Appendix: Tea Production and Trade in the World

Production

To meet rising demand, world tea production has increased substantially. As shown in Panel A of Appendix A, world tea production increased from 2.52 tons to 6.34 million tons, with an average annual growth rate of 3.38%, during 1990-2018. Even though the absolute growth rate seems moderate, it is significantly higher than that of coffee, rice and wheat, as shown in Panel B of Appendix A. On the other hand, the sown area for tea increased from 2.24 million hectares in 1990 to 4.19 million hectares in 2018, increasing by 87.05% in approximately three decades. Panel C of A shows that the growth rate of the sown area for tea is much higher than that for other crops (i.e. coffee, rice and wheat).

Further study shows that growth in world output was due mainly to major increases in the major tea-producing countries. The largest four tea-producing countries in the world are China, India, Kenya and Sri Lanka, which produced 4.77 million tons of tea, or 75.21% of the world total in 2018 (FAO 2019). As shown in Appendix B, China became the largest tea-producing country in 2005 and has remained the largest tea-producing country ever since. China produced 2.63 million tons of tea, 41 percent of the world total, in 2018. During 1990-2018, tea production in China increased more than threefold. During the same time period, tea production in India also doubled (increasing from 0.69 million tons to 1.34 million tons). On the other hand, tea production in Sri Lanka only increased slightly, with an annual growth rate of 1% during the past three decades.

Kenya is one of the top four tea-producing countries that is not located in Asia. During the past three decades, tea production in Kenya increased from 0.20 million tons to 0.49 million tons, an increase of 1.5 times. In fact, all the other major tea-producing countries in East Africa, such as Uganda, Burundi, Tanzania, Mozambique and Rwanda, showed similar increasing trends during 1990-2018. As a result, the total tea production in Africa increased from 0.32 million tons to 0.81 million tons.

In addition, previous studies showed that tea production would keep increasing due to the increasing demand in the next decade. Rapid economic growth in China and India, the two largest tea-drinking countries in terms of population, led to continuously increasing global tea demand. In addition, regular tea drinking has been found to be associated with consumer health, and numerous herbal teas have gained popularity in recent years (Chomchalow 1996; Hicks 2009). Hence, world tea demand will continue to increase in the next decade (Chang 2015; Hicks 2009).

Exports

Alongside the rapid increase in tea demand throughout the world, tea exports have increased significantly. As shown in Appendix C, world tea exports in 2017 reached 2.10 million tons, compared to 1.23 million tons in 1990 (Panel A). In other words, world tea exports increased by 70.73% (with an annual growth rate of 2.53%) during 1990-2017.

Panel B of Appendix C shows that all the major tea-producing countries significantly increased their exports. Although China is the largest tea producer in the world, its exports are lower than those of the other three major tea-producing countries in 2017 because of the rapid increase in domestic consumption (Hicks, 2009). As shown in Panel B, China's tea exports increased from 0.21 million tons to 0.37 million tons during 1990-2017. During the same time, exports from India and Sri Lanka both increased by approximately 30% (0.26 million tons vs. 0.20 million tons for India and 0.29 million tons vs. 0.22 million tons for Sri Lanka).

Finally, Kenya became the world's largest tea exporter for the first time in 2005 and has remained so for most years since then. In 2017, Kenya's tea exports reached 0.47 million tons, 22.24% of the world export total. Panel B of Appendix C shows that the annual growth rate of Kenya's tea exports was 6.48% during 1990-2017. In other words, Kenya's tea exports nearly doubled over the past three decades. Significant growth rates were also achieved in other tea-producing countries in East Africa, such as Uganda and Tanzania (FAO 2019). Previous studies showed that this increase was due to expansion in trade to the Near East, given the growth and strength of the economies in this region (Chang 2015).

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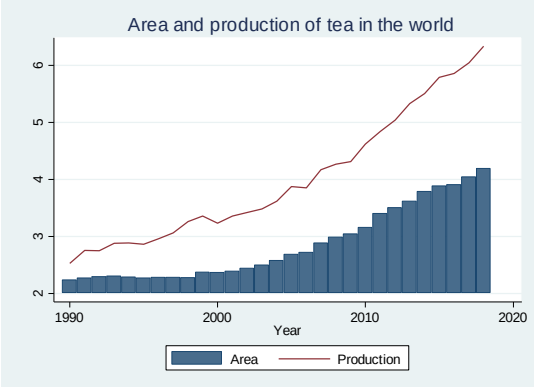
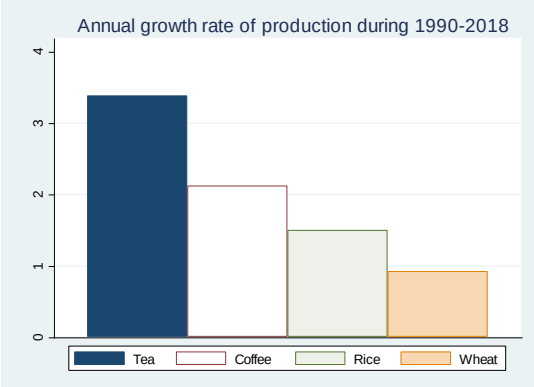
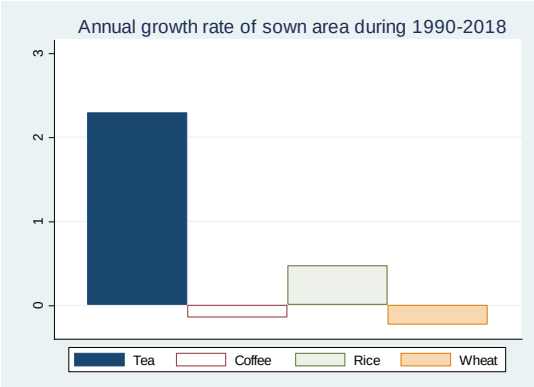


Panel A

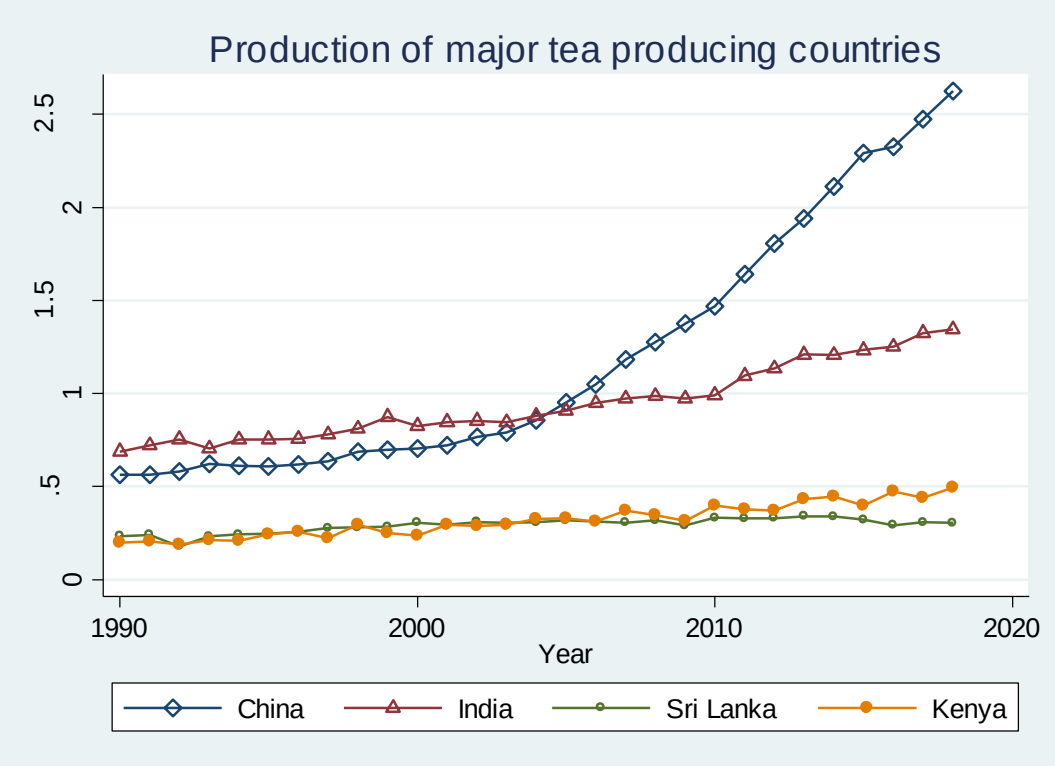


Panel B

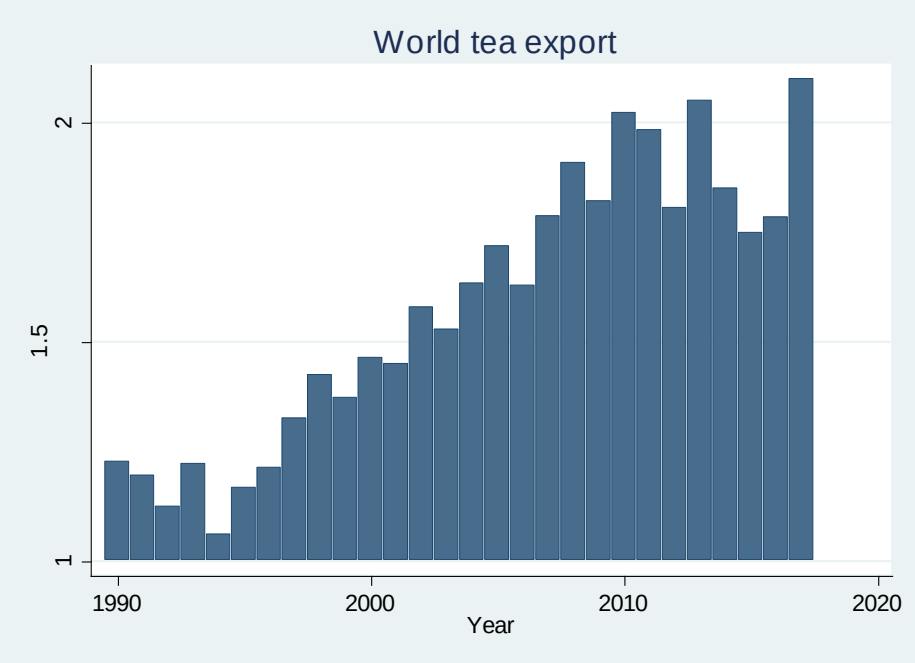


Panel C

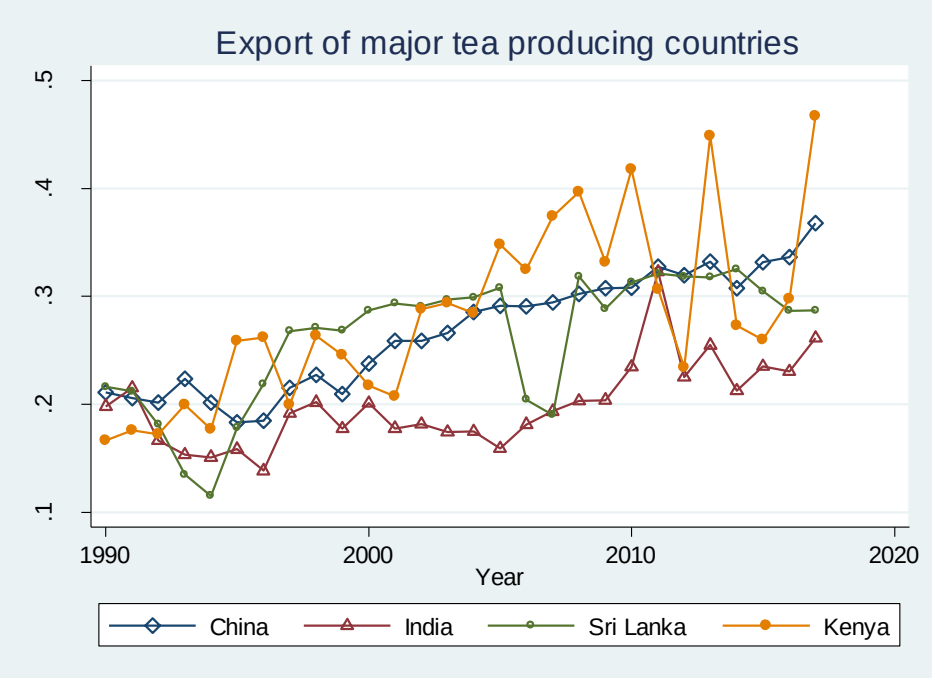
Appendix A Production and sown area of tea, coffee, rice and wheat in the world.



Appendix B World tea production in major tea producing countries.



Panel A



Panel B

Appendix C World tea export.

Appendix D VAR results for price series in India

	Kolkate		Guwahati		Cochin	
	Leaf	Dust	Leaf	Dust	Leaf	Dust
Kolkate leaf (t-1)	0.8358***	0.1237***	0.0091	0.0185	0.0525*	-0.0109
	(21.04)	(2.66)	(0.21)	(0.38)	(1.74)	(-0.59)
Kolkate dust (t-1)	-0.2159***	0.4293***	-0.0557	-0.0409	-0.0614*	0.0300
	(-4.86)	(8.23)	(-1.13)	(-0.75)	(-1.82)	(1.44)
Guwahati leaf (t-1)	0.2331***	0.0991*	0.9172***	0.2337***	0.0374	0.0129
	(4.80)	(1.74)	(17.04)	(3.92)	(1.02)	(0.57)
Guwahat dust (t-1)	0.2260***	0.3961***	0.0408	0.7133***	-0.0473	-0.0485**
	(4.33)	(6.47)	(0.71)	(11.13)	(-1.19)	(-1.99)
Cochin leaf (t-1)	0.1069**	0.0184	0.0403	-0.0113	0.7781***	-0.0007
	(2.35)	(0.34)	(0.80)	(-0.20)	(22.51)	(-0.03)
Cochin dust (t-1)	-0.1130***	-0.1025**	0.0039	0.0284	0.1097***	0.9669***
	(-2.74)	(-2.12)	(0.09)	(0.56)	(3.51)	(50.35)
Constant	-0.0889	0.0850	0.1116	0.1600	0.2722***	0.0955**
	(-1.08)	(0.88)	(1.23)	(1.59)	(4.38)	(2.50)
Observations	345	345	345	345	345	345

Note: z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix E VAR results for price series in European market

	Kolkata		Guwahati		Cochin					
	Leaf	Dust	Leaf	Dust	Leaf	Dust	H&K&B	Rwanda	Tanzania	Mozambique
Kolkata_L (t-1)	0.8402***	0.1358***	0.0085	0.0357	0.0470	-0.0059	0.3112	-0.0258	-0.0404	0.0009
	(20.82)	(2.88)	(0.19)	(0.72)	(1.57)	(-0.32)	(0.49)	(-0.59)	(-0.62)	(0.02)
Kolkata_D (t-1)	-0.2186**	0.4212***	-0.0545	-0.0569	-0.0623*	0.0224	-0.4292	0.0744	0.0206	0.0312
	(-4.87)	(8.03)	(-1.09)	(-1.03)	(-1.87)	(1.09)	(-0.61)	(1.53)	(0.28)	(0.56)
Guwahati_L (t-1)	0.2349***	0.1157*	0.8989***	0.2778***	0.0442	0.0445*	-0.5301	-0.0503	-0.0654	-0.0531
	(4.42)	(1.86)	(15.24)	(4.26)	(1.12)	(1.83)	(-0.64)	(-0.88)	(-0.76)	(-0.81)
Guwahati_D (t-1)	0.2241***	0.3826***	0.0557	0.6752***	-0.0563	-0.0771	0.1654	0.0104	0.1218	0.0147
	(4.04)	(5.91)	(0.91)	(9.93)	(-1.37)	(-3.04)	(0.19)	(0.17)	(1.36)	(0.22)
Cochin_L (t-1)	0.1283***	0.0533	0.0525	-0.0035	0.7341***	-0.0169	-1.2442*	0.1152**	0.0652	-0.0174
	(2.69)	(0.95)	(0.99)	(-0.06)	(20.68)	(-0.77)	(-1.67)	(2.23)	(0.85)	(-0.30)
Cochin_D (t-1)	-0.1373**	-0.1383**	-0.0064	-0.0120	0.1111***	0.9460*	-0.2244	-0.1388**	0.2072**	0.0789
	(-2.73)	(-2.36)	(-0.12)	(-0.19)	(2.97)	(41.15)	(-0.29)	(-2.56)	(2.55)	(1.28)
H&K&B (t-1)	0.0016	0.0039	0.0005	0.0030	-0.0043**	-0.0009	0.7913***	-0.0018	0.0000	-0.0004
	(0.76)	(1.56)	(0.22)	(1.13)	(-2.69)	(-0.91)	(23.75)	(-0.76)	(0.00)	(-0.15)
Rwanda(t-1)	-0.0198	-0.0224	-0.0239	-0.0031	0.0165	0.0125	0.0268	0.9431***	0.1257***	0.0200
	(-1.11)	(-1.08)	(-1.21)	(-0.14)	(1.25)	(1.54)	(0.10)	(49.11)	(4.38)	(0.92)
Tanzania(t-1)	0.0027	0.0048	0.0079	0.0371	0.0354*	0.0250*	0.4716	-0.0278	0.5804***	0.0354
	(0.10)	(0.15)	(0.26)	(1.12)	(1.76)	(2.02)	(1.12)	(-0.95)	(13.26)	(1.06)
Mozambique(t-1)	0.0188	0.0350	-0.0069	0.0161	-0.0404**	0.0022	-0.7429**	0.0145	0.1911***	0.8643***
	(0.79)	(1.26)	(-0.26)	(0.55)	(-2.28)	(0.20)	(-2.00)	(0.56)	(4.97)	(29.56)
Constant	-0.0638	0.0778	0.1731	0.1382	0.3273***	0.0918*	3.8855**	0.1705	-0.5410***	-0.0430
	(-0.60)	(0.62)	(1.46)	(1.05)	(4.11)	(1.87)	(2.33)	(1.47)	(-3.13)	(-0.33)
Observations	345	345	345	345	345	345	345	345	345	345

Note: H&K&B stands for high-grown (in Sri Lanka), Kenya and Burundi. "D" stands for dust tea, while "L" stands for leaf tea. z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix F VAR results for price series in Middle East market

	Kolkata		Guwahati				
	Leaf	Dust	Leaf	Dust	L&M&K&U	Tanzania	Mozambique
Kolkata_L (t-1)	0.8601***	0.1200***	0.0220	0.0169	-0.0058	-0.0004	0.0128
	(22.29)	(2.67)	(0.52)	(0.36)	(-0.21)	(-0.01)	(0.27)
Kolkata_D (t-1)	-0.2292***	0.4458***	-0.0712	-0.0415	0.0149	-0.0401	0.0166
	(-5.32)	(8.86)	(-1.50)	(-0.80)	(0.49)	(-0.56)	(0.32)
Guwahati_L (t-1)	0.2228***	0.0802	0.9192***	0.2654***	0.0169	-0.0502	-0.0475
	(4.34)	(1.34)	(16.31)	(4.27)	(0.46)	(-0.59)	(-0.76)
Guwahati _D (t-1)	0.2216***	0.3982***	0.0421	0.6827***	-0.0086	0.1096	0.0158
	(4.00)	(6.17)	(0.69)	(10.18)	(-0.22)	(1.20)	(0.23)
L&M&K&U (t-1)	0.0225	0.0395	-0.0117	0.0298	0.8431***	0.0278	-0.0630
	(0.55)	(0.82)	(-0.26)	(0.60)	(28.64)	(0.41)	(-1.26)
Tanzania(t-1)	-0.0153	-0.0365	0.0061	0.0255	-0.0109	0.7060***	0.0630**
	(-0.68)	(-1.40)	(0.25)	(0.94)	(-0.68)	(19.08)	(2.32)
Mozambique(t-1)	0.0025	0.0202	-0.0082	0.0144	-0.0141	0.1966***	0.8633***
	(0.11)	(0.73)	(-0.32)	(0.50)	(-0.84)	(5.03)	(30.14)
Constant	-0.0597	-0.0233	0.1932***	0.1412**	-0.0073	0.1399*	0.0669
	(-1.18)	(-0.39)	(3.48)	(2.30)	(-0.20)	(1.67)	(1.09)
Observations	345	345	345	345	345	345	345

Note: L&M&K&U stands for low-grown (in Sri Lanka), mid-grown (in Sri Lanka), Kenya and Uganda. "D" stands for dust tea, while "L" stands for leaf tea.