Supporting Information for

Tension of agricultural land and water use in China's trade: Tele-connections, hidden drivers and potential solutions

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This supporting information is organized as follows: Section 1 shows the agricultural land per capita and water scarcity index of each province, resource intensity and final demand per capita of each province. Section 2 presents the methodology to compile the China's Multi-Regional Input-Output table. Section 3 provides the whole picture of virtual agricultural land and water use flows of each province in 2002, 2007 and 2012. Sections 4 shows the driving forces of changes in virtual f agricultural land and water use flows from 2002 to 2007 and 2007 to 2012 and results of scenario analysis about the virtual agricultural land and water use flows for each province.

Contents

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1.Background data of each province

Table S1 shows that the agricultural land availability differed greatly between regions in China. Generally speaking, the inland developing regions which included Northeast and Northeast got more agricultural land than the coastal developed regions like the East Coast and South Coast. The inland regions face water scarcity (almost water scarcity index of all the provinces in Northeast and Northwest were larger than 0.2 in 2002, 2007 and 2012) while the developed regions like South Coast characterized by relatively water abundance. In addition, the water use intensity of the developing regions is much larger than the developed regions which implies that the water use efficiency of the regions with higher economic level is much better than the developing regions. For example, the water use intensity of Xinjiang is more than three times larger than that of Beijing. The ALU intensity also shows a similar distribution pattern between different provinces.

Table S1. The agricultural land per capita and water scarcity index of each province in 2002, 2007 and 2012 and ALU and AWU intensity as well as final demand per capita of each province in 2012

Regions	Provinces	Agricultural land (hectare/person)			Water Scarcity Index			Agricultural water use intensity of 2012 (m^3/10,000 GDP)	Agricultural land intensity of 2012 (hectare/10,000 GDP)	Final demand per capita of agriculture in 2012 (Yuan/person)	GDP per capita in 2012 (unit: 10,000 Yuan/person)
		2002	2007	2012	2002	2007	2012				
Beijing-Tianjin	Beijing	0.29	0.28	0.29	2.15	1.46	0.91	90.63	0.13	2032.86	8.45
	Tianjin	0.07	0.06	0.07	5.44	2.07	0.70	374.65	0.37	203.19	3.79
North Coast	Hebei	0.31	0.31	0.32	1.92	1.69	0.83	441.48	0.61	1496.99	1.41
	Shandong	0.33	0.32	0.33	2.57	0.57	0.81	717.20	0.89	464.93	2.48
Northeast	Heilongjiang	1.12	1.11	0.93	0.40	0.59	0.43	952.46	1.80	2743.98	1.73
	Liaoning	0.17	0.17	0.17	0.86	0.55	0.26	417.54	0.76	871.36	3.16
	Jilin	0.48	0.47	0.51	0.30	0.29	0.28	583.66	1.63	910.48	2.04
East Coast	Shanghai	0.58	0.57	0.56	2.37	3.48	3.42	1434.43	0.41	312.43	5.61
	Jiangsu	0.40	0.40	0.42	1.79	1.13	1.48	1041.07	0.38	871.88	4.52
	Zhejiang	0.27	0.27	0.27	0.22	0.24	0.14	910.00	1.06	710.43	3.27
South Coast	Guangdong	1.29	1.30	1.45	0.24	0.29	0.22	1815.81	1.41	514.43	1.95
	Fujian	0.22	0.21	0.22	0.15	0.18	0.13	1050.10	1.39	682.64	2.47
	Hainan	0.34	0.33	0.37	0.13	0.16	0.12	380.07	0.41	5451.53	2.92
Central	Anhui	0.33	0.33	0.34	0.33	0.33	0.42	604.15	0.66	1393.51	2.07
	Jiangxi	4.15	4.11	3.70	0.10	0.21	0.11	1285.54	1.45	1031.21	1.48
	Henan	0.15	0.15	0.14	0.70	0.45	0.90	359.20	0.55	812.89	1.51
	Hubei	0.38	0.38	0.39	0.21	0.25	0.37	896.03	1.14	1312.07	2.19
	Hunan	0.80	0.80	0.86	0.12	0.23	0.17	730.36	0.87	1289.73	1.54
	Shanxi	0.35	0.35	0.38	0.50	0.57	0.69	1069.94	3.53	586.51	1.34
Southwest	Sichuan	0.85	0.82	0.79	0.08	0.09	0.09	768.25	2.58	759.21	1.52
	Chongqing	7.74	7.72	7.97	0.11	0.12	0.17	339.26	1.29	833.22	2.50
	Guizhou	0.63	0.60	0.60	0.08	0.09	0.10	712.92	1.19	870.73	0.98

	Guangxi	0.20	0.20	0.20	0.13	0.22	0.15	1053.43	2.74	1490.49	1.23
	Yunnan	0.03	0.03	0.02	0.07	0.07	0.09	820.17	3.10	1130.04	1.16
Northwest	Inner Mongolia	0.41	0.39	0.39	0.48	0.61	0.36	1034.81	7.04	933.32	2.35
	Shaanxi	0.58	0.60	0.61	0.13	0.22	0.23	385.80	1.50	1546.73	1.74
	Gansu	0.09	0.08	0.08	0.26	0.54	0.46	1214.01	3.06	1347.88	1.28
	Ningxia	3.00	3.01	2.55	7.53	6.83	6.43	4367.59	3.62	954.01	2.02
	Qinghai	0.82	0.81	0.84	0.12	0.05	0.03	2160.58	43.88	1289.53	1.59
	Xinjiang	0.20	0.19	0.19	0.44	0.60	0.66	3942.81	3.99	2620.63	1.51
National average								863.46	3.11	1248.96	

2. Methodology to compile China's Multi-Regional Input-Output table

The Multi-Regional Input-Output Table (MRIOT) used in this paper was compiled based on 30 provincial input-output tables (IOT) for the corresponding year which are 2002, 2007 and 2012. Additionally, 42 sectors in MRIOT are reclassified into 29 sectors for each province. There are four steps to compile an MRIOT: Step 1, each province's IOT was first processed to be noncompetitive IOT [1]. Step 2, each province's import and export data were used to construct the interregional trade coefficient matrix of MRIOT through a hybrid technique based on a maximum entropy model and dual-constrained gravity model. Step 3: developing the MRIOT using Chenery-Moses model [2] based on provincial noncompetitive IOTs from step 1 and interregional trade coefficient matrix from step 2. Details information can be found in Zhang et al [3].

There are uncertainties from MRIOT which include, but are not limited to, linking trade through supply chains among different regions. Uncertainties mostly come from the source (survey) data and data manipulation of MRIOT [4-6]. Moreover, the uncertainties may also come from MRIOT's sector detail, region coverage, and the number of environmental extensions [7, 8]. According to Lin et al [9]. the uncertainties in the Chinese input-output model are relatively small, which contribute about 10% of total errors in export-related pollutant emissions.

Table S2 The framework of MRIO table

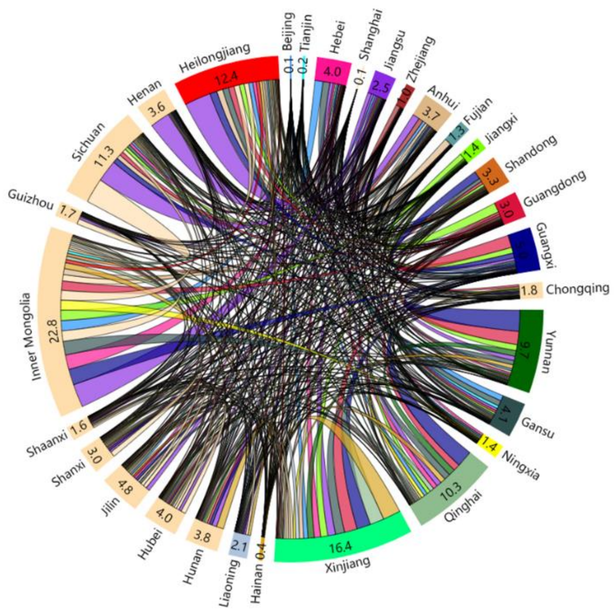
<table>
<tr><td colspan="2" rowspan="3">output / input</td><td colspan="7">Intermediate use</td><td colspan="3">final use</td><td rowspan="3">export</td><td rowspan="3">total output</td></tr>
<tr><td colspan="3">region 1</td><td>…</td><td colspan="3">region m</td><td rowspan="2">region 1</td><td rowspan="2">…</td><td rowspan="2">region m</td></tr>
<tr><td>sector 1</td><td>…</td><td>sector n</td><td>…</td><td>sector 1</td><td>…</td><td>sector n</td></tr>
<tr><td rowspan="3">region 1</td><td>sector 1</td><td colspan="7" rowspan="7">z_{ij}^{rs}</td><td colspan="3" rowspan="7">y_i^{rs}</td><td rowspan="7">ex_i^r</td><td rowspan="7">x_i^r</td></tr>
<tr><td>…</td></tr>
<tr><td>sector n</td></tr>
<tr><td>…</td><td>…</td></tr>
<tr><td rowspan="3">region m</td><td>sector 1</td></tr>
<tr><td>…</td></tr>
<tr><td>sector n</td></tr>
<tr><td colspan="2">import</td><td colspan="7">Im_j^s</td></tr>
<tr><td colspan="2">added value</td><td colspan="7">v_j^s</td></tr>
<tr><td colspan="2">total input</td><td colspan="7">x_j^s</td></tr>
</table>

Table S3 Classification of economic sectors in MRIO table

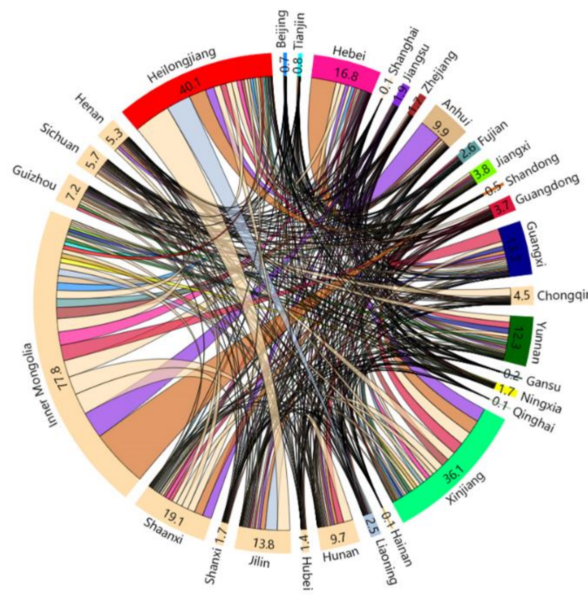
No.	Classification of sectors in MRIO analysis	Classification of sectors with Three Industries
1	Agriculture	Agriculture
2	Coal Mining and Dressing	Industry
3	Petroleum and Natural Gas Extraction	
4	Metals Mining and Dressing	
5	Nonmetal Minerals Mining and Dressing	
6	Food and Tobacco Processing	
7	Textile Industry	
8	Garments, Leather, Furs, Down and Related Products	
9	Timber Processing and Furniture Manufacturing	
10	Papermaking, Cultural, Educational and Sports Articles	
11	Petroleum Processing and Coking	
12	Chemicals	
13	Nonmetal Mineral Products	
14	Smelting and Pressing of Metals	
15	Metal Products	
16	General and Specialized Machinery	
17	Transportation Equipment	
18	Electric Equipment and Machinery	
19	Electronic and Telecommunications Equipment	
20	Instruments, Meters Cultural and Office Machinery	
21	Other Manufacturing Products	
22	Scrap industry	
23	Electricity and Heating Power Production and Supply	
24	Gas Production and Supply	
25	Water Production and Supply	
26	Construction	
27	Freight Transport and Warehousing	Service
28	Wholesale and Retail Trade	
29	Other Services	

3. Virtual agricultural land and water use flows of each province

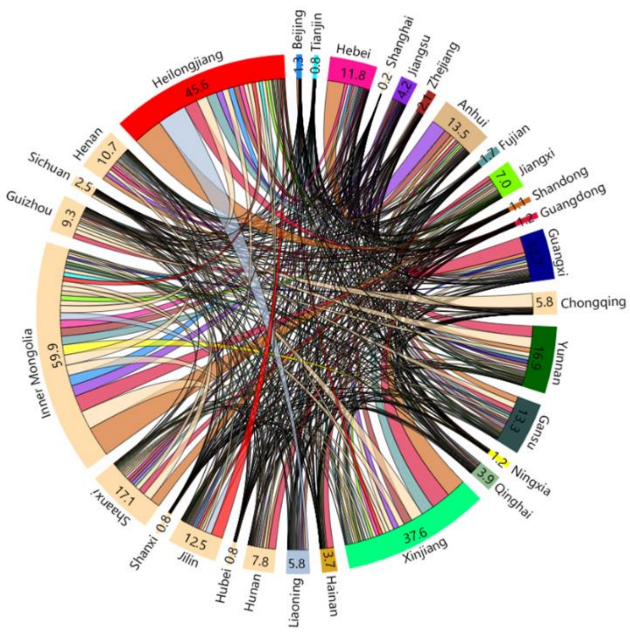
The Figure S1-S2 show the whole picture of virtual agricultural land use (ALU) and agricultural water use (AWU) flows between province in 2002, 2007 and 2012 while we also show the main importers and exporters in Figure 2 of the main body. Figure S3 shows the effects of virtual ALU and AWU flows in China. The distance agricultural products production and consumption made little contribution to the regional GDP while consumed lots of land and water resources. The agricultural products export accounts for less than 12% of the total regional GDP of the main ALU and AWU exporters. The agricultural products exports represented 2.7%, 5.7% and 10.1% of Xinjiang's total GDP in 2002, 2007 and 2012. While the water use accompanied with agricultural products export accounts for 24.6%, 52.3% and 72.1% of the total regional water use and the ALU export represents 24.5%, 53.7% and 66.1% of the total regional agricultural land. Similar, the agricultural products export only accounts for only 1.5% of the total GDP of Inner Mongolia in 2012 while AWU export holds 46.1% of the total regional water use and the ALU export represents 65.0% of the total regional agricultural land. Heilongjiang which is one of the major agricultural production bases of China, the agricultural products exports account for 11.1% of the total GDP. However, the water use export due to the agricultural trade accounts for 67.1% of the total water use and ALU export represents 81.7% of the total regional agricultural land. Unfortunately, the major agricultural water use exporters like Heilongjiang, Inner Mongolia, and Xinjiang face water scarcity problem, the per capita water resources of these regions were less than 1000 cubic meters. In other words, the virtual AWU flows intensified water scarcity of the main resource exporters. The main exporters sacrifice their scarce water resources to satisfy the demand of the main importers and in return for humble GDP.



(a) 2002

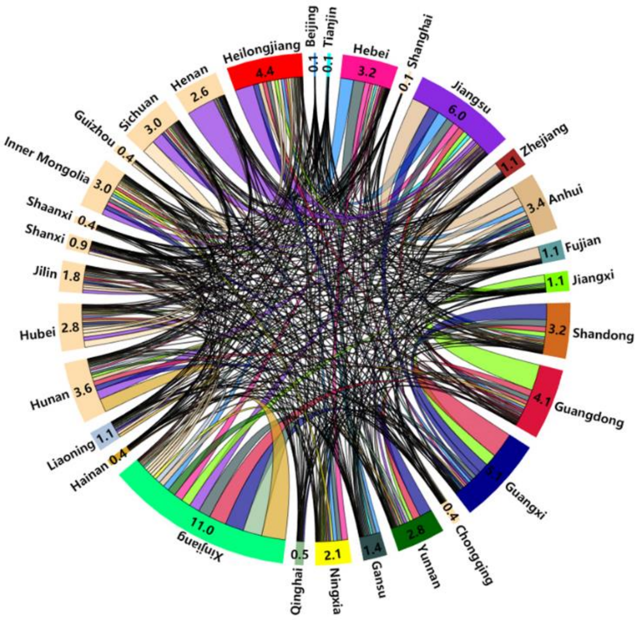


(b) 2007

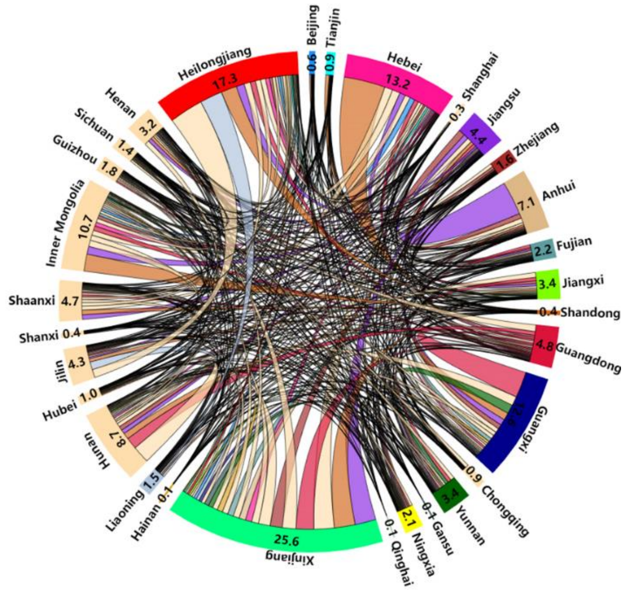


(c) 2012

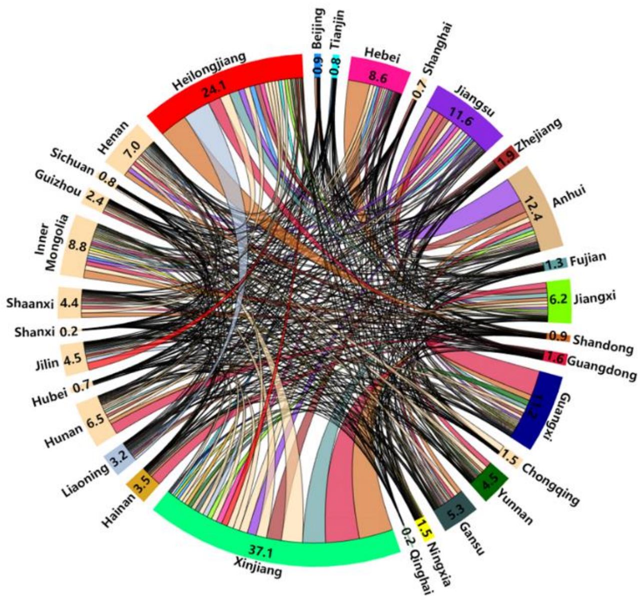
Figure S1 Virtual ALU flows in China in 2002, 2007 and 2012 (Unit: million hectare)



(a) 2002



(b) 2007



(c) 2012

Figure S2. Virtual AWU flows in China in 2002, 2007 and 2012 (Unit: billion cubic meter)

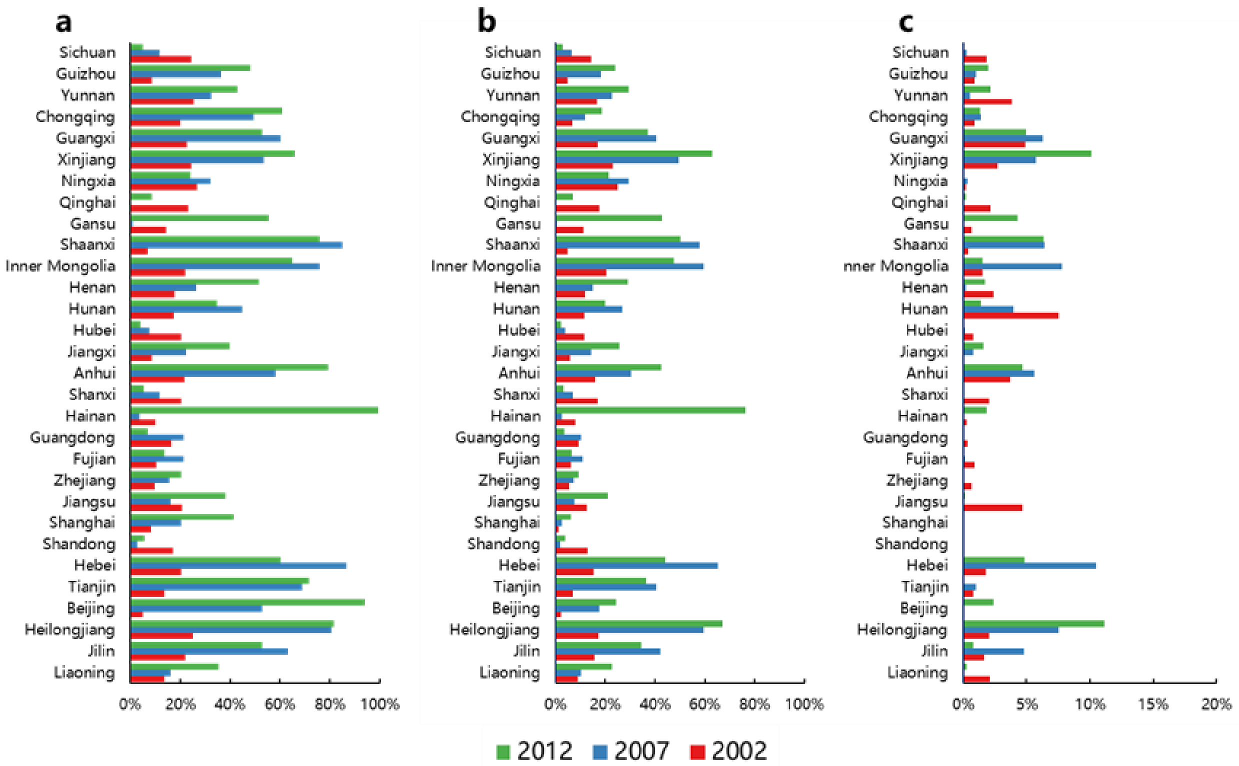


Figure S3. Composition of agricultural products to the total GDP, agricultural land use and total water use (a. ALU export accounts for total agricultural land; b. AWU export account for total water use; c. agricultural products export account for total regional GDP)

4. Driving forces of changes in virtual ALU and AWU and scenario analysis

The variation of resources use efficiency and economic development made the largest contribution to the virtual ALU and AWU of each province from 2002 to 2007 and 2007 to 2012 as Table S4-S7 shows. Based on this, we made a scenario analysis of virtual ALU and AWU flows in the future. According to the National Water Conservation Action Plan of China (NWCAPC), the water use intensity would reach the world advanced level in 2035. We compared the agricultural water use intensity of China with the main countries around the world and found that the intensity of China ranks 50th in 2012. So we set the average intensity of the top 49 countries as the world advanced level, which means the water intensity of China should decrease by 75% compared with the current value in 2012. We first got the projection of national average in 2035 which is the quarter of the national average in 2012. And then we made three assumptions which under the consideration of different water use efficiency between provinces in 2012 and the cost of investment to improve the water use efficiency: First, if the value of the intensity has already got the world advanced level which mean less than or equal to the quarter of national average in 2012, the value would not change in scenarios. This assumption indicated that if the water use efficiency of provinces was smaller than the quarter of the national average which means has already surpassed the world advanced level in 2012, there is no need for more improvement in this case for the possible huge margin cost. Second, if the value of the province was less than the quarter of the national level when reduced by 75%, the value would be set as the quarter of the national average in 2012. For these provinces, there is certain room for the water use efficiency to get improve, while the intensity, if reduced by 75% maybe not economical as they have already got the world advanced level even reduced by less than 75%. Third, except for the situation of first and second assumptions, the value of intensity for the provinces would be reduced by 75% compared with its value of 2012. These provinces got much room to get the water use efficiency improved and would be much easier than the situations in first and second assumptions. As pointed out in the main text, the water use intensity would be reduced in scenarios 2 and 3 under the first, second and third assumption. We calculated the national average water use intensity f_n in 2035 which is the quarter of the value in 2012 ($f_n^{'}$):

$$f_n = \frac{1}{4} \times f_n^{'} \tag{1}$$

for the water use intensity of province r (f_{wr}) in 2035, if the f_{wr} was smaller than f_n, then the f_{wr} would remain unchanged as the value in 2012 ($f_{wr}{'}$) for the scenario 2 and 3:

$$f_{wr} < f_n,\ f_{wr} = f_{wr}{'} \quad (2)$$

if the quarter of $f_{wr}{'}$ was smaller than f_n, the f_{wr} would be set as f_n in scenario 2 and 3:

$$\frac{1}{4} \times f_{wr}{'} < f_n, f_{wr} = f_n \quad (3)$$

if the quarter of $f_{wr}{'}$ was larger than f_n, the f_{wr} would be reduced by 75% compared with the value in 2012 for scenario 2 and 3:

$$\frac{1}{4} \times f_{wr}{'} > f_n,\ f_{wr} = \frac{1}{4} \times f_{wr}{'} \quad (4)$$

Table S4 Driving forces of changes in virtual AWU flows for each province from 2002 to 2007 (unit: billion cubic meter)

Regions	Provinces	△*E*	△*F*	△*S*	△*L*	△*P*	△*R*	△*E*	△*F*	△*S*	△*L*	△*P*	△*R*
		Export						**Import**					
Beijing-Tianjin	Beijing	0.1	0.2	0.2	0.1	0.0	0.5	0.8	5.0	-7.2	-0.9	0.5	-1.8
	Tianjin	0.2	0.1	0.3	0.2	0.0	0.8	0.2	1.6	-2.0	-0.1	0.2	-0.1
North Coast	Hebei	-5.2	6.1	6.0	2.6	0.4	9.9	1.0	4.4	-5.2	0.1	0.3	0.6
	Shandong	0.8	1.9	-1.6	-4.0	0.1	-2.8	-7.0	7.1	12.5	3.7	0.4	16.8
Northeast	Heilongjiang	-15.1	13.9	8.0	6.0	0.2	12.9	-0.8	2.0	-0.3	0.8	0.0	1.7
	Liaoning	0.1	0.8	-1.1	0.5	0.0	0.4	-2.5	3.8	2.2	0.8	0.1	4.3
	Jilin	-0.1	0.7	1.5	0.3	0.1	2.5	-4.2	1.5	2.9	4.7	0.0	5.0
East coast	Shanghai	1.2	0.9	1.2	-3.2	0.1	0.2	-2.0	2.4	5.5	0.9	0.5	7.4
	Jiangsu	-4.3	5.1	-4.9	2.2	0.3	-1.6	-14.2	28.1	-3.9	-4.2	0.4	6.1
	Zhejiang	0.5	0.8	0.2	-1.2	0.1	0.4	-2.8	3.6	2.5	2.3	0.4	6.0
South Coast	Guangdong	0.0	5.1	-1.0	-3.8	0.3	0.6	-3.9	7.5	3.0	-1.2	0.6	6.0
	Fujian	0.3	0.6	0.1	0.0	0.1	1.1	-1.6	1.5	1.6	1.6	0.1	3.2
	Hainan	1.8	-0.8	-0.7	-0.6	0.0	-0.2	0.0	-0.9	-1.5	-0.2	0.2	-2.3
Central	Anhui	-5.7	6.1	0.6	2.5	0.1	3.6	-2.0	5.4	-3.6	-0.9	0.1	-1.0
	Jiangxi	-3.2	1.1	0.6	3.5	0.1	2.2	-0.1	2.5	-4.4	-1.8	0.2	-3.7
	Henan	-36.9	26.0	-4.7	16.1	0.1	0.5	-0.8	5.2	2.0	-2.3	0.0	4.1
	Hubei	-2.1	2.0	-1.8	0.1	0.0	-1.8	-9.8	6.0	11.9	2.7	0.1	10.8
	Hunan	-22.5	15.6	-1.5	13.5	0.0	5.1	-0.6	3.0	1.7	-1.8	0.0	2.3
	Shanxi	0.5	0.1	-0.6	-0.5	0.0	-0.5	-1.5	1.8	1.8	0.5	0.1	2.6
Southwest	Sichuan	-29.7	23.5	-14.3	18.7	0.2	-1.6	-0.4	5.5	6.7	-6.2	0.2	5.9
	Chongqing	0.7	0.1	0.7	-1.0	0.0	0.5	-3.9	0.5	-0.2	4.7	0.0	1.1
	Guizhou	0.0	1.0	0.7	-0.3	0.0	1.3	-5.3	9.1	-5.9	1.6	0.0	-0.5
	Guangxi	-2.2	5.7	0.4	3.5	0.1	7.5	0.4	4.7	-7.8	-2.2	0.2	-4.6
	Yunnan	0.5	2.1	-0.5	-1.6	0.1	0.6	-0.2	1.1	0.9	-0.1	0.1	1.8
Northwest	Inner Mongolia	-6.6	5.3	5.0	3.8	0.3	7.7	0.9	1.4	-0.8	-0.8	0.1	0.8
	Shaanxi	0.0	0.4	3.0	1.0	0.1	4.4	-2.7	1.8	-0.8	2.9	0.1	1.2
	Gansu	13.1	1.8	-1.9	-14.6	0.2	-1.3	1.6	0.3	-4.6	-1.7	0.2	-4.2
	Ningxia	32.0	-3.6	3.4	-32.4	0.7	0.0	-0.8	-2.0	-1.1	3.1	0.1	-0.7
	Qinghai	3.5	-0.1	-0.9	-3.1	0.1	-0.5	1.1	-1.0	-1.4	-0.7	0.1	-1.9
	Xinjiang	17.3	-10.0	8.1	-2.4	1.5	14.6	0.1	-0.5	0.2	0.4	0.1	0.2

Table S5 Driving forces of changes in virtual AWU flows for each province from 2007 to 2012 (unit: billion cubic meter)

Regions	Provinces	$\triangle E$	$\triangle F$	$\triangle S$	$\triangle L$	$\triangle P$	$\triangle R$	$\triangle E$	$\triangle F$	$\triangle S$	$\triangle L$	$\triangle P$	$\triangle R$
		Export						**Import**					
Beijing-Tianjin	Beijing	-3.4	1.2	0.8	1.5	0.2	0.3	-1.7	1.4	-0.2	1.5	0.6	1.6
	Tianjin	-0.8	0.4	-0.2	0.4	0.2	-0.1	-1.2	1.0	0.8	0.5	0.3	1.3
North Coast	Hebei	-2.3	1.8	-3.9	-0.8	0.6	-4.6	-2.9	1.4	2.3	-0.1	0.3	0.9
	Shandong	-0.3	0.3	0.2	0.2	0.0	0.4	-11.7	6.5	0.8	8.1	1.0	4.7
Northeast	Heilongjiang	-5.0	11.3	-0.8	0.7	0.5	6.8	-1.3	1.5	1.1	0.3	0.1	1.7
	Liaoning	-2.3	1.4	1.1	1.4	0.1	1.7	-2.3	4.7	-1.4	1.4	0.1	2.6
	Jilin	0.8	2.0	-0.7	-2.0	0.1	0.2	-1.3	1.9	-3.2	-1.9	0.0	-4.5
East coast	Shanghai	-0.2	0.2	0.2	0.2	0.1	0.4	-4.2	3.3	-2.7	0.6	0.4	-2.5
	Jiangsu	-7.5	5.0	3.5	6.0	0.3	7.3	-6.0	8.4	-6.0	-0.7	0.3	-4.0
	Zhejiang	-0.9	0.7	0.1	0.3	0.1	0.3	-5.3	3.6	2.3	2.2	0.5	3.4
South Coast	Guangdong	-0.5	0.4	-1.1	-2.2	0.2	-3.2	-11.4	7.5	10.2	3.1	0.9	10.2
	Fujian	-0.7	0.9	-0.7	-0.5	0.1	-0.9	-4.3	3.9	6.3	0.3	0.3	6.4
	Hainan	-6.0	2.6	3.6	3.0	0.2	3.3	-1.1	1.4	-1.8	1.1	0.1	-0.3
Central	Anhui	-3.6	5.5	2.2	1.2	0.1	5.4	-2.6	3.2	-1.6	1.2	0.0	0.2
	Jiangxi	-2.2	2.1	1.4	1.3	0.2	2.8	-1.5	1.4	1.1	1.4	0.1	2.4
	Henan	-3.3	2.5	1.9	2.5	0.2	3.8	-2.9	2.6	-0.4	1.7	0.2	1.2
	Hubei	-0.1	0.4	-0.1	-0.5	0.0	-0.3	-3.6	4.1	-6.0	-0.3	0.3	-5.5
	Hunan	-2.0	2.7	-1.6	-1.7	0.4	-2.2	-2.4	1.9	1.7	1.1	0.2	2.5
	Shanxi	-0.2	0.2	0.0	-0.2	0.0	-0.2	-2.0	1.5	0.8	0.8	0.2	1.3
Southwest	Sichuan	0.2	0.5	-0.3	-1.1	0.0	-0.7	-5.9	4.8	3.6	1.9	0.3	4.7
	Chongqing	-0.3	0.6	0.1	0.2	0.0	0.6	-1.2	1.3	0.7	0.4	0.1	1.2
	Guizhou	-1.5	1.2	0.3	0.5	0.0	0.6	-0.9	0.9	0.2	0.2	0.0	0.5
	Guangxi	-3.2	3.9	-1.4	-0.8	0.2	-1.4	-1.1	1.0	0.2	0.1	0.0	0.2
	Yunnan	-2.4	1.4	0.6	1.3	0.1	1.0	-1.6	1.5	0.0	0.3	0.1	0.3
Northwest	Inner Mongolia	-1.7	1.6	-1.8	-0.4	0.4	-1.9	-2.6	1.6	1.0	2.0	0.1	2.1
	Shaanxi	-2.6	2.0	-0.6	0.8	0.1	-0.3	-1.9	1.5	0.6	0.2	0.1	0.5
	Gansu	-9.5	3.2	4.3	7.1	0.1	5.2	-0.9	1.0	-0.2	0.9	0.1	0.8
	Ningxia	-1.4	1.0	-0.4	0.1	0.1	-0.6	-0.6	0.6	0.6	0.3	0.0	0.9
	Qinghai	0.0	0.0	0.0	0.1	0.0	0.2	-0.6	0.3	0.5	0.3	0.0	0.6
	Xinjiang	-24.5	19.0	4.8	10.4	1.8	11.5	-0.5	0.4	0.2	0.2	0.0	0.4

Table S6 Driving forces of changes in virtual ALU flows for each province from 2002 to 2007 (unit: million hectare)

Regions	Provinces	△*E*	△*F*	△*S*	△*L*	△*P*	△*R*	△*E*	△*F*	△*S*	△*L*	△*P*	△*R*
		Export						**Import**					
Beijing-Tianjin	Beijing	0.1	0.2	0.2	0.1	0.0	0.6	2.1	9.6	-13.8	-0.7	1.1	-1.6
	Tianjin	0.1	0.1	0.2	0.1	0.0	0.6	0.8	3.3	-4.1	0.1	0.3	0.6
North Coast	Hebei	-6.1	7.7	7.6	3.2	0.4	12.8	0.3	10.6	-10.8	2.3	0.5	2.9
	Shandong	1.4	2.1	-1.8	-4.5	0.1	-2.8	-18.6	17.7	31.5	8.5	0.8	39.9
Northeast	Heilongjiang	-47.5	37.0	21.1	16.5	0.6	27.7	-2.1	5.1	-0.4	2.3	0.1	4.9
	Liaoning	-0.1	1.3	-1.9	0.9	0.1	0.4	-6.8	9.0	7.0	2.0	0.2	11.4
	Jilin	1.4	2.0	4.4	1.0	0.2	9.0	-12.9	3.8	7.7	12.9	0.1	11.5
East coast	Shanghai	0.4	0.4	0.5	-1.3	0.1	0.1	-5.4	5.9	12.6	0.8	0.9	14.8
	Jiangsu	-1.7	2.1	-2.1	0.9	0.1	-0.6	-26.6	60.2	-11.8	-12.3	0.8	10.3
	Zhejiang	0.7	0.8	0.2	-1.3	0.1	0.6	-5.5	6.4	5.0	4.5	0.6	11.1
South Coast	Guangdong	0.3	3.9	-0.8	-2.9	0.3	0.7	-2.0	15.6	4.9	-9.4	1.1	10.3
	Fujian	0.4	0.7	0.1	0.0	0.1	1.3	-3.8	3.7	4.1	3.0	0.2	7.3
	Hainan	1.8	-0.8	-0.7	-0.6	0.0	-0.2	2.1	-3.0	-1.9	-1.3	0.3	-3.7
Central	Anhui	-5.0	7.3	0.8	3.0	0.1	6.1	-3.0	10.9	-5.6	-2.4	0.2	0.0
	Jiangxi	-4.4	1.4	0.8	4.4	0.2	2.3	1.6	5.1	-8.5	-3.8	0.3	-5.4
	Henan	-3.0	2.8	-2.7	0.2	0.1	-2.6	-16.3	11.6	23.3	2.4	0.1	21.1
	Hubei	-23.6	16.7	-1.6	14.5	0.0	5.9	-0.8	6.9	3.4	-5.1	0.0	4.4
	Hunan	-51.2	36.7	-6.6	22.7	0.1	1.7	-3.1	11.9	3.7	-4.2	0.0	8.3
	Shanxi	2.4	0.6	-2.4	-2.0	0.1	-1.3	-5.2	5.3	6.3	1.9	0.2	8.5
Southwest	Sichuan	-111.6	88.7	-54.0	70.6	0.6	-5.6	-0.6	15.4	17.1	-18.8	0.3	13.5
	Chongqing	3.6	0.7	3.2	-4.9	0.1	2.7	-14.0	1.2	-0.5	16.5	0.1	3.2
	Guizhou	0.0	4.0	2.7	-1.2	-0.1	5.5	-18.3	30.0	-20.4	5.7	0.0	-3.1
	Guangxi	-1.6	5.9	0.4	3.5	0.2	8.3	9.5	8.4	-21.0	-7.0	0.4	-9.8
	Yunnan	2.1	7.2	-1.7	-5.5	0.5	2.5	3.3	2.1	0.6	-3.5	0.3	2.7
Northwest	Inner Mongolia	-52.7	39.6	37.8	28.7	1.9	55.2	-1.0	5.8	-4.2	0.0	0.2	0.8
	Shaanxi	-1.5	1.8	12.9	4.1	0.2	17.5	-7.3	4.8	-2.2	7.0	0.2	2.5
	Gansu	38.9	5.4	-5.6	-43.4	0.7	-3.9	2.5	1.9	-9.4	-2.4	0.3	-7.1
	Ningxia	26.2	-2.9	2.7	-26.3	0.5	0.2	-2.1	-8.9	-2.9	12.1	0.4	-1.4
	Qinghai	76.1	-1.9	-18.7	-66.9	1.2	-10.3	0.9	-1.2	-2.6	-0.7	0.1	-3.5
	Xinjiang	23.4	-14.2	11.7	-3.4	2.1	19.6	2.1	-1.8	-0.3	0.0	0.2	0.1

Table S7 Driving forces of changes in virtual ALU flows for each province from 2007 to 2012(unit: million cubic meter)

Regions	Provinces	△*E*	△*F*	△*S*	△*L*	△*P*	△*R*	△*E*	△*F*	△*S*	△*L*	△*P*	△*R*
		Export						**Import**					
Beijing-Tianjin	Beijing	-3.8	1.4	1.0	1.8	0.2	0.6	-3.8	3.1	-0.7	3.0	1.3	2.9
	Tianjin	-0.6	0.3	-0.2	0.4	0.1	0.0	-2.2	1.7	1.2	0.5	0.6	1.7
North Coast	Hebei	-2.0	2.3	-5.2	-1.0	0.9	-5.0	-6.1	2.1	3.9	-1.5	0.6	-1.0
	Shandong	-0.4	0.3	0.3	0.3	0.1	0.5	-24.4	10.7	-1.7	13.2	1.8	-0.4
Northeast	Heilongjiang	-19.6	24.1	-1.7	1.5	1.1	5.4	-2.8	3.2	1.6	-0.3	0.1	1.9
	Liaoning	-3.6	2.5	1.9	2.4	0.2	3.4	-6.3	10.0	-4.0	1.7	0.3	1.7
	Jilin	0.4	5.9	-2.2	-5.8	0.3	-1.4	-3.6	4.1	-6.7	-4.4	0.1	-10.6
East coast	Shanghai	-0.1	0.1	0.1	0.1	0.0	0.1	-8.1	4.7	-5.8	0.7	0.7	-7.8
	Jiangsu	-3.6	2.0	1.4	2.4	0.1	2.4	-13.2	14.0	-12.3	-1.1	0.6	-12.1
	Zhejiang	-0.8	0.8	0.1	0.3	0.1	0.5	-9.7	5.4	3.3	3.1	0.8	2.8
South Coast	Guangdong	-0.5	0.3	-0.9	-1.7	0.1	-2.6	-20.0	11.2	16.3	5.2	1.4	14.1
	Fujian	-0.7	1.2	-0.9	-0.6	0.1	-0.9	-9.1	6.5	10.9	0.1	0.4	8.9
	Hainan	-5.9	2.6	3.6	3.0	0.2	3.6	-2.3	2.1	-3.4	1.9	0.1	-1.6
Central	Anhui	-7.7	7.0	2.7	1.5	0.1	3.6	-4.2	4.7	-2.8	1.2	0.1	-1.1
	Jiangxi	-2.4	2.4	1.6	1.4	0.2	3.2	-3.1	2.4	1.6	2.8	0.2	3.8
	Henan	-6.1	4.0	3.1	4.1	0.3	5.4	-5.9	4.8	-1.3	2.8	0.3	0.8
	Hubei	-0.3	0.5	-0.1	-0.7	0.0	-0.6	-7.1	7.1	-12.0	0.4	0.5	-11.1
	Hunan	-1.8	3.1	-1.8	-1.9	0.4	-2.0	-4.6	3.3	2.6	1.7	0.3	3.3
	Shanxi	-1.0	0.7	0.0	-0.7	0.1	-0.9	-5.1	3.1	1.7	1.2	0.5	1.4
Southwest	Sichuan	-0.3	2.0	-0.9	-4.1	0.1	-3.2	-15.4	10.3	8.1	5.2	0.6	8.8
	Chongqing	-2.7	2.5	0.4	0.9	0.2	1.3	-3.1	3.0	1.5	0.7	0.2	2.3
	Guizhou	-6.3	4.9	1.3	2.2	0.0	2.1	-1.9	1.8	0.5	0.4	0.0	0.9
	Guangxi	-2.6	4.2	-1.6	-0.9	0.2	-0.6	-2.5	1.9	-0.1	0.1	0.1	-0.5
	Yunnan	-8.1	5.3	2.3	4.6	0.5	4.6	-3.1	2.7	0.1	0.5	0.1	0.3
Northwest	Inner Mongolia	-16.8	10.9	-12.5	-2.7	3.1	-17.9	-5.1	2.5	1.7	3.5	0.2	2.7
	Shaanxi	-11.4	7.9	-2.2	3.1	0.5	-2.0	-4.0	2.5	1.0	0.2	0.2	-0.2
	Gansu	-29.1	9.2	12.2	20.4	0.4	13.1	-1.9	1.8	-0.4	1.9	0.1	1.4
	Ningxia	-1.1	0.8	-0.3	0.1	0.1	-0.5	-1.8	1.6	1.9	0.6	0.1	2.5
	Qinghai	-0.6	0.8	0.7	2.9	0.1	3.9	-1.6	0.7	1.4	0.6	0.0	1.2
	Xinjiang	-44.0	24.0	6.1	13.1	2.3	1.5	-1.1	0.9	0.4	0.5	0.1	0.7

Table S8 Comparison of agricultural water use intensity between different countries.

Country	Agricultural water use (unit: bcm)	Agricultural GDP (unit: billion dollar, constant price of 2010)	Intensity(m^3/$)	Ranking
Algeria	4.9900	13.35	0.3738	42
Antigua and Barbuda	0.0018	0.02	0.0874	26
Argentina	27.9300	27.51	1.0153	61
Australia	9.5870	26.19	0.3661	41
Austria	0.0771	5.18	0.0149	12
Azerbaijan	8.8870	2.81	3.1635	72
Bangladesh	31.5000	19.67	1.6015	64
Belarus	0.4710	4.86	0.0970	28
Belgium	0.0402	3.44	0.0117	10
Bhutan	0.3180	0.27	1.1900	62
Bolivia	1.9200	2.04	0.9407	59
Botswana	0.0743	0.34	0.2192	35
Brazil	44.9000	94.82	0.4735	46
Bulgaria	0.9494	2.40	0.3959	43
Canada	4.7490	24.68	0.1924	32
China	388.0000	589.00	0.6583	50
Colombia	6.3910	18.24	0.3504	40
Costa Rica	1.6730	2.39	0.6992	51
Côte d'Ivoire	0.5953	5.77	0.1033	29
Croatia	0.0086	2.26	0.0038	3
Cuba	3.5690	2.43	1.4669	63
Cyprus	0.1710	0.53	0.3247	39
Czechia	0.0432	4.01	0.0108	8
Denmark	0.1640	3.81	0.0430	16
Dominican Republic	5.7150	3.14	1.8221	65
Egypt	61.5000	27.59	2.2292	68
Estonia	0.0045	0.58	0.0077	6
France	3.1430	41.18	0.0763	25
Germany	0.2109	24.60	0.0086	7
Greece	7.9180	8.60	0.9207	58
Grenada	0.0021	0.03	0.0605	19
Guyana	1.3630	0.46	2.9585	71
Haiti	1.2090	1.50	0.8069	55
Hungary	0.3220	4.54	0.0710	24
Iceland	0.0003	0.85	0.0004	1
India	688.0000	280.00	2.4558	69
Israel	1.0160	3.56	0.2858	38
Japan	54.4300	62.10	0.8765	57
Jordan	0.4620	0.73	0.6345	49
Kazakhstan	13.6900	7.50	1.8261	66

Kenya	1.9070	9.85	0.1936	33
Kyrgyzstan	7.1000	0.91	7.8425	74
Latvia	0.0408	0.87	0.0470	17
Lithuania	0.0793	1.29	0.0615	20
Luxembourg	0.0002	0.15	0.0013	2
Malta	0.0241	0.12	0.2006	34
Mexico	63.3500	34.04	1.8612	67
Mongolia	0.2420	1.06	0.2282	36
Montenegro	0.0017	0.32	0.0052	5
Morocco	9.1560	11.88	0.7707	54
Netherlands	0.0602	13.71	0.0044	4
New Zealand	3.2070	11.57	0.2771	37
Nicaragua	1.1850	1.55	0.7644	53
Nigeria	5.5100	85.56	0.0644	22
Pakistan	172.4000	41.94	4.1104	73
Panama	0.4460	1.10	0.4048	44
Paraguay	1.8970	3.19	0.5948	48
Philippines	67.0700	25.11	2.6710	70
Puerto Rico	0.0641	0.71	0.0909	27
Republic of Moldova	0.0390	0.62	0.0625	21
Romania	1.0930	9.79	0.1116	30
Saint Kitts and Nevis	0.0002	0.01	0.0204	13
Serbia	0.0974	3.32	0.0293	14
Slovakia	0.0307	2.81	0.0109	9
Sweden	0.0980	6.72	0.0146	11
Switzerland	0.1601	4.26	0.0376	15
Trinidad and Tobago	0.0167	0.10	0.1646	31
Tunisia	2.6440	3.57	0.7401	52
Turkey	34.0000	64.74	0.5252	47
Uganda	0.2590	5.13	0.0505	18
Ukraine	4.4540	10.63	0.4191	45
United Kingdom	1.0490	15.15	0.0693	23
United States of America	175.1000	175.00	1.0001	60
Venezuela	16.7100	20.62	0.8102	56

The data of agricultural water use for each country came from FAO and the data was the average of 2008-2012. The data of agricultural GDP derived from the World Bank and the data was the average of 2008-2012.

Table S9 Economic growth rate for each province during 2013-2035 in China

provinces	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Beijing	9.1%	9.4%	7.9%	6.8%	6.7%	6.7%	6.5%	6.3%	6.2%	6.1%	6.0%	5.9%	5.7%	5.6%	5.5%	5.4%	5.2%	5.1%	5.0%	4.8%	4.7%	4.6%	4.5%
Tianjin	11.4%	9.4%	5.2%	9.1%	3.6%	3.5%	3.4%	3.4%	3.3%	3.2%	3.2%	3.1%	3.0%	2.9%	2.9%	2.8%	2.7%	2.6%	2.6%	2.5%	2.4%	2.3%	2.3%
Hebei	6.5%	4.0%	1.3%	6.8%	6.7%	6.6%	6.3%	6.2%	6.1%	6.0%	5.8%	5.7%	5.6%	5.4%	5.3%	5.2%	5.0%	4.9%	4.8%	4.6%	4.5%	4.4%	4.2%
Shandong	9.3%	8.7%	6.0%	7.6%	7.4%	6.5%	5.9%	5.3%	4.8%	4.2%	3.6%	3.0%	2.4%	4.6%	4.3%	4.1%	3.9%	3.7%	3.4%	3.2%	3.0%	2.8%	2.5%
Heilongjiang	5.0%	4.6%	0.3%	6.1%	6.4%	5.0%	4.9%	4.9%	5.0%	4.9%	4.8%	4.8%	4.8%	4.7%	4.7%	4.6%	4.6%	4.6%	4.5%	4.5%	4.5%	4.4%	4.4%
Liaoning	9.0%	5.7%	0.1%	-2.5%	4.2%	5.4%	4.7%	4.5%	4.8%	6.3%	6.7%	6.9%	7.4%	7.5%	7.7%	7.5%	7.3%	6.9%	6.4%	5.7%	4.9%	3.9%	2.8%
Jilin	8.7%	6.3%	1.9%	6.9%	5.3%	4.0%	3.8%	3.7%	3.6%	3.3%	3.1%	2.9%	2.7%	2.5%	2.3%	2.1%	1.9%	1.7%	1.5%	1.3%	1.1%	0.9%	0.7%
Shanghai	7.0%	9.1%	6.6%	6.9%	6.9%	6.5%	6.3%	6.2%	6.0%	5.9%	5.7%	5.5%	5.4%	5.2%	5.1%	4.9%	4.7%	4.6%	4.4%	4.3%	4.1%	4.0%	3.8%
Jiangsu	9.4%	10.0%	7.7%	7.8%	7.2%	6.6%	6.4%	6.3%	6.2%	6.0%	5.9%	5.7%	5.6%	5.4%	5.3%	5.1%	5.0%	4.8%	4.7%	4.5%	4.4%	4.2%	4.1%
Zhejiang	8.4%	6.9%	6.8%	7.6%	7.8%	7.4%	7.2%	7.2%	7.0%	7.0%	6.8%	6.7%	6.6%	6.5%	6.4%	6.3%	6.2%	6.0%	5.9%	5.8%	5.7%	5.6%	5.5%
Guangdong	8.9%	9.1%	7.4%	7.5%	7.5%	6.9%	6.6%	6.3%	6.0%	5.7%	5.3%	5.0%	4.7%	4.4%	4.1%	3.7%	3.4%	3.1%	2.8%	2.5%	2.1%	1.8%	1.5%
Fujian	10.4%	10.6%	8.0%	8.4%	8.1%	8.2%	7.7%	7.2%	6.9%	6.6%	6.4%	6.0%	5.6%	5.3%	5.0%	4.7%	4.3%	4.0%	3.7%	3.4%	3.0%	2.7%	2.4%
Hainan	10.2%	11.3%	5.8%	7.5%	7.0%	5.4%	5.2%	5.1%	4.9%	4.7%	4.5%	4.4%	4.2%	4.0%	3.8%	3.6%	3.5%	3.3%	3.1%	2.9%	2.7%	2.6%	2.4%
Anhui	10.6%	9.5%	5.5%	8.7%	8.5%	8.2%	7.8%	7.5%	7.2%	6.9%	6.6%	6.3%	6.0%	5.7%	5.4%	5.1%	4.8%	4.5%	4.2%	3.9%	3.6%	3.3%	3.0%
Jiangxi	10.7%	9.6%	6.4%	9.0%	8.9%	8.8%	8.5%	8.3%	8.2%	8.0%	7.8%	7.6%	7.4%	7.2%	7.0%	6.9%	6.7%	6.5%	6.3%	6.1%	5.9%	5.7%	5.5%
Henan	8.6%	8.7%	5.9%	8.1%	7.8%	7.4%	7.1%	6.7%	6.4%	6.0%	5.7%	5.4%	5.0%	4.7%	4.3%	4.0%	3.7%	3.3%	3.0%	2.6%	2.3%	2.0%	1.6%
Hubei	10.9%	11.0%	7.9%	8.1%	7.8%	7.9%	7.4%	7.0%	6.6%	6.3%	6.0%	5.7%	5.3%	5.0%	4.6%	4.3%	4.0%	3.6%	3.3%	2.9%	2.6%	2.3%	1.9%
Hunan	10.6%	10.3%	6.9%	8.0%	8.0%	7.8%	7.3%	6.9%	6.6%	6.3%	6.0%	5.6%	5.2%	4.9%	4.6%	4.2%	3.9%	3.5%	3.2%	2.9%	2.5%	2.2%	1.9%
Shanxi	4.0%	1.3%	0.0%	4.5%	7.0%	6.1%	5.5%	5.7%	6.2%	6.5%	6.4%	6.5%	6.7%	6.9%	7.0%	7.1%	7.2%	7.4%	7.5%	7.7%	7.8%	8.0%	8.1%
Sichuan	10.0%	8.7%	5.3%	7.8%	8.1%	8.1%	7.7%	7.6%	7.5%	7.4%	7.3%	7.1%	7.0%	6.9%	6.8%	6.7%	6.6%	6.4%	6.3%	6.2%	6.1%	6.0%	5.8%
Chongqing	10.9%	12.7%	10.2%	10.7%	9.3%	6.3%	6.1%	6.0%	5.8%	5.6%	5.4%	5.2%	5.0%	4.8%	4.6%	4.4%	4.2%	4.0%	3.8%	3.7%	3.5%	3.3%	3.1%
Guizhou	16.8%	15.7%	13.3%	10.5%	10.2%	9.0%	8.7%	8.5%	8.2%	8.0%	7.7%	7.5%	7.2%	6.9%	6.7%	6.4%	6.2%	5.9%	5.6%	5.4%	5.1%	4.9%	4.6%
Guangxi	10.3%	9.0%	7.2%	7.3%	7.3%	7.0%	6.4%	5.9%	5.5%	5.1%	4.7%	4.2%	3.8%	5.2%	4.9%	4.7%	4.5%	4.3%	4.1%	3.8%	3.6%	3.4%	3.2%
Yunnan	13.7%	9.3%	6.3%	8.7%	9.5%	9.1%	8.5%	8.6%	8.6%	8.5%	8.3%	8.2%	8.1%	8.0%	7.9%	7.8%	7.7%	7.6%	7.5%	7.4%	7.3%	7.2%	7.1%
Inner Mongolia	6.0%	5.6%	0.3%	7.2%	4.0%	4.9%	4.7%	4.6%	4.6%	4.7%	4.9%	4.9%	4.9%	5.0%	5.0%	5.1%	5.1%	5.2%	5.2%	5.3%	5.3%	5.4%	5.4%
Shaanxi	11.0%	10.3%	1.9%	7.6%	8.0%	8.4%	8.3%	8.3%	8.3%	8.5%	8.6%	8.6%	8.7%	8.4%	8.0%	7.5%	6.8%	6.1%	5.2%	4.3%	3.4%	2.4%	1.3%

Gansu	10.9%	9.1%	-0.7%	7.6%	3.6%	6.3%	6.4%	6.5%	6.8%	7.3%	8.0%	8.4%	8.8%	8.7%	8.7%	8.5%	8.2%	7.7%	7.4%	6.9%	6.5%	5.9%	5.4%
Ningxia	9.6%	7.3%	5.8%	8.1%	7.8%	7.0%	6.7%	6.5%	6.2%	5.8%	5.4%	5.1%	4.7%	4.4%	4.0%	3.6%	3.3%	3.0%	2.6%	2.2%	1.9%	1.5%	1.2%
Qinghai	11.0%	9.6%	4.9%	8.0%	7.3%	6.8%	6.5%	6.1%	5.7%	5.2%	4.8%	4.4%	4.0%	5.0%	4.8%	4.6%	4.4%	4.1%	3.9%	3.7%	3.4%	3.2%	3.0%
Xinjiang	11.4%	10.9%	0.6%	7.6%	7.6%	7.6%	7.4%	7.3%	7.2%	7.2%	7.1%	7.0%	6.9%	6.8%	6.7%	6.6%	6.5%	6.4%	6.3%	6.2%	6.1%	6.0%	5.9%

The economic growth rate for each province during 2013-2015 was calculated by the GDP data which came from China Statistical Yearbook and the rate during 2016-2035 was directly derived from the report conducted by the State Information Center.

Table S10. Scenarios analysis of virtual ALU and AWU flows in China based on the results of SDA.

Regions	Provinces	Resources							
		Water						Land	
		Scenario 1		Scenario 2		Scenario 3		Scenario 1	
		Resources intensity changes	Per capita final demand changes	Resources intensity changes	Per capita final demand changes	Resources intensity changes	Per capita final demand changes	Resources intensity changes	Per capita final demand changes
Beijing-Tianjin	Beijing	0.0%	286.9%	0.0%	0.0%	0.0%	286.9%	0.0%	286.9%
	Tianjin	0.0%	142.0%	-42.4%	0.0%	-42.4%	142.0%	0.0%	142.0%
North Coast	Hebei	0.0%	227.2%	-51.1%	0.0%	-51.1%	227.2%	0.0%	227.2%
	Shandong	0.0%	191.7%	-69.9%	0.0%	-69.9%	191.7%	0.0%	191.7%
Northeast	Heilongjiang	0.0%	184.4%	-75.0%	0.0%	-75.0%	184.4%	0.0%	184.4%
	Liaoning	0.0%	231.1%	-48.3%	0.0%	-48.3%	231.1%	0.0%	231.1%
	Jilin	0.0%	102.6%	-63.0%	0.0%	-63.0%	102.6%	0.0%	102.6%
East Coast	Shanghai	0.0%	250.7%	-75.0%	0.0%	-75.0%	250.7%	0.0%	250.7%
	Jiangsu	0.0%	282.2%	-79.3%	0.0%	-79.3%	282.2%	0.0%	282.2%
	Zhejiang	0.0%	340.2%	-75.0%	0.0%	-75.0%	340.2%	0.0%	340.2%
South Coast	Guangdong	0.0%	209.5%	-75.0%	0.0%	-75.0%	209.5%	0.0%	209.5%
	Fujian	0.0%	282.2%	-79.4%	0.0%	-79.4%	282.2%	0.0%	282.2%
	Hainan	0.0%	196.5%	-43.2%	0.0%	-43.2%	196.5%	0.0%	196.5%
Central	Anhui	0.0%	298.3%	-64.3%	0.0%	-64.3%	298.3%	0.0%	298.3%

	Jiangxi	0.0%	429.4%	-75.0%	0.0%	-75.0%	429.4%	0.0%	429.4%
	Henan	0.0%	220.8%	-39.9%	0.0%	-39.9%	220.8%	0.0%	220.8%
	Hubei	0.0%	259.7%	-75.0%	0.0%	-75.0%	259.7%	0.0%	259.7%
	Hunan	0.0%	249.5%	-70.4%	0.0%	-70.4%	249.5%	0.0%	249.5%
	Shanxi	0.0%	291.1%	-75.0%	0.0%	-75.0%	291.1%	0.0%	291.1%
Southwest	Sichuan	0.0%	383.9%	-71.9%	0.0%	-71.9%	383.9%	0.0%	383.9%
	Chongqing	0.0%	280.5%	0.0%	0.0%	0.0%	280.5%	0.0%	280.5%
	Guizhou	0.0%	509.0%	-69.7%	0.0%	-69.7%	509.0%	0.0%	509.0%
	Guangxi	0.0%	238.0%	-75.0%	0.0%	-75.0%	238.0%	0.0%	238.0%
	Yunnan	0.0%	523.0%	0.0%	0.0%	0.0%	523.0%	0.0%	523.0%
Northwest	Inner Mongolia	0.0%	201.4%	-75.0%	0.0%	-75.0%	201.4%	0.0%	201.4%
	Shaanxi	0.0%	364.9%	-44.0%	0.0%	-44.0%	364.9%	0.0%	364.9%
	Gansu	0.0%	379.5%	-75.0%	0.0%	-75.0%	379.5%	0.0%	379.5%
	Ningxia	0.0%	201.3%	-75.0%	0.0%	-75.0%	201.3%	0.0%	201.3%
	Qinghai	0.0%	234.7%	-75.0%	0.0%	-75.0%	234.7%	0.0%	234.7%
	Xinjiang	0.0%	364.2%	-75.0%	0.0%	-75.0%	364.2%	0.0%	364.2%

Changes mean compared with the data of 2012.

Table S11 Virtual AWU flows of each province in scenario 1 (unit: billion cubic meter)

	Beijing	Tianjin	Hebei	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Jiangxi	Shandong	Guangdong	Guangxi	Chongqing	Yunnan	Gansu	Ningxia	Qinghai	Xinjiang	Hainan	Liaoning	Hunan	Hubei	Jilin	Shanxi	Shaanxi	Inner Mongolia	Guizhou	Sichuan	Henan	Heilongjiang
Beijing	0.00	0.18	0.25	0.04	0.04	0.05	0.02	0.04	0.02	0.99	0.10	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.03	0.02	0.00	0.04	0.01	0.03	0.01	0.05	0.05	0.04
Tianjin	0.17	0.00	0.06	0.03	0.06	0.04	0.02	0.03	0.02	0.16	0.05	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.04	0.02	0.03	0.01	0.05	0.01	0.02	0.01	0.03	0.04	0.02
Hebei	0.49	0.29	0.00	0.20	0.29	0.29	0.14	0.41	0.17	8.01	0.88	0.06	0.09	0.09	0.06	0.04	0.02	0.05	0.05	0.35	0.29	0.32	0.06	0.65	0.18	0.23	0.06	0.48	0.91	0.21
Shanghai	0.01	0.00	0.01	0.00	0.16	0.67	0.03	0.03	0.02	0.06	0.04	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.02	0.00
Jiangsu	0.17	0.42	0.65	1.57	0.00	1.39	1.56	0.31	0.26	1.52	1.09	0.33	0.20	0.27	0.15	0.03	0.03	0.20	0.11	0.60	0.63	0.27	0.16	0.15	0.49	0.44	0.10	0.27	0.76	0.24
Zhejiang	0.06	0.02	0.04	0.69	0.22	0.00	0.11	0.10	0.11	0.11	0.20	0.04	0.03	0.05	0.02	0.01	0.01	0.02	0.01	0.04	0.06	0.12	0.01	0.03	0.04	0.03	0.03	0.10	0.08	0.02
Anhui	0.14	0.17	0.31	2.07	6.89	4.66	0.00	1.80	1.45	2.30	1.95	0.11	0.11	0.15	0.07	0.03	0.02	0.08	0.12	0.19	0.52	0.27	0.04	0.17	0.18	0.20	0.11	0.45	0.65	0.21
Fujian	0.03	0.01	0.02	0.03	0.05	0.08	0.03	0.00	0.08	0.03	0.14	0.04	0.02	0.08	0.02	0.01	0.01	0.02	0.01	0.03	0.05	0.20	0.01	0.04	0.03	0.03	0.04	0.18	0.03	0.02
Jiangxi	0.09	0.06	0.18	0.68	0.52	1.87	0.60	2.39	0.00	1.31	2.59	0.07	0.10	0.11	0.05	0.02	0.01	0.04	0.10	0.09	1.17	0.53	0.02	0.10	0.09	0.13	0.09	0.43	0.23	0.14
Shandong	0.07	0.04	0.06	0.05	0.12	0.06	0.03	0.03	0.02	0.00	0.07	0.01	0.01	0.02	0.01	0.01	0.00	0.01	0.00	0.04	0.03	0.05	0.01	0.06	0.02	0.02	0.01	0.03	0.06	0.02
Guangdong	0.05	0.02	0.04	0.04	0.07	0.09	0.04	0.09	0.08	0.07	0.00	0.12	0.05	0.11	0.03	0.02	0.01	0.03	0.04	0.04	0.20	0.12	0.01	0.04	0.05	0.03	0.05	0.12	0.08	0.02
Guangxi	0.13	0.08	0.30	0.43	0.42	0.94	0.26	1.47	0.41	1.68	9.28	0.00	0.23	1.66	0.08	0.05	0.02	0.07	0.39	0.17	1.16	0.27	0.02	0.21	0.12	0.26	0.43	0.89	0.31	0.26
Chongqing	0.01	0.01	0.02	0.03	0.02	0.05	0.01	0.04	0.02	0.07	0.15	0.02	0.00	0.05	0.02	0.00	0.00	0.01	0.01	0.01	0.05	0.01	0.00	0.01	0.04	0.02	0.08	2.08	0.02	0.02
Yunnan	0.05	0.04	0.14	0.30	0.15	0.57	0.12	0.92	0.18	0.88	2.87	0.45	0.36	0.00	0.05	0.02	0.01	0.04	0.21	0.08	0.37	0.09	0.01	0.09	0.07	0.15	0.81	2.18	0.11	0.17
Gansu	0.09	0.07	0.35	0.62	0.32	0.63	0.17	1.03	0.24	1.96	1.92	0.06	0.32	0.16	0.00	0.25	0.49	0.12	0.15	0.14	0.36	0.10	0.02	0.22	0.57	0.60	0.11	2.22	0.34	0.27
Ningxia	0.05	0.02	0.04	0.04	0.08	0.07	0.03	0.07	0.03	0.13	0.16	0.02	0.03	0.03	0.15	0.00	0.02	0.04	0.01	0.04	0.04	0.07	0.01	0.08	0.06	0.25	0.02	0.15	0.05	0.03
Qinghai	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.04	0.03	0.00	0.01	0.00	0.08	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.02	0.00	0.03	0.01	0.01
Xinjiang	0.55	0.53	2.16	4.47	2.36	6.34	1.42	13.40	2.13	15.61	18.93	0.55	1.63	1.75	1.98	0.69	0.27	0.00	2.11	1.23	2.86	0.60	0.10	1.57	1.57	3.42	1.02	11.31	1.86	2.71
Hainan	0.03	0.02	0.10	0.11	0.11	0.27	0.07	0.47	0.15	0.61	4.26	0.04	0.05	0.10	0.02	0.01	0.00	0.01	0.00	0.06	0.24	0.04	0.01	0.05	0.04	0.09	0.06	0.29	0.09	0.09
Liaoning	0.23	0.14	0.16	0.12	0.17	0.12	0.07	0.17	0.07	0.54	0.29	0.05	0.05	0.05	0.04	0.03	0.01	0.03	0.02	0.00	0.11	0.11	0.18	0.13	0.05	0.11	0.04	0.17	0.14	0.66
Hunan	0.10	0.05	0.26	0.27	0.33	0.77	0.21	0.69	0.78	1.08	3.48	0.15	0.14	0.16	0.05	0.02	0.01	0.05	0.12	0.10	0.00	0.63	0.02	0.10	0.12	0.12	0.17	0.44	0.38	0.12
Hubei	0.01	0.01	0.03	0.02	0.05	0.06	0.04	0.03	0.12	0.08	0.10	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.12	0.00	0.00	0.01	0.02	0.01	0.01	0.03	0.07	0.01

Jilin	0.20	0.09	0.10	0.10	0.17	0.11	0.07	0.23	0.08	0.39	0.30	0.05	0.05	0.06	0.04	0.04	0.02	0.04	0.02	0.78	0.09	0.10	0.00	0.24	0.04	0.11	0.04	0.29	0.11	1.54
Shanxi	0.01	0.00	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00
Shaanxi	0.07	0.06	0.48	0.59	0.36	0.51	0.18	0.78	0.20	2.20	1.53	0.04	0.37	0.10	0.27	0.05	0.03	0.04	0.11	0.09	0.37	0.10	0.01	0.28	0.00	0.16	0.07	2.14	0.68	0.12
Inner Mongolia	0.44	0.21	0.45	0.30	0.50	0.47	0.24	0.60	0.28	2.24	1.00	0.13	0.19	0.17	0.19	0.50	0.05	0.13	0.08	0.33	0.26	0.45	0.10	0.90	0.22	0.00	0.10	0.60	0.34	0.27
Guizhou	0.03	0.02	0.07	0.17	0.08	0.30	0.06	0.53	0.11	0.44	1.18	0.09	0.45	0.60	0.03	0.01	0.01	0.02	0.08	0.04	0.33	0.07	0.01	0.05	0.04	0.06	0.00	0.73	0.07	0.07
Sichuan	0.01	0.01	0.02	0.02	0.03	0.03	0.01	0.03	0.02	0.04	0.08	0.02	0.30	0.08	0.02	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.00	0.02	0.04	0.02	0.04	0.00	0.02	0.02
Henan	0.26	0.12	0.99	0.54	0.85	0.47	0.30	0.40	0.24	1.73	1.00	0.09	0.12	0.09	0.09	0.03	0.03	0.07	0.05	0.21	0.46	0.67	0.04	0.28	0.34	0.14	0.07	0.43	0.00	0.13
Heilongjiang	0.86	0.67	1.23	1.06	1.15	1.39	0.65	3.11	0.88	9.33	4.08	0.25	0.38	0.48	0.22	0.20	0.08	0.15	0.42	7.26	0.90	0.51	0.19	1.15	0.27	0.76	0.33	2.79	0.81	0.00

The rows show the virtual AWU export to other provinces and columns show the virtual AWU import of other provinces.

Table S12 Virtual AWU flows of each province in scenario 2 (unit: billion cubic meter)

	Beijing	Tianjin	Hebei	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Jiangxi	Shandong	Guangdong	Guangxi	Chongqing	Yunnan	Gansu	Ningxia	Qinghai	Xinjiang	Hainan	Liaoning	Hunan	Hubei	Jilin	Shanxi	Shaanxi	Inner Mongolia	Guizhou	Sichuan	Henan	Heilongjiang
Beijing	0.00	0.09	0.10	0.02	0.03	0.02	0.01	0.02	0.01	0.34	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.02	0.01	0.02	0.00	0.02	0.03	0.02
Tianjin	0.10	0.00	0.03	0.01	0.03	0.02	0.01	0.01	0.01	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.02	0.01	0.03	0.01	0.01	0.00	0.02	0.02	0.01
Hebei	0.22	0.11	0.00	0.06	0.12	0.09	0.05	0.10	0.05	1.70	0.22	0.03	0.03	0.03	0.02	0.01	0.01	0.02	0.01	0.15	0.09	0.15	0.03	0.24	0.07	0.08	0.02	0.16	0.30	0.06
Shanghai	0.00	0.00	0.00	0.00	0.03	0.09	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jiangsu	0.03	0.09	0.13	0.16	0.00	0.19	0.24	0.04	0.04	0.21	0.20	0.07	0.04	0.05	0.03	0.00	0.01	0.04	0.02	0.12	0.12	0.05	0.03	0.03	0.10	0.09	0.02	0.05	0.15	0.05
Zhejiang	0.01	0.00	0.01	0.08	0.05	0.00	0.02	0.02	0.02	0.02	0.04	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.03	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.01
Anhui	0.05	0.05	0.07	0.29	1.39	0.68	0.00	0.22	0.21	0.33	0.28	0.03	0.03	0.03	0.02	0.01	0.01	0.02	0.02	0.06	0.10	0.09	0.01	0.05	0.05	0.05	0.02	0.08	0.16	0.04
Fujian	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.03	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.01	0.00	0.01	0.04	0.01	0.00
Jiangxi	0.02	0.01	0.02	0.06	0.10	0.19	0.08	0.18	0.00	0.13	0.23	0.01	0.02	0.02	0.01	0.00	0.00	0.01	0.01	0.02	0.12	0.12	0.00	0.02	0.02	0.02	0.01	0.05	0.04	0.02
Shandong	0.02	0.01	0.01	0.01	0.03	0.02	0.01	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.02	0.01	0.01	0.00	0.01	0.02	0.00
Guangdong	0.01	0.00	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.01	0.00	0.03	0.01	0.02	0.01	0.00	0.00	0.01	0.01	0.01	0.04	0.03	0.00	0.01	0.01	0.01	0.01	0.03	0.02	0.00
Guangxi	0.03	0.02	0.04	0.06	0.09	0.13	0.04	0.17	0.05	0.22	0.99	0.00	0.04	0.21	0.01	0.01	0.00	0.01	0.04	0.03	0.15	0.06	0.01	0.04	0.02	0.04	0.06	0.13	0.06	0.03
Chongqing	0.01	0.01	0.01	0.02	0.02	0.03	0.01	0.02	0.01	0.04	0.07	0.02	0.00	0.03	0.01	0.00	0.00	0.01	0.01	0.01	0.03	0.01	0.00	0.01	0.03	0.02	0.04	1.02	0.02	0.01
Yunnan	0.05	0.03	0.07	0.10	0.12	0.23	0.07	0.28	0.08	0.34	0.82	0.27	0.16	0.00	0.03	0.02	0.01	0.03	0.06	0.06	0.15	0.08	0.01	0.06	0.05	0.08	0.31	0.80	0.08	0.06
Gansu	0.02	0.01	0.04	0.05	0.05	0.06	0.02	0.07	0.02	0.17	0.14	0.01	0.03	0.02	0.00	0.03	0.06	0.02	0.01	0.02	0.03	0.02	0.00	0.03	0.06	0.07	0.01	0.17	0.05	0.03
Ningxia	0.01	0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.03	0.00	0.01	0.01	0.03	0.00	0.01	0.01	0.00	0.01	0.01	0.02	0.00	0.02	0.01	0.05	0.00	0.03	0.01	0.01
Qinghai	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Xinjiang	0.13	0.08	0.23	0.33	0.36	0.59	0.17	0.89	0.19	1.34	1.33	0.08	0.15	0.15	0.18	0.09	0.04	0.00	0.15	0.19	0.25	0.14	0.03	0.21	0.18	0.41	0.08	0.84	0.25	0.24
Hainan	0.02	0.01	0.03	0.03	0.05	0.09	0.02	0.11	0.04	0.19	0.95	0.02	0.02	0.02	0.01	0.01	0.00	0.01	0.00	0.02	0.06	0.02	0.00	0.02	0.01	0.03	0.01	0.08	0.04	0.03
Liaoning	0.12	0.07	0.06	0.05	0.08	0.05	0.03	0.07	0.03	0.17	0.11	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.01	0.00	0.05	0.06	0.09	0.06	0.02	0.05	0.01	0.07	0.06	0.21
Hunan	0.03	0.01	0.05	0.05	0.08	0.13	0.04	0.10	0.12	0.19	0.50	0.04	0.03	0.03	0.01	0.01	0.00	0.01	0.02	0.03	0.00	0.16	0.01	0.02	0.03	0.02	0.03	0.08	0.09	0.02
Hubei	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00

Jilin	0.07	0.03	0.03	0.03	0.06	0.03	0.02	0.07	0.02	0.09	0.09	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.24	0.03	0.04	0.00	0.09	0.02	0.04	0.01	0.09	0.04	0.43
Shanxi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shaanxi	0.04	0.02	0.10	0.10	0.12	0.11	0.05	0.12	0.04	0.41	0.25	0.01	0.07	0.02	0.06	0.01	0.01	0.02	0.02	0.03	0.07	0.05	0.01	0.08	0.00	0.05	0.02	0.36	0.19	0.03
Inner Mongolia	0.11	0.04	0.08	0.05	0.11	0.09	0.05	0.09	0.05	0.31	0.17	0.03	0.04	0.03	0.04	0.10	0.01	0.03	0.01	0.07	0.05	0.11	0.02	0.19	0.05	0.00	0.02	0.11	0.07	0.05
Guizhou	0.01	0.00	0.01	0.02	0.02	0.04	0.01	0.05	0.02	0.05	0.11	0.02	0.06	0.08	0.00	0.00	0.00	0.00	0.01	0.01	0.04	0.02	0.00	0.01	0.01	0.01	0.00	0.10	0.02	0.01
Sichuan	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.02	0.00	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00
Henan	0.15	0.06	0.35	0.19	0.43	0.18	0.13	0.13	0.09	0.50	0.35	0.05	0.06	0.04	0.04	0.02	0.01	0.04	0.02	0.11	0.19	0.38	0.02	0.14	0.17	0.07	0.03	0.18	0.00	0.05
Heilongjiang	0.21	0.12	0.17	0.15	0.23	0.21	0.11	0.38	0.12	1.09	0.50	0.05	0.06	0.07	0.04	0.04	0.02	0.03	0.05	1.08	0.13	0.12	0.05	0.22	0.05	0.13	0.05	0.39	0.15	0.00

The rows show the virtual AWU export to other provinces and columns show the virtual AWU import of other provinces.

Table S13 Virtual AWU flows of each province in scenario 3 (unit: billion cubic meter)

	Beijing	Tianjin	Hebei	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Jiangxi	Shandong	Guangdong	Guangxi	Chongqing	Yunnan	Gansu	Ningxia	Qinghai	Xinjiang	Hainan	Liaoning	Hunan	Hubei	Jilin	Shanxi	Shaanxi	Inner Mongolia	Guizhou	Sichuan	Henan	Heilongjiang
Beijing	0.00	0.18	0.25	0.04	0.04	0.05	0.02	0.04	0.02	0.99	0.10	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.03	0.02	0.00	0.04	0.01	0.03	0.01	0.05	0.05	0.04
Tianjin	0.10	0.00	0.03	0.02	0.04	0.02	0.01	0.02	0.01	0.09	0.03	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.02	0.01	0.03	0.01	0.01	0.00	0.02	0.02	0.01
Hebei	0.24	0.14	0.00	0.10	0.14	0.14	0.07	0.20	0.08	3.92	0.43	0.03	0.04	0.04	0.03	0.02	0.01	0.02	0.03	0.17	0.14	0.16	0.03	0.32	0.09	0.11	0.03	0.24	0.44	0.10
Shanghai	0.00	0.00	0.00	0.00	0.04	0.17	0.01	0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Jiangsu	0.03	0.09	0.14	0.32	0.00	0.29	0.32	0.06	0.05	0.31	0.23	0.07	0.04	0.06	0.03	0.01	0.01	0.04	0.02	0.12	0.13	0.06	0.03	0.03	0.10	0.09	0.02	0.06	0.16	0.05
Zhejiang	0.02	0.00	0.01	0.17	0.06	0.00	0.03	0.03	0.03	0.03	0.05	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.03	0.00	0.01	0.01	0.01	0.01	0.03	0.02	0.01
Anhui	0.05	0.06	0.11	0.74	2.46	1.66	0.00	0.64	0.52	0.82	0.70	0.04	0.04	0.05	0.03	0.01	0.01	0.03	0.04	0.07	0.19	0.10	0.01	0.06	0.07	0.07	0.04	0.16	0.23	0.07
Fujian	0.01	0.00	0.00	0.01	0.01	0.02	0.01	0.00	0.02	0.01	0.03	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.01	0.01	0.01	0.04	0.01	0.01
Jiangxi	0.02	0.01	0.04	0.17	0.13	0.47	0.15	0.60	0.00	0.33	0.65	0.02	0.02	0.03	0.01	0.01	0.00	0.01	0.03	0.02	0.29	0.13	0.00	0.03	0.02	0.03	0.02	0.11	0.06	0.03
Shandong	0.02	0.01	0.02	0.01	0.04	0.02	0.01	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.02	0.01	0.01	0.00	0.01	0.02	0.01
Guangdong	0.01	0.00	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.00	0.03	0.01	0.03	0.01	0.00	0.00	0.01	0.01	0.01	0.05	0.03	0.00	0.01	0.01	0.01	0.01	0.03	0.02	0.01
Guangxi	0.03	0.02	0.07	0.11	0.11	0.23	0.06	0.37	0.10	0.42	2.32	0.00	0.06	0.42	0.02	0.01	0.01	0.02	0.10	0.04	0.29	0.07	0.01	0.05	0.03	0.06	0.11	0.22	0.08	0.07
Chongqing	0.01	0.01	0.02	0.03	0.02	0.05	0.01	0.04	0.02	0.07	0.15	0.02	0.00	0.05	0.02	0.00	0.00	0.01	0.01	0.01	0.05	0.01	0.00	0.01	0.04	0.02	0.08	2.08	0.02	0.02
Yunnan	0.05	0.04	0.14	0.30	0.15	0.57	0.12	0.92	0.18	0.88	2.87	0.45	0.36	0.00	0.05	0.02	0.01	0.04	0.21	0.08	0.37	0.09	0.01	0.09	0.07	0.15	0.81	2.18	0.11	0.17
Gansu	0.02	0.02	0.09	0.15	0.08	0.16	0.04	0.26	0.06	0.49	0.48	0.01	0.08	0.04	0.00	0.06	0.12	0.03	0.04	0.04	0.09	0.02	0.00	0.06	0.14	0.15	0.03	0.55	0.08	0.07
Ningxia	0.01	0.00	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.03	0.04	0.01	0.01	0.01	0.04	0.00	0.01	0.01	0.00	0.01	0.01	0.02	0.00	0.02	0.02	0.06	0.00	0.04	0.01	0.01
Qinghai	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00
Xinjiang	0.14	0.13	0.54	1.12	0.59	1.59	0.35	3.35	0.53	3.90	4.73	0.14	0.41	0.44	0.49	0.17	0.07	0.00	0.53	0.31	0.71	0.15	0.03	0.39	0.39	0.85	0.25	2.83	0.46	0.68
Hainan	0.02	0.01	0.05	0.06	0.06	0.16	0.04	0.27	0.08	0.35	2.42	0.02	0.03	0.06	0.01	0.01	0.00	0.01	0.00	0.03	0.13	0.02	0.00	0.03	0.02	0.05	0.03	0.17	0.05	0.05
Liaoning	0.12	0.07	0.08	0.06	0.09	0.06	0.04	0.09	0.03	0.28	0.15	0.03	0.03	0.03	0.02	0.02	0.01	0.02	0.01	0.00	0.06	0.06	0.09	0.07	0.03	0.06	0.02	0.09	0.07	0.34
Hunan	0.03	0.02	0.08	0.08	0.10	0.23	0.06	0.21	0.23	0.32	1.03	0.05	0.04	0.05	0.02	0.01	0.00	0.01	0.04	0.03	0.00	0.19	0.01	0.03	0.03	0.04	0.05	0.13	0.11	0.04
Hubei	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.01	0.03	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00

Jilin	0.07	0.03	0.04	0.04	0.06	0.04	0.03	0.08	0.03	0.15	0.11	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.29	0.03	0.04	0.00	0.09	0.02	0.04	0.02	0.11	0.04	0.57
Shanxi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shaanxi	0.04	0.03	0.27	0.33	0.20	0.29	0.10	0.43	0.11	1.23	0.86	0.02	0.21	0.06	0.15	0.03	0.02	0.02	0.06	0.05	0.21	0.06	0.01	0.16	0.00	0.09	0.04	1.20	0.38	0.07
Inner Mongolia	0.11	0.05	0.11	0.08	0.13	0.12	0.06	0.15	0.07	0.56	0.25	0.03	0.05	0.04	0.05	0.13	0.01	0.03	0.02	0.08	0.06	0.11	0.02	0.23	0.05	0.00	0.03	0.15	0.08	0.07
Guizhou	0.01	0.01	0.02	0.05	0.02	0.09	0.02	0.16	0.03	0.13	0.36	0.03	0.14	0.18	0.01	0.00	0.00	0.01	0.02	0.01	0.10	0.02	0.00	0.01	0.01	0.02	0.00	0.22	0.02	0.02
Sichuan	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.02	0.01	0.08	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.00
Henan	0.15	0.07	0.60	0.33	0.51	0.28	0.18	0.24	0.14	1.04	0.60	0.05	0.07	0.06	0.06	0.02	0.02	0.04	0.03	0.12	0.28	0.40	0.02	0.17	0.20	0.08	0.04	0.26	0.00	0.08
Heilongjiang	0.22	0.17	0.31	0.26	0.29	0.35	0.16	0.78	0.22	2.33	1.02	0.06	0.10	0.12	0.06	0.05	0.02	0.04	0.11	1.82	0.22	0.13	0.05	0.29	0.07	0.19	0.08	0.70	0.20	0.00

The rows show the virtual AWU export to other provinces and columns show the virtual AWU import of other provinces.

Table S14 Virtual ALU of each province in scenario 1 (unit: million hectare)

	Beijing	Tianjin	Hebei	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Jiangxi	Shandong	Guangdong	Guangxi	Chongqing	Yunnan	Gansu	Ningxia	Qinghai	Xinjiang	Hainan	Liaoning	Hunan	Hubei	Jilin	Shanxi	Shaanxi	Inner Mongolia	Guizhou	Sichuan	Henan	Heilongjiang
Beijing	0.00	0.27	0.37	0.06	0.05	0.07	0.03	0.06	0.03	1.46	0.14	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.06	0.04	0.02	0.01	0.05	0.02	0.04	0.01	0.07	0.07	0.06
Tianjin	0.16	0.00	0.05	0.03	0.06	0.03	0.02	0.03	0.02	0.16	0.05	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.03	0.02	0.03	0.01	0.05	0.01	0.02	0.01	0.03	0.04	0.02
Hebei	0.67	0.40	0.00	0.27	0.40	0.40	0.20	0.57	0.23	11.03	1.21	0.09	0.12	0.12	0.08	0.05	0.02	0.07	0.07	0.48	0.40	0.45	0.08	0.89	0.24	0.31	0.08	0.67	1.25	0.29
Shanghai	0.00	0.00	0.00	0.00	0.05	0.19	0.01	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Jiangsu	0.06	0.15	0.24	0.57	0.00	0.51	0.57	0.11	0.10	0.55	0.40	0.12	0.07	0.10	0.06	0.01	0.01	0.07	0.04	0.22	0.23	0.10	0.06	0.06	0.18	0.16	0.03	0.10	0.28	0.09
Zhejiang	0.07	0.02	0.04	0.80	0.26	0.00	0.13	0.12	0.13	0.13	0.23	0.04	0.03	0.06	0.02	0.01	0.01	0.03	0.01	0.05	0.07	0.14	0.02	0.04	0.04	0.03	0.03	0.12	0.09	0.03
Anhui	0.15	0.18	0.34	2.25	7.49	5.06	0.00	1.96	1.58	2.50	2.12	0.12	0.12	0.16	0.08	0.03	0.02	0.08	0.13	0.21	0.57	0.29	0.04	0.19	0.20	0.22	0.11	0.49	0.70	0.23
Fujian	0.04	0.01	0.03	0.04	0.06	0.11	0.04	0.00	0.10	0.04	0.18	0.05	0.03	0.10	0.03	0.01	0.01	0.03	0.01	0.04	0.06	0.26	0.01	0.05	0.04	0.03	0.05	0.24	0.04	0.03
Jiangxi	0.10	0.07	0.20	0.77	0.58	2.10	0.68	2.70	0.00	1.48	2.92	0.08	0.11	0.13	0.05	0.02	0.01	0.04	0.11	0.10	1.32	0.60	0.02	0.12	0.10	0.15	0.10	0.49	0.26	0.15
Shandong	0.09	0.05	0.07	0.06	0.15	0.08	0.04	0.03	0.03	0.00	0.09	0.02	0.01	0.02	0.01	0.01	0.00	0.01	0.00	0.05	0.03	0.06	0.01	0.08	0.03	0.03	0.01	0.04	0.07	0.02
Guangdong	0.04	0.01	0.03	0.03	0.06	0.07	0.03	0.07	0.06	0.05	0.00	0.10	0.04	0.09	0.02	0.01	0.01	0.03	0.03	0.03	0.16	0.09	0.01	0.03	0.04	0.02	0.04	0.09	0.06	0.02
Guangxi	0.15	0.09	0.34	0.48	0.48	1.06	0.29	1.66	0.47	1.91	10.51	0.00	0.26	1.88	0.09	0.06	0.02	0.08	0.45	0.19	1.32	0.30	0.03	0.24	0.14	0.29	0.49	1.00	0.35	0.30
Chongqing	0.03	0.02	0.08	0.10	0.08	0.17	0.04	0.15	0.08	0.28	0.56	0.08	0.00	0.19	0.06	0.02	0.01	0.03	0.04	0.05	0.18	0.05	0.01	0.05	0.16	0.08	0.29	7.89	0.09	0.07
Yunnan	0.18	0.14	0.53	1.12	0.58	2.16	0.45	3.49	0.69	3.34	10.83	1.70	1.38	0.00	0.19	0.09	0.04	0.13	0.78	0.31	1.39	0.33	0.05	0.33	0.28	0.57	3.06	8.24	0.43	0.65
Gansu	0.22	0.18	0.89	1.56	0.82	1.59	0.44	2.58	0.59	4.94	4.83	0.14	0.80	0.40	0.00	0.62	1.24	0.31	0.39	0.36	0.89	0.25	0.04	0.56	1.44	1.50	0.28	5.58	0.85	0.68
Ningxia	0.04	0.02	0.03	0.03	0.07	0.06	0.03	0.06	0.03	0.11	0.13	0.02	0.03	0.03	0.12	0.00	0.02	0.03	0.01	0.03	0.04	0.06	0.01	0.06	0.05	0.21	0.02	0.12	0.04	0.03
Qinghai	0.08	0.05	0.23	0.19	0.21	0.38	0.11	0.30	0.11	0.71	0.59	0.04	0.11	0.08	1.58	0.07	0.00	0.07	0.05	0.11	0.14	0.08	0.01	0.13	0.22	0.43	0.05	0.60	0.21	0.20
Xinjiang	0.56	0.53	2.18	4.52	2.39	6.42	1.44	13.56	2.16	15.80	19.15	0.56	1.64	1.77	2.00	0.70	0.28	0.00	2.13	1.25	2.89	0.60	0.11	1.59	1.59	3.46	1.03	11.45	1.88	2.75
Hainan	0.03	0.03	0.10	0.12	0.12	0.29	0.07	0.51	0.16	0.65	4.55	0.05	0.06	0.10	0.02	0.01	0.00	0.02	0.00	0.06	0.25	0.04	0.01	0.05	0.04	0.09	0.06	0.31	0.09	0.10
Liaoning	0.42	0.26	0.29	0.21	0.31	0.22	0.14	0.31	0.12	0.97	0.53	0.09	0.09	0.10	0.07	0.05	0.03	0.06	0.03	0.00	0.20	0.21	0.33	0.24	0.09	0.20	0.07	0.32	0.25	1.19
Hunan	0.12	0.07	0.31	0.32	0.39	0.91	0.24	0.82	0.93	1.28	4.13	0.18	0.17	0.19	0.06	0.03	0.01	0.05	0.14	0.12	0.00	0.74	0.02	0.11	0.14	0.14	0.20	0.52	0.45	0.14
Hubei	0.02	0.01	0.04	0.03	0.07	0.08	0.06	0.04	0.15	0.10	0.13	0.02	0.01	0.02	0.01	0.00	0.00	0.01	0.01	0.02	0.15	0.00	0.00	0.01	0.02	0.02	0.01	0.04	0.09	0.02

Jilin	0.57	0.24	0.27	0.29	0.46	0.31	0.20	0.63	0.21	1.10	0.84	0.14	0.13	0.16	0.12	0.12	0.06	0.12	0.06	2.17	0.26	0.28	0.00	0.68	0.12	0.30	0.12	0.81	0.30	4.30
Shanxi	0.04	0.01	0.06	0.02	0.05	0.04	0.02	0.01	0.03	0.16	0.07	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.03	0.02	0.07	0.01	0.00	0.03	0.02	0.01	0.03	0.04	0.01
Shaanxi	0.27	0.23	1.85	2.27	1.39	1.99	0.69	3.01	0.78	8.54	5.95	0.14	1.45	0.38	1.03	0.19	0.12	0.16	0.41	0.33	1.45	0.39	0.04	1.11	0.00	0.64	0.29	8.32	2.65	0.45
Inner Mongolia	3.01	1.43	3.07	2.07	3.41	3.19	1.62	4.07	1.88	15.21	6.79	0.87	1.29	1.15	1.32	3.43	0.36	0.91	0.58	2.26	1.74	3.04	0.67	6.15	1.49	0.00	0.69	4.07	2.29	1.82
Guizhou	0.10	0.07	0.28	0.64	0.31	1.15	0.25	2.02	0.44	1.70	4.54	0.35	1.72	2.32	0.10	0.04	0.03	0.07	0.29	0.15	1.25	0.25	0.02	0.18	0.16	0.25	0.00	2.82	0.29	0.29
Sichuan	0.04	0.02	0.06	0.06	0.10	0.12	0.04	0.09	0.07	0.12	0.26	0.06	1.00	0.26	0.07	0.02	0.02	0.05	0.02	0.04	0.10	0.09	0.01	0.07	0.13	0.06	0.14	0.00	0.08	0.05
Henan	0.39	0.19	1.53	0.84	1.32	0.72	0.46	0.61	0.37	2.67	1.54	0.13	0.18	0.14	0.14	0.05	0.04	0.11	0.08	0.32	0.71	1.03	0.06	0.43	0.53	0.21	0.11	0.66	0.00	0.20
Heilongjiang	1.63	1.26	2.32	2.00	2.18	2.62	1.24	5.89	1.67	17.64	7.72	0.47	0.72	0.91	0.43	0.37	0.14	0.29	0.80	13.74	1.70	0.97	0.36	2.17	0.50	1.44	0.62	5.27	1.54	0.00

The rows show the virtual ALU export to other provinces and columns show the virtual ALU import of other provinces.

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