Table 1: The relevant studies in the existing academic literature

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Author(s) | Concept | | Methodology | | | | | | Author(s) | Concept | | Methodology | | | | | |
| Objective | Medical Supply Chain | Simulation Model | Deterministic Opt. Mod. | Stochastic Opt. Mod. | Fuzzy Methodology | Robust Opt. Model | Other | Objective | Medical Supply Chain | Simulation Model | Deterministic Opt. Mod. | Stochastic Opt. Mod. | Fuzzy Methodology | Robust Opt. Model | Other |
| Gu and Gao (2012) | SO |  | ✘ |  |  |  |  |  | Pavlov et al. (2019) | MO |  |  | ✘ |  | ✘ |  |  |
| Qiaolun and Tiegang (2012) | SO |  | ✘ |  |  |  |  |  | Samani and Hosseini-Motlagh (2019) | SO |  |  |  |  | ✘ |  |  |
| Qiaolun and Tiegang (2013) | SO |  | ✘ |  |  |  |  |  | Setak et al. (2019) | MO |  |  |  | ✘ |  |  |  |
| Lim et al. (2013) | SO |  |  |  |  |  | ✘ |  | Zhang et al. (2019) | SO |  |  |  |  | ✘ |  |  |
| Hatefi and Jolai (2014) | SO |  |  |  |  |  | ✘ |  | Dolgui et al. (2020) | SO |  | ✘ |  |  |  |  |  |
| Ivanov et al. (2014a) | MO |  |  | ✘ |  |  |  |  | Hamdan and Diabat (2020) | MO |  |  |  |  |  | ✘ | ✘ |
| Hatefi et al. (2015) | SO |  |  |  |  | ✘ |  |  | Hosseini-Motlagh et al. (2020) | MO |  |  |  |  |  | ✘ |  |
| Ghadge et al. (2016) | SO |  |  | ✘ |  |  |  |  | Özçelik et al. (2020) | SO |  |  |  |  |  | ✘ |  |
| Hassani and Khosrojerdi (2016) | SO | ✘ |  |  |  |  | ✘ | ✘ | Tucker et al. (2020) | SO | ✘ |  |  | ✘ |  |  |  |
| Hatefi et al. (2016) | SO |  |  |  |  |  | ✘ |  | Wang and Chen (2020) | SO |  |  |  |  |  | ✘ |  |
| Ivanov et al. (2016) | MO |  |  | ✘ |  |  |  |  | Yılmaz et al. (2021) | SO |  |  |  | ✘ |  |  |  |
| Kamalahmadi and Mellat-Parast (2016) | SO |  |  |  | ✘ |  |  |  | Shi et al. (2021) | SO |  | ✘ |  |  |  |  |  |
| Sawik (2016) | SO |  |  |  | ✘ |  |  |  | Goodarzian et al. (2021) | MO | ✘ |  |  |  | ✘ |  | ✘ |
| Ivanov et al. (2017) | MO |  |  | ✘ |  |  |  |  | Mosallanezhad et al. (2021) | MO | ✘ |  | ✘ |  |  |  | ✘ |
| Rezapour et al. (2017) | SO |  |  | ✘ |  |  |  |  | Sazvar et al. (2021) | MO | ✘ |  |  |  | ✘ | ✘ |  |
| Sawik (2017) | SO |  |  | ✘ | ✘ |  | ✘ |  | Salarpour and Nagurney (2021) | SO | ✘ |  |  | ✘ |  |  |  |
| Doan et al. (2018) | SO |  |  | ✘ |  |  |  |  | Riberio and Barbosa-Póvoa (2022) | SO |  |  | ✘ |  |  |  |  |
| Ivanov (2018) | SO |  | ✘ |  |  |  |  |  | Sawik (2022) | SO |  |  |  | ✘ |  |  |  |
| Pavlov et al. (2018) | MO |  |  |  |  | ✘ |  | ✘ | Andoh and Yu (2022) | SO | ✘ | ✘ | ✘ |  |  |  |  |
| Hosseini and Ivanov (2019) | SO |  |  |  |  |  |  | ✘ | Goodarzian et al. (2022) | MO | ✘ |  |  | ✘ |  |  | ✘ |
| Hosseini et al. (2019a) | SO |  |  |  | ✘ |  |  | ✘ | Zamiela et al. (2022) | SO | ✘ |  |  |  |  |  | ✘ |
| Hosseini et al. (2019b) | SO |  |  |  | ✘ |  |  | ✘ | Shi et al. (2022) | MO | ✘ |  | ✘ |  |  |  | ✘ |
| Kinra et al. (2019) | SO |  |  |  |  |  |  | ✘ | Darmian and Farughi (2022) | SO |  |  | ✘ |  |  |  | ✘ |
| Hosseini-Motlagh et al. (2019) | SO |  |  |  |  |  |  | ✘ | Chowdhury et al. (2022) | MO | ✘ |  | ✘ |  |  |  | ✘ |
| Ivanov (2019b) | SO |  | ✘ |  |  |  |  |  | **This study** | **SO** | ✘ |  |  | ✘ |  |  |  |

(SO: Single-Objective; MO: Multi-Objective)

Table 2: The possible disruption scenarios associated with probabilities

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Scenarios | Region | Intensity of Disruptions | | | Probability of Scenario Realization | Demand Increase Ratio (%) | Scenarios | Region | Intensity of Disruptions | | | Probability of Scenario Realization | Demand Increase Ratio (%) | | Scenarios | Region | Intensity of Disruptions | | | Probability of Scenario Realization | | | Demand Increase Ratio (%) |
|  |
| S1 | 1 |  |  |  | 0.03 | U(8,15) | S10 | 1 |  |  |  | 0.06 | | U(5,10) | S19 | 1 |  |  |  | | 0.01 | U(8,15) | |  | |
| 2 |  |  |  | 0 | 2 |  |  |  | U(5,10) | 2 |  |  |  | | U(8,15) | |  | |
| 3 |  |  |  | 0 | 3 |  |  |  | 0 | 3 |  |  |  | | U(8,15) | |  | |
| S2 | 1 |  |  |  | 0.06 | U(5,10) | S11 | 1 |  |  |  | 0.01 | | U(8,15) | S20 | 1 |  |  |  | | 0.02 | U(8,15) | |  | |
| 2 |  |  |  | 0 | 2 |  |  |  | 0 | 2 |  |  |  | | U(8,15) | |  | |
| 3 |  |  |  | 0 | 3 |  |  |  | U(8,15) | 3 |  |  |  | | U(5,10) | |  | |
| S3 | 1 |  |  |  | 0.07 | 0 | S12 | 1 |  |  |  | 0.01 | | U(8,15) | S21 | 1 |  |  |  | | 0.02 | U(8,15) | |  | |
| 2 |  |  |  | U(8,15) | 2 |  |  |  | 0 | 2 |  |  |  | | U(5,10) | |  | |
| 3 |  |  |  | 0 | 3 |  |  |  | U(5,10) | 3 |  |  |  | | U(8,15) | |  | |
| S4 | 1 |  |  |  | 0.06 | 0 | S13 | 1 |  |  |  | 0.01 | | U(5,10) | S22 | 1 |  |  |  | | 0.04 | U(8,15) | |  | |
| 2 |  |  |  | U(5,10) | 2 |  |  |  | 0 | 2 |  |  |  | | U(5,10) | |  | |
| 3 |  |  |  | 0 | 3 |  |  |  | U(8,15) | 3 |  |  |  | | U(5,10) | |  | |
| S5 | 1 |  |  |  | 0.03 | 0 | S14 | 1 |  |  |  | 0.02 | | U(5,10) | S23 | 1 |  |  |  | | 0.04 | U(5,10) | |  | |
| 2 |  |  |  | 0 | 2 |  |  |  | 0 | 2 |  |  |  | | U(8,15) | |  | |
| 3 |  |  |  | U(8,15) | 3 |  |  |  | U(5,10) | 3 |  |  |  | | U(8,15) | |  | |
| S6 | 1 |  |  |  | 0.05 | 0 | S15 | 1 |  |  |  | 0.05 | | 0 | S24 | 1 |  |  |  | | 0.04 | U(5,10) | |  | |
| 2 |  |  |  | 0 | 2 |  |  |  | U(8,15) | 2 |  |  |  | | U(8,15) | |  | |
| 3 |  |  |  | U(5,10) | 3 |  |  |  | U(8,15) | 3 |  |  |  | | U(5,10) | |  | |
| S7 | 1 |  |  |  | 0.04 | U(8,15) | S16 | 1 |  |  |  | 0.04 | | 0 | S25 | 1 |  |  |  | | 0.04 | U(5,10) | |  | |
| 2 |  |  | U(8,15) | 2 |  |  |  | U(8,15) | 2 |  |  |  | | U(5,10) | |  | |
| 3 |  |  | 0 | 3 |  |  |  | U(5,10) | 3 |  |  |  | | U(8,15) | |  | |
| S8 | 1 |  |  |  | 0.05 | U(8,15) | S17 | 1 |  |  |  | 0.04 | | 0 | S26 | 1 |  |  |  | | 0.04 | U(5,10) | |  | |
| 2 |  |  | U(5,10) | 2 |  |  |  | U(5,10) | 2 |  |  |  | | U(5,10) | |  | |
| 3 |  |  | 0 | 3 |  |  |  | U(8,15) | 3 |  |  |  | | U(5,10) | |  | |
| S9 | 1 |  |  |  | 0.06 | U(5,10) | S18 | 1 |  |  |  | 0.05 | | 0 | S27 | 1 |  |  |  | | 0.01 | 0 | |  | |
| 2 |  |  | U(8,15) | 2 |  |  |  | U(5,10) | 2 |  |  |  | | 0 | |  | |
| 3 |  |  | 0 | 3 |  |  |  | U(5,10) | 3 |  |  |  | | 0 | |  | |

No Impact

Low-Impact

High-Impact

Table 3: The intensity of disruptions associated with cases

|  |  |  |  |
| --- | --- | --- | --- |
| Cases | Increase Ratio of Demand (%) | | Visualization of Distribution Intervals |
| Low-Intensity | High-Intensity |
| C1 | U(5,10) | U(8,15) |  |
| C2 | U(5,8) | U(9,15) |  |
| C3 | U(5,10) | U(12,18) |  |
| C4 | U(8,15) | U(20,30) |  |
| C5 | U(8,20) | U(25,40) |  |
| C6 | U(8,25) | U(30,60) |  |

Table 4: Computational results

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cases | ⍺ level | Decentralized | | | | | | | Centralized | | | | | | |
| OFV | NOF | R1 EIS | R2 EIS | R3 EIS | EEA | CPU  time | OFV | NOF | R1 EIS | R2 EIS | R3 EIS | EEA | CPU  time |
| Case 1 | ⍺=0.80 | 6230273.00 | 4 | 0 | 487706 | 398340 | 6093020 | 121.88 | 8324076.88 | 7 | 0 | 16675 | 10855 | 13605859 | 238.44 |
| ⍺=0.85 | 6619643.53 | 4 | 0 | 499618 | 415312 | 6393930 | 112.28 | 8573378.02 | 7 | 0 | 27305 | 35233 | 14668169 | 29.42 |
| ⍺=0.90 | 7035713.92 | 10 | 0 | 146883 | 102407 | 13500251 | 171.80 | 8517053.73 | 7 | 0 | 18058 | 29316 | 15304795 | 7.81 |
| ⍺=0.95 | 7386631.30 | 11 | 0 | 91799 | 93232 | 14954059 | 117.53 | 8483701.26 | 7 | 0 | 22945 | 27622 | 16215707 | 4.26 |
| ⍺=1 | 7893337.86 | 11 | 0 | 96698 | 110575 | 15594524 | 1.49 | 8571763.47 | 7 | 0 | 598 | 51437 | 17070126 | 2.10 |
| Case 2 | ⍺=0.80 | 6240115.80 | 4 | 0 | 482303 | 392939 | 6017816 | 137.95 | 8313334.07 | 7 | 0 | 10173 | 22036 | 13591479 | 53.43 |
| ⍺=0.85 | 6618111.41 | 4 | 0 | 486126 | 418822 | 6393930 | 99.26 | 8392839.77 | 7 | 0 | 2171 | 44246 | 14432188 | 20.47 |
| ⍺=0.90 | 7109069.23 | 10 | 0 | 125871 | 129746 | 13382537 | 84.95 | 8477357.97 | 7 | 0 | 20659 | 27463 | 15500822 | 7.95 |
| ⍺=0.95 | 7318773.95 | 11 | 0 | 86398 | 89552 | 14977067 | 11.76 | 8510494.64 | 7 | 0 | 14293 | 33179 | 16181258 | 7.41 |
| ⍺=1 | 7895285.88 | 11 | 0 | 112676 | 103013 | 15568339 | 4.73 | 8559255.68 | 7 | 0 | 1956 | 48948 | 17056881 | 2.02 |
| Case 3 | ⍺=0.80 | 6313257.53 | 4 | 0 | 447637 | 399246 | 6093039 | 123.28 | 8625618.49 | 7 | 0 | 29220 | 45565 | 13515568 | 48.27 |
| ⍺=0.85 | 6760491.23 | 5 | 0 | 416225 | 422232 | 7435907 | 91.35 | 8457156.13 | 7 | 0 | 4311 | 42609 | 14541117 | 159.56 |
| ⍺=0.90 | 7205294.56 | 10 | 0 | 111076 | 165613 | 13379608 | 89.13 | 8461979.88 | 7 | 0 | 8444 | 42905 | 15433756 | 85.22 |
| ⍺=0.95 | 7473113.28 | 11 | 0 | 87174 | 108751 | 15005969 | 145.36 | 8815745.51 | 7 | 0 | 28477 | 61464 | 15930836 | 36.41 |
| ⍺=1 | 7922027.00 | 11 | 0 | 95497 | 108739 | 15738720 | 2.80 | 8659231.52 | 7 | 0 | 3033 | 56866 | 17163186 | 9.07 |
| Case 4 | ⍺=0.80 | 6750876.79 | 4 | 0 | 523962 | 408409 | 6017816 | 104.99 | 8569399.31 | 7 | 0 | 28969 | 33061 | 13953791 | 64.05 |
| ⍺=0.85 | 7169194.28 | 4 | 0 | 570100 | 433135 | 6393909 | 102.67 | 8714956.88 | 7 | 0 | 12837 | 70794 | 14892304 | 86.35 |
| ⍺=0.90 | 7668338.10 | 11 | 0 | 165708 | 79443 | 14348369 | 54.56 | 8734927.97 | 7 | 0 | 24088 | 58992 | 15807792 | 18.20 |
| ⍺=0.95 | 8033121.23 | 11 | 0 | 133484 | 126467 | 15315169 | 142.13 | 9073802.02 | 7 | 0 | 39623 | 77486 | 16415481 | 24.31 |
| ⍺=1 | 8503062.57 | 12 | 0 | 64817 | 117305 | 16701349 | 2.92 | 9053009.51 | 7 | 0 | 33385 | 59680 | 17588877 | 2.79 |
| Case 5 | ⍺=0.80 | 7098427.29 | 4 | 0 | 552443 | 412154 | 6017806 | 174.47 | 9056400.35 | 7 | 0 | 36579 | 79541 | 14504529 | 66.10 |
| ⍺=0.85 | 7595410.85 | 4 | 0 | 586595 | 439654 | 6393918 | 182.72 | 8874096.54 | 7 | 0 | 42640 | 48374 | 15263655 | 303.37 |
| ⍺=0.90 | 8287809.65 | 10 | 0 | 228194 | 169719 | 13385296 | 241.08 | 8959419.00 | 7 | 0 | 44803 | 52231 | 16225249 | 12.41 |
| ⍺=0.95 | 8430540.64 | 11 | 0 | 155933 | 149455 | 15186322 | 157.13 | 9354057.04 | 7 | 0 | 67425 | 80381 | 16591455 | 16.55 |
| ⍺=1 | 9111348.36 | 12 | 0 | 102483 | 116208 | 16840151 | 5.56 | 9324976.57 | 7 | 0 | 20280 | 99474 | 17875731 | 2.32 |
| Case 6 | ⍺=0.80 | 7492414.46 | 4 | 0 | 601040 | 426795 | 6017816 | 49.76 | 9281272.29 | 7 | 0 | 63584 | 82986 | 14819738 | 10.93 |
| ⍺=0.85 | 8160858.74 | 4 | 0 | 653952 | 461447 | 6393914 | 42.66 | 9459309.44 | 7 | 0 | 66247 | 100137 | 15408385 | 13.05 |
| ⍺=0.90 | 8673126.25 | 11 | 0 | 187330 | 155582 | 14409034 | 66.71 | 9388362.37 | 7 | 0 | 60670 | 96504 | 16506272 | 11.52 |
| ⍺=0.95 | 8998605.49 | 11 | 0 | 223241 | 155471 | 15214219 | 16.41 | 9650190.64 | 7 | 0 | 70112 | 96115 | 17215897 | 16.28 |
| ⍺=1 | 11142275.65 | 14 | 0 | 109095 | 150683 | 17289092 | 1.40 | 9838441.66 | 7 | 0 | 53684 | 102103 | 18307269 | 2.58 |

(OFV: Objective Function Value; EIS: Expected Inventory Shortage; NOF: Number of Opened Facility; EEA: Expected Emission Amount; R1: Region 1; R2: Region 2; R3: Region 3)

Table 5: The amount of unsatisfied products for Case 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Case 1 | Scenarios | Decentralized Model | | | | | | | | | Centralized Model | | | | | | | | |
| Product 1 | | | Product 2 | | | Product 3 | | | Product 1 | | | Product 2 | | | Product 3 | | |
| R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 |
| S1 | 0 | 2 | 1 | 0 | 8387 | 2,0 | 0 | 165261 | 35552 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 3 | 20298 |
| S2 | 0 | 2 | 47443 | 0 | 3 | 17670 | 0 | 115883 | 76622 | 0 | 6 | 1 | 0 | 4 | 2 | 0 | 34073 | 11989 |
| S3 | 0 | 454 | 11441 | 0 | 31358 | 12082 | 0 | 93209 | 102677 | 0 | 4 | 1 | 0 | 3 | 1 | 0 | 19178 | 12580 |
| S4 | 0 | 4 | 2830 | 0 | 33392 | 2 | 0 | 142578 | 69693 | 0 | 2 | 1 | 0 | 4 | 1 | 0 | 3 | 12580 |
| S5 | 0 | 2 | 1382 | 0 | 3 | 7567 | 0 | 119300 | 90898 | 0 | 2 | 2 | 0 | 2 | 3 | 0 | 4549 | 29683 |
| S6 | 0 | 2 | 3 | 0 | 14717 | 10269 | 0 | 143563 | 58726 | 0 | 4 | 3 | 0 | 5 | 3 | 0 | 28458 | 17227 |
| S7 | 0 | 22239 | 1 | 0 | 5 | 33619 | 0 | 99925 | 102677 | 0 | 6 | 1 | 0 | 4 | 2 | 0 | 12807 | 35970 |
| S8 | 0 | 6 | 12680 | 0 | 32267 | 10289 | 0 | 131244 | 96681 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 34605 |
| S9 | 0 | 2248 | 17648 | 0 | 26867 | 24433 | 0 | 167839 | 71435 | 0 | 5 | 0 | 0 | 4 | 0 | 0 | 27777 | 0 |
| S10 | 0 | 5 | 10176 | 0 | 14408 | 26506 | 0 | 151619 | 72751 | 0 | 2 | 1 | 0 | 2 | 2 | 0 | 1238 | 16080 |
| S11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 5397 |
| S12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1786 | 0 | 0 | 12133 | 0 | 0 | 3 | 0 |
| S13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 13247 | 0 | 3 | 3 | 0 | 3 | 33238 |
| S14 | 0 | 2 | 23340 | 0 | 3 | 13090 | 0 | 107345 | 65207 | 0 | 5 | 2 | 0 | 5 | 4 | 0 | 40879 | 30840 |
| S15 | 0 | 18164 | 15894 | 0 | 23335 | 43610 | 0 | 147162 | 114973 | 0 | 5 | 4 | 0 | 5 | 4 | 0 | 48113 | 40743 |
| S16 | 0 | 14015 | 13221 | 0 | 42762 | 17215 | 0 | 135680 | 84243 | 0 | 3 | 4 | 0 | 5 | 4 | 0 | 13453 | 22577 |
| S17 | 0 | 3 | 22925 | 0 | 32550 | 20051 | 0 | 203308 | 40047 | 0 | 6 | 3 | 0 | 4 | 3 | 0 | 22285 | 49389 |
| S18 | 0 | 17257 | 4 | 0 | 24493 | 23064 | 0 | 106731 | 93769 | 0 | 0 | 4 | 0 | 0 | 3 | 0 | 0 | 32168 |
| S19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17997 | 0 | 0 | 10601 | 0 | 0 | 2051 | 0 |
| S21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 0 | 4 | 13542 | 0 | 22652 | 46836 |
| S22 | 0 | 6 | 26781 | 0 | 4 | 39900 | 0 | 138304 | 69806 | 0 | 3 | 3 | 0 | 5 | 4 | 0 | 6254 | 47032 |
| S23 | 0 | 7748 | 28978 | 0 | 35490 | 12201 | 0 | 79897 | 147625 | 0 | 4 | 36423 | 0 | 6 | 3 | 0 | 6 | 80071 |
| S24 | 0 | 17685 | 3354 | 0 | 41390 | 17183 | 0 | 118201 | 69688 | 0 | 4 | 3 | 0 | 5 | 3 | 0 | 11417 | 71729 |
| S25 | 0 | 13147 | 9900 | 0 | 2477 | 59685 | 0 | 174923 | 9295 | 0 | 6 | 4 | 0 | 6 | 5 | 0 | 54323 | 33897 |
| S26 | 0 | 12349 | 8615 | 0 | 20529 | 31063 | 0 | 161322 | 63118 | 0 | 2 | 3 | 0 | 2 | 2 | 0 | 3 | 6153 |
| S27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 3 | 1 | 0 | 0 | 2392 |

(R1: Region 1; R2: Region 2; R3: Region 3)

Table 5 (Continue): The amount of unsatisfied products for Case 2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Case 2 | Scenarios | Decentralized Model | | | | | | | | | Centralized Model | | | | | | | | |
| Product 1 | | | Product 2 | | | Product 3 | | | Product 1 | | | Product 2 | | | Product 3 | | |
| R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 |
| S1 | 0 | 2 | 1 | 0 | 8843 | 12370 | 0 | 95556 | 71033 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 3 | 12438 |
| S2 | 0 | 2 | 1 | 0 | 5066 | 12082 | 0 | 59384 | 99189 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 3 | 11240 |
| S3 | 0 | 8837 | 4613 | 0 | 46169 | 2 | 0 | 168715 | 61540 | 0 | 6 | 1 | 0 | 5 | 1 | 0 | 34514 | 15228 |
| S4 | 0 | 780 | 1 | 0 | 31084 | 2 | 0 | 54740 | 153604 | 0 | 5 | 1 | 0 | 5 | 2 | 0 | 5 | 29229 |
| S5 | 0 | 3085 | 4 | 0 | 18813 | 4098 | 0 | 87093 | 124998 | 0 | 2 | 4 | 0 | 3 | 3 | 0 | 310 | 31268 |
| S6 | 0 | 2 | 4 | 0 | 3 | 23789 | 0 | 61705 | 138768 | 0 | 2 | 4 | 0 | 3 | 4 | 0 | 2443 | 17517 |
| S7 | 0 | 3158 | 7076 | 0 | 28633 | 29604 | 0 | 112893 | 97666 | 0 | 6 | 1 | 0 | 5 | 2 | 0 | 33077 | 35970 |
| S8 | 0 | 6504 | 4829 | 0 | 18568 | 22153 | 0 | 96842 | 129550 | 0 | 4 | 1 | 0 | 5 | 1 | 0 | 4772 | 40458 |
| S9 | 0 | 4 | 21112 | 0 | 22811 | 29964 | 0 | 104004 | 95827 | 0 | 4 | 1 | 0 | 4 | 2 | 0 | 7882 | 53431 |
| S10 | 0 | 6734 | 1 | 0 | 4090 | 32698 | 0 | 57095 | 119621 | 0 | 6 | 1 | 0 | 5 | 2 | 0 | 37072 | 1109 |
| S11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S14 | 0 | 2 | 3 | 0 | 27826 | 3 | 0 | 93269 | 115003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S15 | 0 | 17438 | 18630 | 0 | 41635 | 27661 | 0 | 91992 | 172453 | 0 | 6 | 4 | 0 | 5 | 3 | 0 | 69994 | 13938 |
| S16 | 0 | 17566 | 9601 | 0 | 171 | 58053 | 0 | 168497 | 50688 | 0 | 4 | 2 | 0 | 4 | 3 | 0 | 1837 | 38744 |
| S17 | 0 | 8676 | 13286 | 0 | 9463 | 42658 | 0 | 116585 | 126385 | 0 | 4 | 3 | 0 | 6 | 4 | 0 | 35527 | 26930 |
| S18 | 0 | 2066 | 8714 | 0 | 6 | 40949 | 0 | 127045 | 97794 | 0 | 6 | 4 | 0 | 6 | 2 | 0 | 21446 | 22880 |
| S19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 2 | 0 | 5 | 2 | 0 | 156837 | 40964 |
| S22 | 0 | 6 | 21473 | 0 | 46800 | 3725 | 0 | 103083 | 108575 | 0 | 6 | 4 | 0 | 5 | 4 | 0 | 61451 | 3 |
| S23 | 0 | 113459 | 1968 | 0 | 21844 | 88218 | 0 | 101645 | 133368 | 0 | 4 | 3399 | 0 | 6 | 4 | 0 | 6 | 89469 |
| S24 | 0 | 112946 | 49418 | 0 | 53942 | 41509 | 0 | 125383 | 95903 | 0 | 4 | 4 | 0 | 4 | 4 | 0 | 54569 | 22931 |
| S25 | 0 | 11990 | 16955 | 0 | 39443 | 4 | 0 | 130397 | 81521 | 0 | 5 | 4 | 0 | 4 | 4 | 0 | 5 | 73220 |
| S26 | 0 | 6050 | 11010 | 0 | 6 | 23943 | 0 | 103592 | 95631 | 0 | 5 | 3 | 0 | 6 | 3 | 0 | 5 | 54888 |
| S27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(R1: Region 1; R2: Region 2; R3: Region 3)

Table 5 (Continue): The amount of unsatisfied products for Case 3

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Case 3 | Scenarios | Decentralized Model | | | | | | | | | Centralized Model | | | | | | | | |
| Product 1 | | | Product 2 | | | Product 3 | | | Product 1 | | | Product 2 | | | Product 3 | | |
| R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 |
| S1 | 0 | 2 | 1 | 0 | 3 | 24165,0 | 0 | 129774 | 74493 | 0 | 2 | 1 | 0 | 2 | 2 | 0 | 11174 | 12579 |
| S2 | 0 | 2 | 1 | 0 | 3 | 17705 | 0 | 73207 | 119621 | 0 | 2 | 1 | 0 | 3 | 1 | 0 | 3 | 12311 |
| S3 | 0 | 5 | 23287 | 0 | 25600 | 31865 | 0 | 125644 | 119621 | 0 | 5 | 1 | 0 | 5 | 2 | 0 | 5 | 64747 |
| S4 | 0 | 6 | 2292 | 0 | 1138 | 31865 | 0 | 92898 | 119621 | 0 | 6 | 1 | 0 | 5 | 2 | 0 | 6 | 31999 |
| S5 | 0 | 2 | 9697 | 0 | 3 | 37237 | 0 | 63288 | 158391 | 0 | 2 | 4 | 0 | 2 | 2 | 0 | 7728 | 33438 |
| S6 | 0 | 2 | 4 | 0 | 7156 | 16360 | 0 | 69130 | 131538 | 0 | 2 | 4 | 0 | 2 | 5 | 0 | 3 | 20152 |
| S7 | 0 | 3627 | 31906 | 0 | 35819 | 32070 | 0 | 145265 | 119621 | 0 | 5 | 1 | 0 | 4 | 1 | 0 | 4 | 82942 |
| S8 | 0 | 7 | 15722 | 0 | 14212 | 31865 | 0 | 114048 | 119621 | 0 | 7 | 1 | 0 | 4 | 1 | 0 | 5 | 53151 |
| S9 | 0 | 3 | 29205 | 0 | 29302 | 31865 | 0 | 133054 | 119621 | 0 | 3 | 1 | 0 | 5 | 1 | 0 | 20410 | 51752 |
| S10 | 0 | 7 | 8872 | 0 | 12289 | 27280 | 0 | 102653 | 119621 | 0 | 7 | 1 | 0 | 5 | 1 | 0 | 20497 | 21264 |
| S11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S14 | 0 | 2 | 1705 | 0 | 3 | 30036 | 0 | 77106 | 133783 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S15 | 0 | 5 | 42599 | 0 | 22095 | 53586 | 0 | 123852 | 150654 | 0 | 5 | 3 | 0 | 5 | 3 | 0 | 42912 | 51081 |
| S16 | 0 | 4 | 35737 | 0 | 24506 | 44677 | 0 | 125219 | 139823 | 0 | 4 | 3 | 0 | 4 | 4 | 0 | 5 | 84524 |
| S17 | 0 | 6 | 28592 | 0 | 5118 | 54573 | 0 | 92072 | 159592 | 0 | 6 | 3 | 0 | 6 | 4 | 0 | 5 | 71147 |
| S18 | 0 | 6 | 14944 | 0 | 1911 | 43332 | 0 | 93444 | 137828 | 0 | 6 | 3 | 0 | 3 | 4 | 0 | 13216 | 37543 |
| S19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S21 | 0 | 33209 | 10312 | 0 | 30531 | 34640 | 0 | 112969 | 162466 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S22 | 0 | 1849 | 26596 | 0 | 45656 | 13053 | 0 | 121668 | 132148 | 0 | 4 | 3 | 0 | 6 | 4 | 0 | 6716 | 66587 |
| S23 | 0 | 7 | 51194 | 0 | 43631 | 40269 | 0 | 130092 | 156798 | 0 | 7 | 4 | 0 | 5 | 4 | 0 | 7 | 106370 |
| S24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 4 | 0 | 4 | 5 | 0 | 12843 | 45929 |
| S25 | 0 | 4 | 31418 | 0 | 4448 | 56663 | 0 | 98447 | 156937 | 0 | 4 | 4 | 0 | 5 | 3 | 0 | 26631 | 48240 |
| S26 | 0 | 3121 | 16898 | 0 | 14976 | 35114 | 0 | 102442 | 137022 | 0 | 5 | 4 | 0 | 5 | 3 | 0 | 18975 | 39976 |
| S27 | 0 | 2 | 1 | 0 | 3 | 12076 | 0 | 73416 | 109493 | 0 | 2 | 1 | 0 | 3 | 1 | 0 | 3 | 2392 |

(R1: Region 1; R2: Region 2; R3: Region 3)

Table 5 (Continue): The amount of unsatisfied products for Case 4

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Case 4 | Scenarios | Decentralized Model | | | | | | | | | Centralized Model | | | | | | | | |
| Product 1 | | | Product 2 | | | Product 3 | | | Product 1 | | | Product 2 | | | Product 3 | | |
| R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 |
| S1 | 0 | 2 | 1 | 0 | 3 | 2,0 | 0 | 114240 | 57549 | 0 | 2 | 1 | 0 | 2 | 1 | 0 | 23824 | 12579 |
| S2 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 94636 | 57549 | 0 | 2 | 1 | 0 | 2 | 1 | 0 | 4882 | 11917 |
| S3 | 0 | 5 | 12001 | 0 | 25241 | 12082 | 0 | 180919 | 57549 | 0 | 5 | 1 | 0 | 5 | 2 | 0 | 10921 | 92162 |
| S4 | 0 | 4 | 1 | 0 | 4 | 332 | 0 | 128022 | 57549 | 0 | 4 | 1 | 0 | 4 | 2 | 0 | 22007 | 28179 |
| S5 | 0 | 2 | 3 | 0 | 3 | 6558 | 0 | 97855 | 101213 | 0 | 2 | 3 | 0 | 3 | 5 | 0 | 37979 | 25704 |
| S6 | 0 | 2 | 4 | 0 | 3 | 3 | 0 | 86451 | 83119 | 0 | 2 | 4 | 0 | 3 | 3 | 0 | 3691 | 30494 |
| S7 | 0 | 9143 | 12001 | 0 | 45004 | 12082 | 0 | 213143 | 57549 | 0 | 4 | 1 | 0 | 5 | 2 | 0 | 39480 | 95827 |
| S8 | 0 | 6 | 1 | 0 | 9028 | 9661 | 0 | 159098 | 57549 | 0 | 6 | 1 | 0 | 6 | 2 | 0 | 24278 | 56984 |
| S9 | 0 | 4 | 12001 | 0 | 35921 | 12082 | 0 | 194497 | 57549 | 0 | 4 | 1 | 0 | 5 | 1 | 0 | 12083 | 104577 |
| S10 | 0 | 6 | 1 | 0 | 498 | 10202 | 0 | 164312 | 35970 | 0 | 6 | 1 | 0 | 5 | 1 | 0 | 3 | 50042 |
| S11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S15 | 0 | 24822 | 19827 | 0 | 55499 | 27307 | 0 | 210917 | 91606 | 0 | 5 | 4 | 0 | 4 | 3 | 0 | 42116 | 125022 |
| S16 | 0 | 6690 | 13490 | 0 | 44122 | 13580 | 0 | 181819 | 82520 | 0 | 5 | 3 | 0 | 6 | 4 | 0 | 63631 | 65323 |
| S17 | 0 | 6 | 11158 | 0 | 27775 | 15159 | 0 | 146764 | 102764 | 0 | 6 | 2 | 0 | 4 | 4 | 0 | 34524 | 79619 |
| S18 | 0 | 5 | 3 | 0 | 2279 | 13705 | 0 | 130519 | 78670 | 0 | 5 | 3 | 0 | 7 | 3 | 0 | 30800 | 43004 |
| S19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S22 | 0 | 5 | 7583 | 0 | 25087 | 13141 | 0 | 167319 | 78114 | 0 | 5 | 4 | 0 | 5 | 4 | 0 | 57505 | 52543 |
| S23 | 0 | 35292 | 19714 | 0 | 61649 | 28944 | 0 | 213188 | 103764 | 0 | 5 | 3 | 0 | 5 | 1 | 0 | 74135 | 107431 |
| S24 | 0 | 24437 | 4146 | 0 | 60276 | 4326 | 0 | 202395 | 77779 | 0 | 5 | 2 | 0 | 5 | 4 | 0 | 53819 | 90970 |
| S25 | 0 | 14581 | 4 | 0 | 21764 | 25562 | 0 | 169573 | 88057 | 0 | 6 | 4 | 0 | 5 | 4 | 0 | 13459 | 108786 |
| S26 | 0 | 5 | 3 | 0 | 12855 | 13503 | 0 | 144739 | 78221 | 0 | 5 | 3 | 0 | 7 | 3 | 0 | 15423 | 72152 |
| S27 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 80233 | 57549 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 3 | 2393 |

(R1: Region 1; R2: Region 2; R3: Region 3)

Table 5 (Continue): The amount of unsatisfied products for Case 5

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Case 5 | Scenarios | Decentralized Model | | | | | | | | | Centralized Model | | | | | | | | |
| Product 1 | | | Product 2 | | | Product 3 | | | Product 1 | | | Product 2 | | | Product 3 | | |
| R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 |
| S1 | 0 | 2 | 1 | 0 | 3 | 9661,0 | 0 | 116889 | 63758 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 4 | 45259 |
| S2 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 73598 | 74493 | 0 | 2 | 1 | 0 | 2 | 1 | 0 | 3 | 20480 |
| S3 | 0 | 6630 | 14648 | 0 | 26323 | 31865 | 0 | 189992 | 74493 | 0 | 6 | 1 | 0 | 4 | 2 | 0 | 58716 | 70384 |
| S4 | 0 | 4 | 15405 | 0 | 6 | 12082 | 0 | 91980 | 102677 | 0 | 4 | 1 | 0 | 6 | 2 | 0 | 7 | 59265 |
| S5 | 0 | 2 | 9978 | 0 | 5450 | 16871 | 0 | 63288 | 162210 | 0 | 2 | 3 | 0 | 3 | 3 | 0 | 3 | 90110 |
| S6 | 0 | 2 | 3 | 0 | 3 | 4 | 0 | 71657 | 99926 | 0 | 2 | 3 | 0 | 3 | 4 | 0 | 3 | 36196 |
| S7 | 0 | 6229 | 38602 | 0 | 80800 | 3511 | 0 | 190302 | 102677 | 0 | 5 | 1 | 0 | 5 | 2 | 0 | 24333 | 107320 |
| S8 | 0 | 4 | 1 | 0 | 14242 | 12082 | 0 | 126572 | 102677 | 0 | 4 | 1 | 0 | 7 | 2 | 0 | 6 | 93858 |
| S9 | 0 | 14165 | 17648 | 0 | 38010 | 31865 | 0 | 185911 | 102677 | 0 | 6 | 1 | 0 | 5 | 2 | 0 | 71231 | 81972 |
| S10 | 0 | 6 | 1 | 0 | 10014 | 12082 | 0 | 111556 | 102677 | 0 | 6 | 1 | 0 | 5 | 2 | 0 | 41453 | 41383 |
| S11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S12 | 0 | 2 | 3 | 0 | 15682 | 2 | 0 | 45275 | 117565 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S14 | 0 | 2 | 4 | 0 | 3 | 5 | 0 | 29983 | 126735 | 0 | 2 | 4 | 0 | 3 | 5 | 0 | 3 | 57945 |
| S15 | 0 | 4 | 92253 | 0 | 58752 | 64470 | 0 | 238936 | 107323 | 0 | 4 | 5 | 0 | 5 | 4 | 0 | 178648 | 32226 |
| S16 | 0 | 10524 | 32021 | 0 | 40239 | 41839 | 0 | 161638 | 141125 | 0 | 6 | 4 | 0 | 6 | 4 | 0 | 167374 | 4 |
| S17 | 0 | 6260 | 20691 | 0 | 18706 | 40894 | 0 | 115232 | 158210 | 0 | 5 | 4 | 0 | 6 | 4 | 0 | 70902 | 67155 |
| S18 | 0 | 7 | 3 | 0 | 5542 | 24015 | 0 | 115676 | 111320 | 0 | 7 | 3 | 0 | 6 | 3 | 0 | 61660 | 29951 |
| S19 | 0 | 97988 | 4 | 0 | 118469 | 15970 | 0 | 148626 | 194958 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S22 | 0 | 6910 | 14632 | 0 | 29360 | 22955 | 0 | 162328 | 105652 | 0 | 5 | 2 | 0 | 5 | 2 | 0 | 86344 | 46251 |
| S23 | 0 | 23441 | 57982 | 0 | 57476 | 41727 | 0 | 169780 | 191979 | 0 | 5 | 3726 | 0 | 8227 | 3 | 0 | 144264 | 4 |
| S24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 0 | 4 | 4 | 0 | 5 | 145945 |
| S25 | 0 | 7 | 38138 | 0 | 18810 | 52654 | 0 | 132043 | 158138 | 0 | 7 | 3 | 0 | 5 | 4 | 0 | 5 | 119187 |
| S26 | 0 | 4 | 7357 | 0 | 4372 | 13877 | 0 | 137796 | 61560 | 0 | 4 | 3 | 0 | 6 | 5 | 0 | 46222 | 17480 |
| S27 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 63288 | 74493 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(R1: Region 1; R2: Region 2; R3: Region 3)

Table 5 (Continue): The amount of unsatisfied products for Case 6

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Case 6 | Scenarios | Decentralized Model | | | | | | | | | Centralized Model | | | | | | | | |
| Product 1 | | | Product 2 | | | Product 3 | | | Product 1 | | | Product 2 | | | Product 3 | | |
| R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 | R1 | R2 | R3 |
| S1 | 0 | 2 | 1 | 0 | 3 | 4041,0 | 0 | 121479 | 80702 | 0 | 2 | 1 | 0 | 2 | 2 | 0 | 3 | 66793 |
| S2 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 87440 | 74493 | 0 | 2 | 1 | 0 | 2 | 1 | 0 | 3 | 27453 |
| S3 | 0 | 18746 | 31907 | 0 | 61631 | 31865 | 0 | 238485 | 74493 | 0 | 5 | 1 | 0 | 6 | 1 | 0 | 73015 | 104578 |
| S4 | 0 | 4 | 1 | 0 | 15190 | 5 | 0 | 59488 | 119621 | 0 | 4 | 1 | 0 | 5 | 2 | 0 | 21435 | 49451 |
| S5 | 0 | 2 | 5454 | 0 | 6832 | 29280 | 0 | 63288 | 178522 | 0 | 2 | 3 | 0 | 2 | 3 | 0 | 23646 | 82779 |
| S6 | 0 | 2 | 3 | 0 | 3 | 3 | 0 | 108416 | 70949 | 0 | 2 | 3 | 0 | 2 | 3 | 0 | 3 | 43978 |
| S7 | 0 | 45999 | 41763 | 0 | 71794 | 31865 | 0 | 245290 | 119621 | 0 | 10068 | 1 | 0 | 5540 | 31958 | 0 | 129989 | 99536 |
| S8 | 0 | 13626 | 2648 | 0 | 20527 | 26249 | 0 | 95641 | 119621 | 0 | 6 | 1 | 0 | 7 | 2 | 0 | 63022 | 62424 |
| S9 | 0 | 50825 | 14648 | 0 | 77059 | 31865 | 0 | 218345 | 119621 | 0 | 6 | 1 | 0 | 6 | 2 | 0 | 77140 | 125441 |
| S10 | 0 | 5 | 1 | 0 | 18408 | 12082 | 0 | 154978 | 74493 | 0 | 5 | 1 | 0 | 6 | 2 | 0 | 21020 | 68852 |
| S11 | 0 | 21961 | 29366 | 0 | 12577 | 63666 | 0 | 108214 | 197933 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S12 | 0 | 2 | 3 | 0 | 13647 | 11727 | 0 | 107889 | 129270 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S14 | 0 | 2 | 4 | 0 | 3 | 6861 | 0 | 21875 | 156115 | 0 | 2 | 4 | 0 | 2 | 2 | 0 | 23416 | 43071 |
| S15 | 0 | 26076 | 112099 | 0 | 120939 | 67803 | 0 | 254481 | 195556 | 0 | 2786 | 4 | 0 | 5 | 53352 | 0 | 190096 | 124556 |
| S16 | 0 | 52223 | 39844 | 0 | 85889 | 30181 | 0 | 204693 | 166227 | 0 | 4 | 3 | 0 | 6 | 4 | 0 | 83527 | 123304 |
| S17 | 0 | 6 | 38154 | 0 | 71017 | 21281 | 0 | 132588 | 188727 | 0 | 6 | 5 | 0 | 4 | 3 | 0 | 16867 | 169063 |
| S18 | 0 | 7 | 6698 | 0 | 18609 | 23159 | 0 | 128320 | 116812 | 0 | 7 | 3 | 0 | 6 | 4 | 0 | 5 | 106319 |
| S19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S22 | 0 | 9466 | 30477 | 0 | 45245 | 22475 | 0 | 148948 | 147002 | 0 | 7 | 3 | 0 | 3 | 3 | 0 | 88954 | 71611 |
| S23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64606 | 67206 | 0 | 71681 | 67177 | 0 | 156697 | 173016 |
| S24 | 0 | 56167 | 21209 | 0 | 52831 | 95975 | 0 | 244661 | 154869 | 0 | 6 | 3 | 0 | 10146 | 3276 | 0 | 145762 | 121316 |
| S25 | 0 | 36035 | 42261 | 0 | 62163 | 45140 | 0 | 132337 | 203749 | 0 | 6 | 4 | 0 | 6 | 3 | 0 | 46687 | 163533 |
| S26 | 0 | 9751 | 16235 | 0 | 29707 | 33014 | 0 | 145978 | 128662 | 0 | 4 | 4 | 0 | 5 | 3 | 0 | 29539 | 109716 |
| S27 | 0 | 2 | 1 | 0 | 3 | 2 | 0 | 63288 | 74493 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(R1: Region 1; R2: Region 2; R3: Region 3)