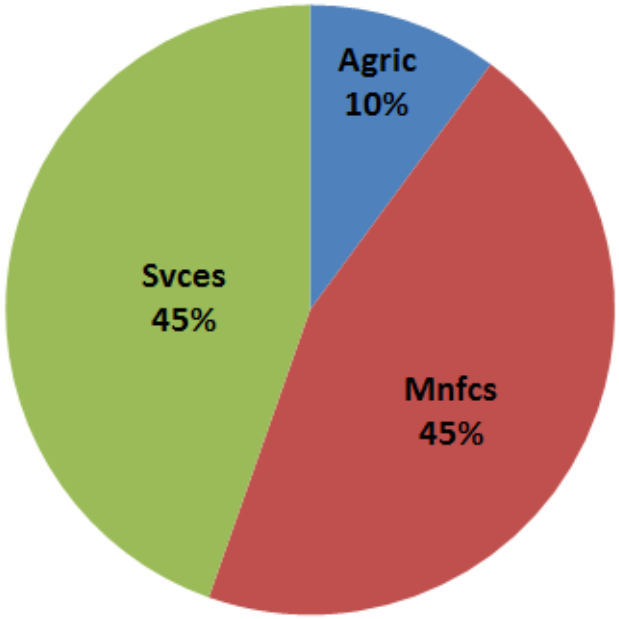
Assessing the impact of a change in the productivity of paddy rice in China

Marie Adrienne Gillardeau
Iman Haqiqi
Hao Shao

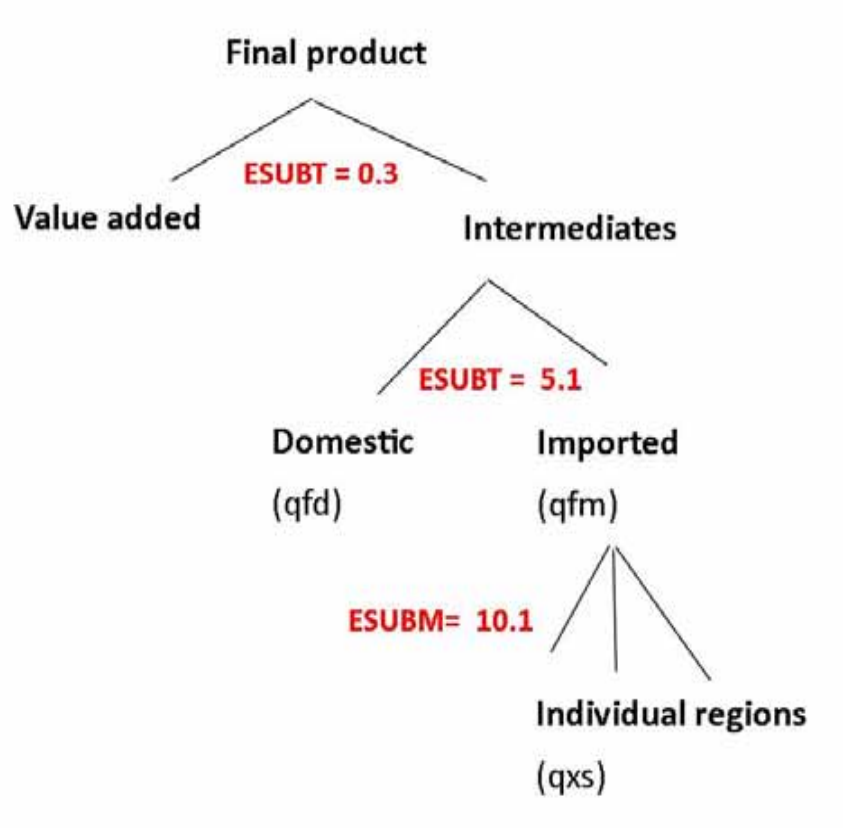
Background

- China is the largest producer of paddy rice in the world and produces 204 million tons of paddy rice every year, for a value of $US 55.8 billion.
- Like for other agricultural commodities, the majority of production is consumed on the domestic market: close to 99% of paddy rice is for domestic consumption.
- Paddy rice constitutes 15% of China's total crops.
- We are looking at the impact of a drought on rice crops on the Chinese economy and the trade effects.



Model assumptions

> Shock aoall("pdr","CHN") = -24



ETRAEL1	**-0,5**
ETRAEL2	**-0,1**

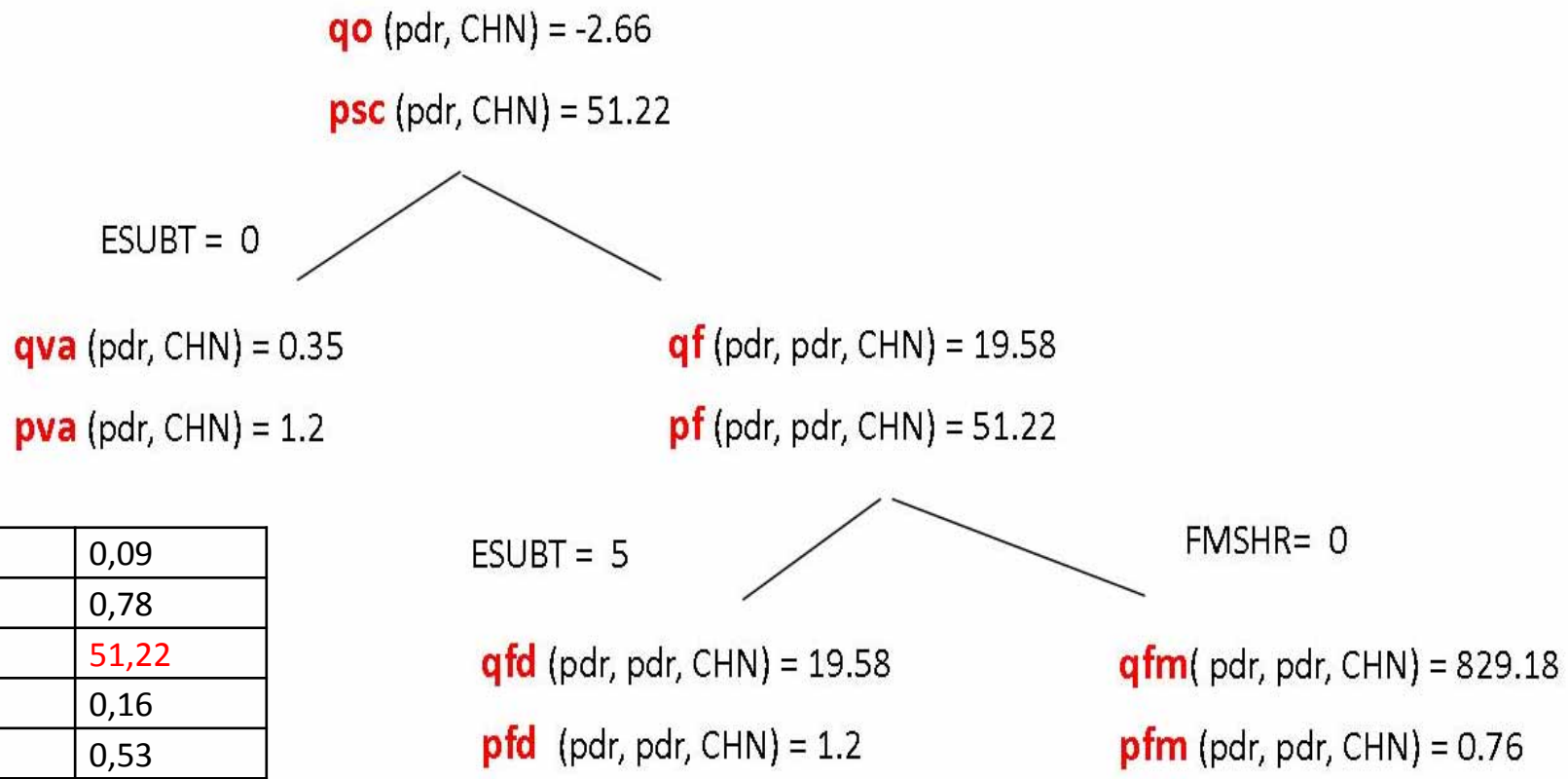
pdr	Paddy Rice
wht	Wheat
gro	Cereal grains nec
osd	Oil seeds
v_f	Vegetables, fruit, nuts
xag	Rest of agricultural products
frs	Forests
grazeliv	cattle and milk
ngrazeliv	Animal products
food	Agric and food processing
vol	Vegetable oils and fats
mnfc	Manufacturing
crp	Chemical (incl fertilizer)
serv	Services

BRA	xea
CAN	xla
CHN	xrw
EU27	xsa
IDN	xse
IND	MENA
USA	SSAFRICA

Key results

- The price of paddy rice increases by more than 50% as a result of the productivity shock, and as a result exports to all other regions fall by more than 96%.
- Output of paddy rice in China falls by -2,66%. Most of this decline comes from the reduction in exports to the rest of south Asia and the rest of east Asia.
- The output of all agricultural commodities in China goes down.
- Switch from intermediate inputs to value-added.
- At the same time there is an increase in value-added of 28% because the paddy rice sector benefits from lower input prices.
- However, exports of paddy rice are a very small share of total Chinese exports.

Quantity and price linkages

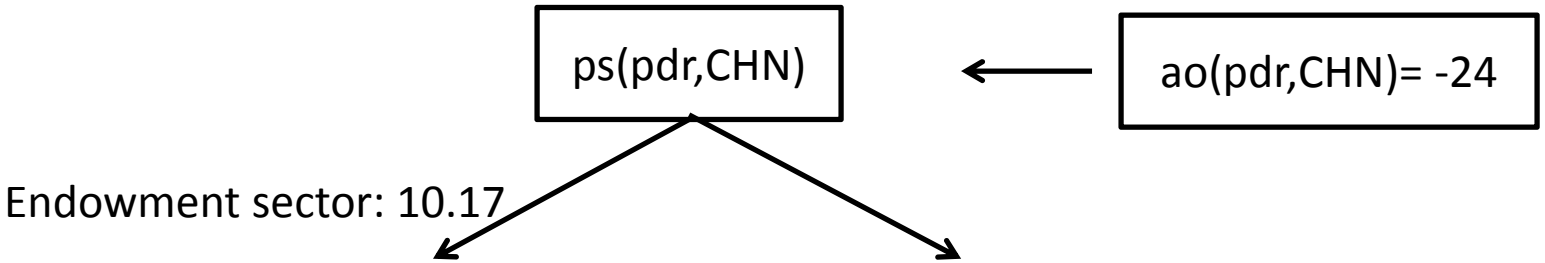


1 BRA	0,09
2 CAN	0,78
3 CHN	51,22
4 EU27	0,16
5 IDN	0,53
6 IND	0,10
7 USA	1,07
8 xea	1,15
9 xla	0,22
10 xrw	0,15
11 xsa	0,09
12 xse	0,59
13 MENA	0,10
14 SSAFRICA	0,14

- The export price of paddy rice from China increases dramatically.

Decomposition of the rise in the price of rice in China

Equation ZEROPROFITS
 # industry zero pure profits condition (HT 6) #
(**all**,j,PROD_COMM)(**all**,r,REG)
ps(j,r) + ao(j,r)
= **sum**(i,ENDW_COMM, STC(i,j,r) * **[**pfe(i,j,r) - afe(i,j,r) - ava(j,r)**]**)
+ **sum**(i,TRAD_COMM, STC(i,j,r) * **[**pf(i,j,r) - af(i,j,r)**]**)
+ *profitslack*(j,r);

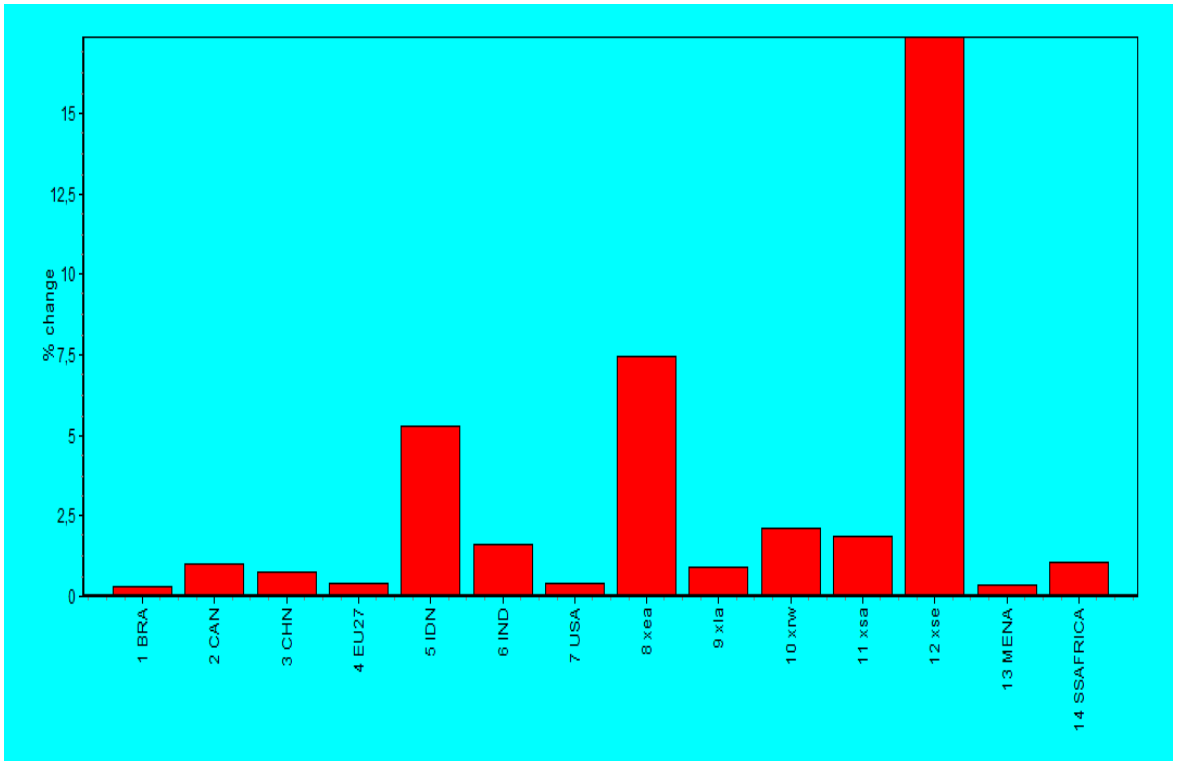


AEZ1	
…	
AEZ11	1.99
AEZ12	6.34
…	
AEZ18	

Price of imported paddy rice for all regions

1 BRA	0,29
2 CAN	1,02
3 CHN	**0,76**
4 EU27	0,38
5 IDN	5,30
6 IND	1,60
7 USA	0,38
8 xea	7,45
9 xla	0,92
10 xrw	2,12
11 xsa	1,85
12 xse	17,37
13 MENA	0,34
14 SSAFRICA	1,05

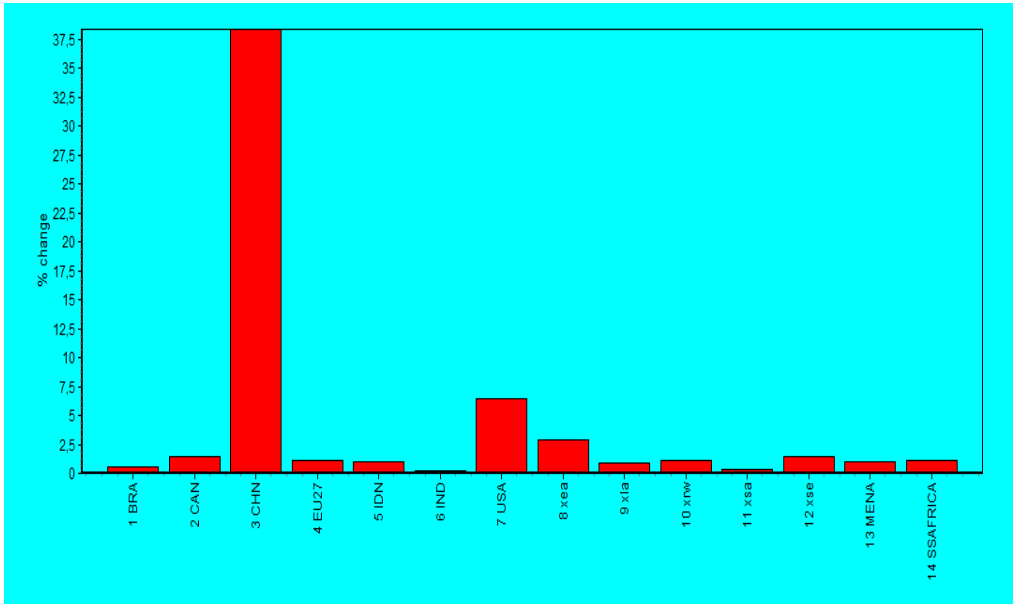
- Imported price for rice in China does not increase much, because VIMS is small.



Changes in the price of agricultural land

1 BRA	0,59
2 CAN	1,48
3 CHN	38,38
4 EU27	1,11
5 IDN	1,04
6 IND	0,26
7 USA	6,40
8 xea	2,87
9 xla	0,92
10 xrw	1,11
11 xsa	0,30
12 xse	1,41
13 MENA	1,02
14 SSAFRICA	1,11

- The price of land goes up as demand for land increases.
- Expansion effect: increases the composite value-added.



Change in intermediate demand by firms (qfd)

1 pdr	19,58
2 wht	-12,00
3 gro	-11,10
4 osd	-12,74
5 v_f	-13,48
6 xag	-12,73
7 frs	-1,25
8 grazeliv	-1,21
9 ngrazeliv	-1,21
10 food	-1,81
11 vol	-2,48
12 mnfc	-27,45
13 crp	-0,03
14 serv	-1,23
15 CGDS	-11,70
share weighted	**-2,02**

- Change of output as a result of domestic demand fall (-2,35%)
- Change of output as a result of export fall (-0,31%)
- The manufacturing sector is highly affected by the shock
  - The share of rice as an input in the sector is high
  - Reallocation of economic resources

Change in demand for value-added composite and expansion effect

	qva	qo
1 pdr	28,08	-2,66
2 wht	-2,07	-1,79
3 gro	-1,42	-1,21
4 osd	-3,47	-3,35
5 v_f	-1,39	-1,22
6 xag	-2,67	-2,41
7 frs	-1,24	-1,24
8 grazeliv	-1,18	-1,18
9 ngrazeliv	-1,17	-1,17
10 food	-1,74	-1,74
11 vol	-2,44	-2,44
12 mnfc	0,15	0,15
13 crp	0,01	0,01
14 serv	-0,13	-0,13
15 CGDS	-0,40	-0,40

- The table shows a positive substitution effect on value added demand.

Change in price for demand of labor, capital and natural resources

pfe	1 frs	2 pdr	3 wht	4 gro	5 osd	6 v_f	7 xag	8 grazeliv	Total
1 labor	-0,50	-0,50	-0,50	-0,50	-0,50	-0,50	-0,50	-0,50	-3,97
2 capital	-0,58	-0,58	-0,58	-0,58	-0,58	-0,58	-0,58	-0,58	-4,60
3 NatRes	-1,87	209,22	-5,80	-3,25	-11,32	-2,47	-7,87	-4,08	172,57
Total	-2,94	208,15	-6,87	-4,32	-12,40	-3,55	-8,94	-5,15	163,99
qfe	1 frs	2 pdr	3 wht	4 gro	5 osd	6 v_f	7 xag	8 grazeliv	Total
1 labor	-0,28	32,77	-1,36	-0,70	-2,84	-0,50	-1,91	-0,83	24,36
2 capital	-0,26	32,80	-1,34	-0,68	-2,82	-0,48	-1,89	-0,81	24,52
3 NatRes	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total	-0,54	65,58	-2,70	-1,38	-5,66	-0,98	-3,79	-1,64	48,88

- As a result of output fall in all sectors, the demand for labor and capital falls.
- Therefore the price of labor and capital declines, which affects the price index of value added composite.
- However, the results for natural resources are insignificant because none is used initially

Change in export sales of paddy rice (qxs)

R029	1 BRA	2 CAN	3 CHN	4 EU27	5 iDN	6 iND	7 USA	8 xea	9 xla	10 xrw	11 xsa	12 xse	13 MENA	14 SSA
1 BRA	1,13	9,52	**508,32**	2,49	32,36	7,85	6,55	58,5	5,65	12,3	9,23	129,98	1,61	5,92
2 CAN	-5,63	2,2	**467,62**	-3,77	23,51	0,65	-0,55	47,89	-0,99	5,41	1,93	116	-4,54	-0,58
3 CHN	**-98,4**	**-97,76**	**-90,5**	**-97,97**	**-97,2**	**-98,29**	**-98,31**	**-96,64**	**-98,08**	**-97,92**	**-97,68**	**-95,18**	**-98,32**	**-97,75**
4 EU27	0,61	8,95	**504,22**	1,75	31,46	7,29	5,99	57,67	4,99	11,5	8,66	128,78	1,08	5,27
5 iDN	-3,22	4,8	**482,14**	-1,53	27,26	3,7	2,44	51,68	1,01	7,88	4,52	121,12	-2,3	1,75
6 iND	1,08	9,57	**508,03**	2,47	32,38	7,8	6,6	58,42	5,56	12,21	9,28	129,89	1,66	5,78
7 USA	-7,42	-0,62	**456,86**	-6,24	21,18	-1,26	-3,36	45,07	-3,61	2,72	0	110,52	-6,99	-3,12
8 xea	-9,06	-0,6	**447**	-7,19	19,04	-3	-3,24	42,52	-4,42	1,48	-1,77	106,8	-8,63	-4,17
9 xla	0,06	8,14	**501,78**	1,33	30,92	6,49	5,37	56,81	4,43	10,99	8,06	127,27	0,52	4,7
10 xrw	0,76	9,11	**506,09**	2,02	31,85	7,31	6,12	57,91	5,13	11,79	8,81	129,14	1,24	5,43
11 xsa	1,15	9,63	**508,43**	2,53	32,41	7,9	6,66	58,54	5,62	12,29	9,34	130,16	1,72	5,93
12 xse	-3,31	4,64	**481,6**	-2,07	26,57	2,61	1,74	51,57	0,85	7,28	4,46	119,84	-2,83	1,2
13 MENA	1,05	9,48	**508,34**	2,43	32,24	7,78	6,5	58,36	5,46	12,19	9,18	130	1,63	5,84
14 SSA	0,66	9	**505,46**	1,94	31,73	7,35	6,05	57,75	5,06	11,67	8,71	128,9	1,18	5,47