Spatial Equilibrium Model

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Report on Spatial Equilibrium Model for Quantitative Agriculture Police Analyze

April 2018

Spatial Equilibrium Model

Consider the 4 regions:

Region 1:

$Demand: Q_D^1 = 100 - 8P_D$

$Supply: Q_s^1 = -40 + 6P_D$

Region 2:

$Demand: Q_D^1 = 115 - 6P_D$

$Supply: Q_s^1 = -15 + 5P_D$

Region 3:

$Demand: Q_D^1 = 125 - 6.5P_D$

$Supply: Q_s^1 = -26 + 2P_D$

Region 4:

$Demand: Q_D^1 = 110 - 4P_D$

$Supply: Q_s^1 = -16 + 1.6P_D$

With the following transportations costs:

	Region 1	Region 2	Region 3	Region 4
Region 1	0	2	4.1	3.2
Region 2	2.2	0	3.2	3.3
Region 3	3.3	2.9	0	3.4
Region 4	3.1	3.2	4	0

1. If region 4 imposes an ad valorem tariff of $\tau = 0.1$ on regions 1, 2, and 3; assume that $T = 0$ for all regions.
    a. Relative to the free trade equilibrium, what are the change in production, consumption, prices, and bilateral trade?
    b. Provide economic interpretation of the results.
    c. Provide your results in a table.

Ad Valorem tariff

Free Trade

Regions	Qty Demanded	Qty Supplied	Price	Region 1 Imports	Region 2 Imports	Region 3 Imports	Region 4 Imports	Total production	Total Exports
1	0.00	36.64	12.50	0.00	0.00	0.00	36.64	36.64	36.64
2	36.96	50.16	13.01	0.00	36.96	13.19	0.00	50.16	13.19
3	19.64	6.45	16.21	0.00	0.00	6.45	0.00	6.45	0.00
4	46.19	9.55	15.95	0.00	0.00	0.00	9.55	9.55	0.00
								102.79	49.83

Ad Valorem tariff of 0.1

Regions	Qty Demanded	Qty Supplied	Price	Region 1 Imports	Region 2 Imports	Region 3 Imports	Region 4 Imports	Total production	Total Exports
1	2.95	34.92	12.13	2.95	0.00	0.00	31.97	34.92	31.97
2	36.93	50.11	13.01	0.00	36.93	13.18	0.00	50.11	13.18
3	19.62	6.44	16.21	0.00	0.00	6.44	0.00	6.44	0.00
4	42.84	10.87	16.79	0.00	0.00	0.00	10.87	10.87	0.00
								102.33	45.15

Welfare Analysis

Regions	Change in producer Welfare	Change in consumer Welfare	Change in consumer government revenue	Net welfare changes
1	-10.24	0.54	0.00	-9.70
2	-0.50	-0.23	0.00	-0.74
3	-0.05	-0.08	0.00	-0.13
4	8.43	-37.26	39.38	10.56

Economic interpretation

In a free trade scenario, regions 1 and 2 are exporting 36.64 and 13.19 of their production to regions 4 and 3 respectively, creating a total of 49.83 international trade volume. However, with the implementation of the importing tariffs by region 4, the volume imported fell to 31.97. Part of the excess production in region 1 was absorbed internally, nonetheless, the overall total production of region 1 fell from 36.64 to 34.92 and the production on region 4 increased from 9.55 to 10.87. Regions 2 and 3 were practically not affected by the imposition of the Ad Valorem tariff in region 4 because those two regions didn't engage in international trade.

Regarding the welfare, region 4 had a positive net welfare gain due to government revenue and an increase in producer welfare. Region 1 have losses in welfare once exports reduced. Regions 2 and 3 also had small reductions in welfare, probably due to the limitations of the model and not because of trade changes.

2. If region 3 has a specific tariff of T = 1.5 imposed on regions 1, 2, and 4; assume that $\tau = 0$ for all regions.
    a. Relative to the free trade equilibrium, what are the change in production, consumption, prices, and bilateral trade?
    b. Provide economic interpretation of the results.
    c. Please provide your results in a table.

Specific tariff

Free Trade

Regions	Qty Demanded	Qty Supplied	Price	Region 1 Imports	Region 2 Imports	Region 3 Imports	Region 4 Imports	Total production	Total Exports
1	0.00	36.64	12.50	0.00	0.00	0.00	36.64	36.64	36.64
2	36.96	50.16	13.01	0.00	36.96	13.19	0.00	50.16	13.19
3	19.64	6.45	16.21	0.00	0.00	6.45	0.00	6.45	0.00
4	46.19	9.55	15.95	0.00	0.00	0.00	9.55	9.55	0.00
								102.79	49.83

Specific tariff of 2

Regions	Qty Demanded	Qty Supplied	Price	Region 1 Imports	Region 2 Imports	Region 3 Imports	Region 4 Imports	Total production	Total Exports
1	0.00	35.51	12.50	0.00	0.00	0.00	35.51	35.51	35.51
2	40.17	47.37	12.47	0.00	40.17	5.04	2.16	47.37	7.20
3	13.39	8.35	17.17	0.00	0.00	8.35	0.00	8.35	0.00
4	46.91	9.24	15.77	0.00	0.00	0.00	9.24	9.24	0.00
								100.47	42.71

Welfare Analysis

Regions	Change in producer Welfare	Change in consumer Welfare	Change in consumer government revenue	Net welfare changes
1	-6.78	0.00	0.00	-6.78
2	-27.13	20.59	0.00	-6.54
3	7.03	-15.88	7.56	-1.28
4	-1.81	8.41	0.00	6.60

Economic interpretation

The specific tariff applied by region 3 had a bigger impact in trading than the Ad Valorem tariff in imposed by region 4. The total world production of the good fell from 102.79 to 100.47. The biggest change was in the output of region 2 that fell from 50.16 to 47.37. This can be explained by the fact that this region was the only exporter to region 3. The internal production of region 3 also increased accompanied by an increase in internal prices.

The welfare in regions 2 and 3 fell due to a reduction in their bilateral trade. Although region 3 had an increase in government revenues it was not enough to offset the losses in consumer surplus.