

- In general, $TR \neq TD$
- Which is larger depends just on country size, size both face the same price change.

$$\Delta W^{W} = \frac{1}{2} TCt + \frac{1}{2}(TR - TD)t$$

- If the new partner is smaller than the old, $TR > TD$, and world gain will be larger
- If new partner is bigger than old, then $TR < TD$ and world gain will be smaller and perhaps a loss.

Conclusion

- Analysis of FTAs shouldn't treat each independently of FTAs that already exist
- Sequencing of FTAs can matter.

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