

Supplementary Information for:

The Polarising Trend of Regional CO₂ Emissions in China and Its Implications

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Table S1. Province to Region Concordance. It shows the specification of provinces assignment to regions

| Province | Region | Province | Region |
|-----------------|-----------------|-----------------|---------------|
| Beijing | Beijing–Tianjin | Hunan | Central |
| Tianjin | Beijing–Tianjin | Guangdong | South Coast |
| Hebei | North | Guangxi | Southwest |
| Shanxi | Central | Hainan | South Coast |
| Inner Mongolia | Northwest | Chongqing | Southwest |
| Liaoning | Northeast | Sichuan | Southwest |
| Jilin | Northeast | Guizhou | Southwest |
| Heilongjiang | Northeast | Yunnan | Southwest |
| Shanghai | Central Coast | Tibet | Southwest |
| Jiangsu | Central Coast | Shaanxi | Northwest |
| Zhejiang | Central Coast | Gansu | Northwest |
| Anhui | Central | Qinghai | Northwest |
| Fujian | South Coast | Ningxia | Northwest |
| Jiangxi | Central | Xinjiang | Northwest |
| Shandong | North | Taiwan | No data |
| Henan | Central | Hong Kong | No data |
| Hubei | Central | Macao | No data |

Table S2. The Net Export of CO₂ Emissions Among the Eight Regions of China in 2007, 2012, and 2017.

| Mt CO ₂ | 2007 | CNE | CBT | CNO | CCE | CCC | CSC | CNW | CSW | Total Domestic Export |
|--------------------|------|-------|------|-------|-------|-------|------|-------|-------|-----------------------|
| Northeast | CNE | 0.0 | 16.4 | -5.1 | 5.8 | 19.1 | 8.1 | -48.9 | 8.0 | 3.3 |
| Beijing–Tianjin | CBT | -16.4 | 0.0 | -40.3 | -24.2 | -1.0 | 0.3 | -33.3 | -2.8 | -117.7 |
| North | CNO | 5.1 | 40.3 | 0.0 | -19.3 | 77.1 | 21.2 | -16.1 | 15.6 | 123.9 |
| Central | CCE | -5.8 | 24.2 | 19.3 | 0.0 | 86.4 | 19.3 | 1.4 | -8.1 | 136.8 |
| Central Coast | CCC | -19.1 | 1.0 | -77.1 | -86.4 | 0.0 | 0.9 | -40.9 | -13.5 | -235.0 |
| South Coast | CSC | -8.1 | -0.3 | -21.2 | -19.3 | -0.9 | 0.0 | -14.1 | -35.0 | -98.9 |
| Northwest | CNW | 48.9 | 33.3 | 16.1 | -1.4 | 40.9 | 14.1 | 0.0 | 13.0 | 165.0 |
| Southwest | CSW | -8.0 | 2.8 | -15.6 | 8.1 | 13.5 | 35.0 | -13.0 | 0.0 | 22.7 |
| Mt CO ₂ | 2012 | CNE | CBT | CNO | CCE | CCC | CSC | CNW | CSW | Total Domestic Export |
| Northeast | CNE | 0.0 | 13.9 | -13.8 | -4.5 | 0.3 | 7.0 | -20.0 | 11.4 | -5.7 |
| Beijing–Tianjin | CBT | -13.9 | 0.0 | -21.9 | -27.0 | -10.0 | -0.6 | -39.2 | -4.5 | -117.1 |
| North | CNO | 13.8 | 21.9 | 0.0 | 3.2 | 30.3 | 15.9 | -38.1 | 13.0 | 59.9 |
| Central | CCE | 4.5 | 27.0 | -3.2 | 0.0 | 38.6 | 26.6 | -38.5 | 15.6 | 70.6 |
| Central Coast | CCC | -0.3 | 10.0 | -30.3 | -38.6 | 0.0 | 14.5 | -40.4 | 4.1 | -81.1 |
| South Coast | CSC | -7.0 | 0.6 | -15.9 | -26.6 | -14.5 | 0.0 | -25.6 | -18.0 | -107.1 |
| Northwest | CNW | 20.0 | 39.2 | 38.1 | 38.5 | 40.4 | 25.6 | 0.0 | 32.1 | 234.1 |
| Southwest | CSW | -11.4 | 4.5 | -13.0 | -15.6 | -4.1 | 18.0 | -32.1 | 0.0 | -53.7 |
| Mt CO ₂ | 2017 | CNE | CBT | CNO | CCE | CCC | CSC | CNW | CSW | Total Domestic Export |
| Northeast | CNE | 0.0 | 7.0 | 3.9 | 1.5 | 13.9 | 11.6 | -24.6 | 4.7 | 18.0 |
| Beijing–Tianjin | CBT | -7.0 | 0.0 | -1.6 | -6.8 | -2.3 | -0.1 | -18.9 | -2.9 | -39.7 |
| North | CNO | -3.9 | 1.6 | 0.0 | -4.4 | 1.9 | 1.8 | -22.6 | -0.8 | -26.4 |
| Central | CCE | -1.5 | 6.8 | 4.4 | 0.0 | 15.0 | 15.8 | -36.0 | 5.3 | 9.8 |
| Central Coast | CCC | -13.9 | 2.3 | -1.9 | -15.0 | 0.0 | 3.2 | -49.5 | -6.3 | -81.1 |
| South Coast | CSC | -11.6 | 0.1 | -1.8 | -15.8 | -3.2 | 0.0 | -48.3 | -8.0 | -88.5 |
| Northwest | CNW | 24.6 | 18.9 | 22.6 | 36.0 | 49.5 | 48.3 | 0.0 | 30.3 | 230.2 |
| Southwest | CSW | -4.7 | 2.9 | 0.8 | -5.3 | 6.3 | 8.0 | -30.3 | 0.0 | -22.2 |

Table S3. Consumption-Based CO₂ vs Final Consumption. The consumption-based CO₂ emissions, final consumptions, CO₂ emission intensities, and CO₂ net export of 31 provinces in 2007, 2012, and 2017. The deeper red in CO₂ net export means the larger negative net export, while the deeper blue in CO₂ net export means the larger positive net export.

| | 2007 | | | | 2012 | | | | 2017 | | | |
|----------------|--|-----------------------------------|--------------------------|---------------------------------|--|-----------------------------------|--------------------------|---------------------------------|--|-----------------------------------|--------------------------|---------------------------------|
| | CBA CO ₂ emission intensity (kg/yuan) | Final Consumption (trillion Yuan) | CBA CO ₂ (Mt) | CO ₂ net export (Mt) | CBA CO ₂ emission intensity (kg/yuan) | Final Consumption (trillion Yuan) | CBA CO ₂ (Mt) | CO ₂ net export (Mt) | CBA CO ₂ emission intensity (kg/yuan) | Final Consumption (trillion Yuan) | CBA CO ₂ (Mt) | CO ₂ net export (Mt) |
| Beijing | 0.14 | 1011.1 | 140.7 | -75.5 | 0.08 | 1684.5 | 134.3 | -69.0 | 0.04 | 2468.5 | 95.4 | -27.0 |
| Tianjin | 0.23 | 443.5 | 102.7 | -42.2 | 0.12 | 1424.0 | 167.4 | -48.1 | 0.09 | 1626.1 | 142.5 | -12.7 |
| Hebei | 0.24 | 991.4 | 236.2 | 128.2 | 0.17 | 2612.9 | 436.1 | 119.5 | 0.22 | 3068.9 | 681.1 | 4.9 |
| Shanxi | 0.31 | 514.3 | 161.5 | 92.1 | 0.21 | 1357.8 | 279.1 | 101.8 | 0.31 | 1388.7 | 426.8 | 44.3 |
| Inner Mongolia | 0.24 | 448.7 | 108.0 | 159.2 | 0.16 | 1713.5 | 280.6 | 191.1 | 0.33 | 1462.9 | 481.5 | 145.6 |
| Liaoning | 0.24 | 866.6 | 205.0 | 55.0 | 0.13 | 2509.4 | 330.7 | 37.9 | 0.22 | 2110.6 | 458.6 | 2.9 |
| Jilin | 0.30 | 596.3 | 179.3 | -45.7 | 0.16 | 1397.2 | 221.1 | -17.7 | 0.14 | 1499.2 | 211.5 | -13.6 |
| Heilongjiang | 0.26 | 597.0 | 153.5 | -6.0 | 0.16 | 1527.0 | 248.1 | -25.9 | 0.13 | 1749.9 | 230.5 | 28.6 |
| Shanghai | 0.18 | 1090.1 | 192.8 | -105.7 | 0.08 | 1721.4 | 140.9 | -9.4 | 0.07 | 2628.6 | 182.7 | -5.3 |
| Jiangsu | 0.16 | 1885.7 | 294.8 | -11.5 | 0.10 | 4383.6 | 443.1 | -6.7 | 0.10 | 7199.6 | 754.1 | -36.7 |
| Zhejiang | 0.19 | 1629.0 | 305.6 | -117.9 | 0.10 | 2989.2 | 296.0 | -65.0 | 0.10 | 4133.3 | 403.6 | -39.2 |
| Anhui | 0.20 | 717.1 | 143.6 | 1.1 | 0.11 | 1740.7 | 194.5 | 47.5 | 0.15 | 2389.4 | 364.9 | -9.3 |
| Fujian | 0.15 | 758.4 | 113.5 | -20.0 | 0.10 | 1570.3 | 151.0 | 1.0 | 0.08 | 2687.6 | 225.4 | -0.9 |
| Jiangxi | 0.26 | 578.6 | 148.8 | -55.4 | 0.11 | 1276.8 | 139.0 | -19.5 | 0.12 | 1769.3 | 218.4 | -2.8 |
| Shandong | 0.22 | 2079.4 | 449.3 | -4.3 | 0.15 | 4506.0 | 662.8 | -59.6 | 0.13 | 6405.2 | 805.6 | -31.3 |

| | | | | | | | | | | | | |
|-----------|------|--------|-------|-------|------|--------|-------|-------|------|--------|-------|-------|
| Henan | 0.18 | 1303.7 | 229.9 | 79.7 | 0.12 | 3491.4 | 416.4 | -4.4 | 0.11 | 4664.9 | 496.4 | -23.1 |
| Hubei | 0.20 | 882.6 | 172.2 | 14.7 | 0.14 | 2223.2 | 313.4 | -24.4 | 0.09 | 3303.1 | 298.9 | 6.5 |
| Hunan | 0.19 | 843.4 | 159.7 | 4.6 | 0.11 | 2256.9 | 250.5 | -30.3 | 0.10 | 3122.7 | 296.8 | -5.8 |
| Guangdong | 0.13 | 2306.4 | 297.2 | -78.5 | 0.08 | 4934.6 | 381.5 | -99.8 | 0.08 | 7447.3 | 596.8 | -95.6 |
| Guangxi | 0.16 | 565.6 | 90.4 | -3.6 | 0.11 | 1579.4 | 176.0 | -22.5 | 0.12 | 1741.9 | 211.9 | 2.9 |
| Hainan | 0.13 | 124.9 | 16.2 | -0.4 | 0.11 | 334.9 | 36.7 | -8.3 | 0.07 | 493.0 | 32.8 | 7.9 |
| Chongqing | 0.21 | 437.6 | 92.4 | -16.2 | 0.14 | 1172.5 | 168.2 | -36.6 | 0.10 | 1718.5 | 171.6 | -23.2 |
| Sichuan | 0.16 | 1019.5 | 167.7 | -12.6 | 0.11 | 2412.5 | 264.2 | -24.2 | 0.08 | 3289.0 | 275.7 | 10.3 |
| Guizhou | 0.26 | 308.0 | 79.4 | 42.6 | 0.17 | 810.0 | 135.9 | 42.7 | 0.17 | 1452.8 | 241.6 | -3.5 |
| Yunan | 0.18 | 483.5 | 88.1 | 12.5 | 0.12 | 1477.1 | 178.8 | -13.2 | 0.09 | 2203.7 | 191.5 | -7.5 |
| Tibet | - | - | - | | - | - | - | | 0.03 | 194.4 | 6.1 | -1.3 |
| Shaanxi | 0.23 | 476.4 | 107.6 | -1.9 | 0.14 | 1602.9 | 220.5 | -30.1 | 0.12 | 2079.6 | 244.1 | 6.3 |
| Gansu | 0.22 | 279.9 | 61.4 | 7.9 | 0.15 | 684.1 | 102.7 | 20.1 | 0.18 | 752.0 | 133.9 | 7.5 |
| Qinghai | 0.28 | 90.7 | 25.2 | -6.7 | 0.15 | 263.0 | 39.3 | -4.4 | 0.15 | 342.9 | 51.4 | -1.7 |
| Ningxia | 0.35 | 118.9 | 41.6 | 10.0 | 0.27 | 261.4 | 71.0 | 44.4 | 0.28 | 569.5 | 162.2 | 11.0 |
| Xinjiang | 0.27 | 347.3 | 94.3 | -3.4 | 0.19 | 1001.1 | 190.2 | 13.0 | 0.21 | 1559.7 | 328.0 | 61.4 |

Table S4. Percentage of Consumption-Based CO₂ vs Percentage of Final Consumption. The percentage share of consumption-based CO₂ emissions and final consumptions of 31 provinces in 2007, 2012, and 2017. Differences in percentage points between consumption-based CO₂ emissions and final consumptions are also presented. The deeper red in differences in percentage points means the larger share of consumption-based CO₂ emissions than final consumption, while the deeper blue in differences in percentage points means the larger share of final consumption than consumption-based CO₂ emissions.

| | % of Final Consumption | | | % of CBA CO ₂ emissions | | | Differences in % | | | Changes in % |
|----------------|------------------------|------|------|------------------------------------|------|------|------------------|-------|-------|--------------|
| | 2007 | 2012 | 2017 | 2007 | 2012 | 2017 | 2007 | 2012 | 2017 | 2007 - 2017 |
| Beijing | 4.2% | 3.0% | 3.2% | 3.0% | 1.9% | 1.0% | 1.2% | 1.1% | 2.2% | 0.9% |
| Tianjin | 1.9% | 2.5% | 2.1% | 2.2% | 2.4% | 1.5% | -0.3% | 0.1% | 0.6% | 0.9% |
| Hebei | 4.2% | 4.6% | 4.0% | 5.1% | 6.2% | 7.2% | -0.9% | -1.6% | -3.3% | -2.4% |
| Shanxi | 2.2% | 2.4% | 1.8% | 3.5% | 3.9% | 4.5% | -1.3% | -1.6% | -2.7% | -1.4% |
| Inner Mongolia | 1.9% | 3.0% | 1.9% | 2.3% | 4.0% | 5.1% | -0.4% | -1.0% | -3.2% | -2.8% |
| Liaoning | 3.6% | 4.4% | 2.7% | 4.4% | 4.7% | 4.9% | -0.8% | -0.3% | -2.1% | -1.4% |
| Jilin | 2.5% | 2.5% | 1.9% | 3.8% | 3.1% | 2.2% | -1.3% | -0.7% | -0.3% | 1.0% |
| Heilongjiang | 2.5% | 2.7% | 2.3% | 3.3% | 3.5% | 2.4% | -0.8% | -0.8% | -0.2% | 0.6% |
| Shanghai | 4.6% | 3.0% | 3.4% | 4.1% | 2.0% | 1.9% | 0.4% | 1.0% | 1.5% | 1.0% |
| Jiangsu | 7.9% | 7.7% | 9.3% | 6.3% | 6.3% | 8.0% | 1.6% | 1.4% | 1.3% | -0.3% |
| Zhejiang | 6.8% | 5.3% | 5.3% | 6.6% | 4.2% | 4.3% | 0.3% | 1.1% | 1.0% | 0.8% |
| Anhui | 3.0% | 3.1% | 3.1% | 3.1% | 2.8% | 3.9% | -0.1% | 0.3% | -0.8% | -0.7% |
| Fujian | 3.2% | 2.8% | 3.5% | 2.4% | 2.1% | 2.4% | 0.8% | 0.6% | 1.1% | 0.3% |
| Jiangxi | 2.4% | 2.2% | 2.3% | 3.2% | 2.0% | 2.3% | -0.8% | 0.3% | 0.0% | 0.7% |
| Shandong | 8.7% | 7.9% | 8.3% | 9.6% | 9.4% | 8.5% | -0.9% | -1.5% | -0.3% | 0.6% |
| Henan | 5.5% | 6.1% | 6.0% | 4.9% | 5.9% | 5.3% | 0.5% | 0.2% | 0.8% | 0.2% |
| Hubei | 3.7% | 3.9% | 4.3% | 3.7% | 4.4% | 3.2% | 0.0% | -0.5% | 1.1% | 1.1% |
| Hunan | 3.5% | 4.0% | 4.0% | 3.4% | 3.5% | 3.1% | 0.1% | 0.4% | 0.9% | 0.8% |
| Guangdong | 9.7% | 8.7% | 9.6% | 6.4% | 5.4% | 6.3% | 3.3% | 3.3% | 3.3% | 0.0% |
| Guangxi | 2.4% | 2.8% | 2.2% | 1.9% | 2.5% | 2.2% | 0.4% | 0.3% | 0.0% | -0.4% |
| Hainan | 0.5% | 0.6% | 0.6% | 0.3% | 0.5% | 0.3% | 0.2% | 0.1% | 0.3% | 0.1% |
| Chongqing | 1.8% | 2.1% | 2.2% | 2.0% | 2.4% | 1.8% | -0.1% | -0.3% | 0.4% | 0.5% |
| Sichuan | 4.3% | 4.2% | 4.2% | 3.6% | 3.7% | 2.9% | 0.7% | 0.5% | 1.3% | 0.6% |
| Guizhou | 1.3% | 1.4% | 1.9% | 1.7% | 1.9% | 2.6% | -0.4% | -0.5% | -0.7% | -0.3% |
| Yunan | 2.0% | 2.6% | 2.8% | 1.9% | 2.5% | 2.0% | 0.1% | 0.1% | 0.8% | 0.7% |
| Tibet | | | 0.3% | | | 0.1% | 0.0% | 0.0% | 0.2% | 0.2% |
| Shaanxi | 2.0% | 2.8% | 2.7% | 2.3% | 3.1% | 2.6% | -0.3% | -0.3% | 0.1% | 0.4% |
| Gansu | 1.2% | 1.2% | 1.0% | 1.3% | 1.5% | 1.4% | -0.1% | -0.3% | -0.5% | -0.3% |
| Qinghai | 0.4% | 0.5% | 0.4% | 0.5% | 0.6% | 0.5% | -0.2% | -0.1% | -0.1% | 0.1% |
| Ningxia | 0.5% | 0.5% | 0.7% | 0.9% | 1.0% | 1.7% | -0.4% | -0.5% | -1.0% | -0.6% |
| Xinjiang | 1.5% | 1.8% | 2.0% | 2.0% | 2.7% | 3.5% | -0.6% | -0.9% | -1.5% | -0.9% |

Table S5. The Net Export of CO₂ Emissions Between China and Rest of the World (RoW) Regions in 2007, 2012, and 2017.

| | 2007 | | 2012 | | 2017 | |
|---------------------------------|--------|----------|--------|----------|--------|----------|
| CO ₂ Net Export (Mt) | to RoW | to China | to RoW | to China | to RoW | to China |
| Europe | -569.2 | -363.6 | -431.0 | -204.8 | -419.3 | -196.6 |
| North America | -285.1 | -486.2 | -216.7 | -338.3 | -505.0 | -382.6 |
| East Asia | 36.9 | -145.4 | -3.4 | -91.6 | 25.7 | -58.3 |
| China | 1615.2 | 0.0 | 1398.1 | 0.0 | 1191.5 | 0.0 |
| BRICS w/o China | 566.9 | -75.2 | 448.1 | -77.3 | 603.7 | -30.7 |
| Rest of Asia Pacific | 158.7 | -310.7 | 100.6 | -417.9 | 127.0 | -287.3 |
| Latin America | -0.9 | -76.7 | -26.7 | -104.7 | 3.2 | -106.1 |
| Africa | -86.2 | -43.5 | -142.3 | -63.9 | -221.9 | -70.6 |
| Middle East | 178.9 | -114.1 | 271.4 | -99.6 | 386.6 | -59.2 |