For Want of a Cup: The Rise of Tea in England and the Impact of Water Quality on Economic Development *

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Preliminary and Incomplete, Not for Citation

March 13, 2015

Abstract

While it is now well accepted that access to clean water plays an important role in public health and economic development, there is little historical evidence for the role that clean water played in the development of the now-rich world. I investigate this question by exploiting a natural experiment on the effects of water quality on mortality—the advent of tea consumption in 18th century England. The custom of tea drinking spread rapidly throughout England, even among lower classes, and resulted in an unintentional increase in consumption of boiled water. Preliminary results suggest that areas with lower initial water quality had larger declines in mortality rates after tea drinking became widespread. A similar pattern of results holds in years following larger volumes of tea imports. Finally, I discuss the broader impact of this accidental improvement in public health which occurred at the same time that people were crowding into cities, thus providing the labor needed for industrialization.

JEL classification: N33, Q25, Q56, I150
Keywords: tea, water quality, mortality, Industrial Revolution

*I thank Tania Barham, Howard Bodenhorn, Brian Cadena, Ann Carlos, Gregory Clark, Melissa Dell, Andrew Foster, Timothy Guinnane, Jonathan Hughes, Trevon Logan, Wolfgang Keller, Victor H. Mair, Craig McIntosh, Terra McKinnish, Nathan Nunn, Nancy Qian, Matthew Ruther, Carol Shiue, Jeffrey Zax, and Shuang Zhang for helpful feedback. Tim Larsen, Peter Graca, Isaac Kaplan, and Priti Kalsi provided excellent research assistance. Seminar and conference participants at the University of New Mexico, Northeast Universities Development Consortium Conference, Population Association of America annual meeting, and Western Economic Association International meeting also offered useful feedback.

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1 Introduction

The importance of access to clean water for economic development has recently received considerable attention. Policy-makers raised the issue as a priority worthy of inclusion in the Millennium Development Goals and now say they have met the global target of expanding access to safe drinking water. Nevertheless, an estimated 780 million people still lack access to an improved drinking water source (WHO/UNICEF 2012). At the same time, researchers have continued to estimate the impact of water interventions on health and mortality (Kremer et al. 2011, Galiani et al. 2005) as well second-order effects, such as happiness and quality of life (Devoto et al.). Although these studies underscore the important role that access to clean water plays in economic development, much less is known about the role that water played in the development of the now-rich world. I investigate this question by exploiting a natural experiment on the effects of water quality on mortality—the advent of tea consumption in 18th century England. I hypothesize that the main mechanism behind this relationship operated through the increased consumption of boiled water. Since boiling water is necessary for brewing tea, the rise of tea consumption in 18th century England would have resulted in an accidental improvement in the relatively poor quality of water available at the time. To what extent can this explain the drop in mortality rates seen over this period?

I put forth two empirical strategies to estimate the causal relationship between tea consumption and mortality rates in England. The first is a differences-in-differences model that compares the period before and after tea gained popularity in England across areas that vary in their initial levels of water quality. This is similar to the approach used by Nunn and Qian (2011), who exploit regional variation in the suitability of land for potato cultivation to estimate the impact of the potato on population. The second model employed here uses actual tea import data at the national level interacted with measures of water quality that vary across England. Thus, I investigate whether positive shocks to tea imports resulted in larger declines in mortality rates in areas where water quality was initially worse.

As expected, preliminary results suggest that the introduction of tea resulted in larger declines in mortality rates in areas that had worse water quality to begin with. Areas with lower initial water quality also appear to have had larger declines in mortality rates in years following relatively high tea imports. Finally, I discuss the broader impact of this accidental improvement in public health which occurred at the same time that people were crowding into cities, thus providing the labor needed for industrialization.

The remainder of this paper is organized as follows. Section II provides some background on the historical context surrounding the introduction of tea to England. Section III presents the empirical strategy including the two identification strategies described above. Section IV describes the data used in the analysis. Section V discusses preliminary results and Section VI concludes.

2 Background

Several historians have suggested that the custom of tea drinking may have been instrumental in curbing deaths from water-borne diseases and thus sowing the seeds for economic growth. MacFarlane (1997) draws comparisons between the experiences of England and Japan in this respect. Mair and Hoh (2009, p.198) write that without "boiled beverages such as tea, the crowding together in immense cities caused by the migration from field to factory would have unleashed devastating epidemics." Similarly, Standage (2006, p.201) writes that the popularity of tea "allowed the workforce to be more densely packed in their living quarters around factories in the industrial cities…without risk of disease." This view is echoed by Johnson (2006, p. 95), who writes that "largely freed from waterborne disease agents, the tea-drinking population began to swell in number, ultimately supplying a larger labor pool to the emerging factory towns...."

Tea was first imported to England from China in 1689 (Mair and Hoh, 2009) and at the beginning of the 18th century, imports were still only estimated to be about six tons (Johnson, 2006). Over the next century, however, the popularity of tea soared, as evidenced by Figure 1 which shows English East India Company imports of tea over the years 1761-1834. The Company had a long-running monopoly on tea imports that lasted throughout this period. While the link between increased tea consumption, population, and growth has been the subject of some speculation, to my knowledge this is the first paper to provide quantitative evidence on this relationship

3 Empirical strategy

To measure the effect of tea drinking on mortality rates in England, I begin by comparing the mortality rates across areas that varied in initial water quality before and after tea consumption became popular. This is estimated via the following regression model:

$$Deaths_{it} = a + \gamma WaterQuality_i \times PostTea_t + X_{it}\beta + \mu_i + \delta_t + \varepsilon_{it} \ , \qquad (1)$$

where the dependent variable is the natural log of the number of deaths in parish i in year

t. The independent variable of interest, $WaterQuality_i \times PostTea_t$, is an interaction term between the initial water quality in parish i and a dummy variable indicating the period is after tea drinking was widespread among the broader population of England. As discussed above, although tea first came to England just prior to 1700, Figure 1 shows very little imported tea at the beginning of the series in 1761. Thus, it is unlikely that tea drinking was widespread at the beginning of the century and could not have had an appreciable effect on death rates at that time. From Figure 1, it appears that the volume of tea imports does not noticeably take off until after 1784, which coincides with the Tea and Window Act which reduced the tea tax from 119 to 12.5 percent at one stroke (Mair and Hoh, p.187-88). In light of this, I define $PostTea_t$ to be an indicator for years 1785 or later. In subsequent specifications, I also introduce lead indicators for the periods immediately preceding 1785 interacted with water quality measures to show that the results are robust to concerns regarding pre-existing trends prior to 1785.

All regressions also include parish fixed effects (μ_i) and year fixed effects (δ_t). X_{it} includes controls for other parish characteristics that vary over time, such as population measures which will be discussed below. Since very few time-varying controls are available for parishes over this period, the remaining components of X_{it} come largely from the interaction of other parish characteristics (e.g. the distance to a market town and the proximity to the coast) interacted with time period indicators. Standard errors are clustered at the parish level. Equation (1) is estimated on the years 1700-1839 to more closely surround the rise of widespread tea consumption in England.

To provide further evidence of the impact that tea consumption had on mortality rates, I utilize actual tea import data to compare the impact of national tea imports on mortality rates in areas that varied in their level of initial water quality:

$$Deaths_{it} = a + \gamma WaterQuality_i \times Tea\,\mathrm{Im}ports_{t-1} + X_{it}\beta + \mu_i + \delta_t + \varepsilon_{it}\ , \qquad (2)$$

where the independent variable of interest, $WaterQuality_i \times Tea\,\mathrm{Im}ports_{t-1}$, is the interaction term between initial water quality in parish i and national-level tea imports in year t-1. The use of lagged tea imports reflects the fact that tea imports arriving in London may not have reached the final consumer until the following year. In further work, I use a simple moving average of tea imports to address the possibility that the accumulation of tea inventories smoothed consumption of tea over time. All remaining variables are as specified above.

To further bolster the evidence that the mechanism behind these results was the improvement in water quality, in the future I will use cause-specific death rates from London over this time period (available in Marshall,1832) to investigate whether the rise of tea consumption and shocks to tea imports resulted in fewer deaths related to water-borne diseases such as dysentery. I also plan to use data on infant and child mortality rates from London (also available in Marshall, 1832), as infants and children are thought to be more sensitive to water-borne diseases (MacFarlane 1997). Falsification tests will also be run to show that shocks to tea imports did not affect air-borne diseases such as tuberculosis and smallpox. This is similar to the approach used by Galiani et al. (2005), with the obvious drawback that cause-specific mortality rates are not available across parishes, thus eliminating the possibility of a difference-in-differences strategy. I also use data on other imported goods to show that other goods did not have a similar impact on mortality rates, and thus rule out the possibility that the observed impact of tea on mortality is simply driven by rising incomes. This will add weight to the causal interpretation for the special role that tea played in decreasing mortality.

4 Data

4.1 Sources of Data

The mortality rates and parish characteristics used in the analysis are constructed from Schofield and Wrigley's (2003) collection of records on burials, baptisms, and marriages for 404 English parishes over the years 1538-1849. To limit the focus to the years in which tea was introduced, this paper focuses on the sample starting in 1700. While Wrigley and Schofield (1981) use these data to recover population estimates for England as a whole, they do not provide population estimates for the parishes individually. This is in part due to concerns about migration rates across parishes which are not available. Since it is important to scale deaths by the relative size of the parishes, I follow Wachter (1998) in constructing the following measure of population based on a weighted average of past measures of parish-specific burials, baptisms, and marriages:

$$Population_{it} = 0.4 \times \frac{smooth(Baptisms_{it})}{0.03} + 0.4 \times \frac{smooth(Burials_{it})}{0.025} + 0.2 \times \frac{smooth(Marriages_{it})}{0.008} , \tag{3}$$

where $Population_{it}$ is the constructed measure of population for parish i in year t and smooth(x_{it}) is the average of x_{it} over the past 20 years. As there may be some concern over the use of this constructed measure and the degree of measurement error it may include, I report specifications with the natural log of $Population_{it}$ on the right-hand side, as opposed to scaling the dependent variable by the constructed population measure. For comparison, I also present results with the measure of births $Baptisms_{it}$ and marriages $Marriages_{it}$, as well as marriages alone on the right-hand side instead of the constructed population measure.

The water quality measures used in the analysis are based on parish altitude, slope, and initial population density in the parish at a point in time prior to the rise of tea consumption. It is believed that parish altitude should be positively correlated with water quality because parishes at higher elevation would have been less likely to be subjected to water contamination from surrounding areas. Similarly, a steeper terrain would have meant that water would be less likely to pool or stand and thus provide fewer sources for contamination. The measures of the average altitude (in meters) and average slope (in degrees) in the parish are constructed from NASA Shuttle Radar Topography images based on historical parish boundaries. The correlation between initial population density and water quality, however, is thought to be negative, as a denser parish would have posed greater challenges for disposing of human waste and thus provided greater sources for contamination. This is particularly true for this period prior to the widespread acceptance of the germ theory of disease and the public health movement that began later in the 19th century (Johnson 2006).

The data on national-level tea imports come from the East India Company records available from Bowen (2007) and cover the years 1761-1834. Unfortunately, the data on tea are not available at the parish level, thus requiring a more subtle empirical strategy to identify the causal impact of tea on mortality. Preliminary results show a negative correlation between tea imports and national mortality rates provided by Wrigley and Schofield (1981, p.531-534). This relationship is illustrated in Figure 1, which shows a dramatic rise in tea imports over the years 1761-1834, going from around 5 tons at the beginning of the period to well over 30 tons at the end. Over the same period, mortality rates fell from around 29 to 24 deaths per 1,000 people. At the same time, there is substantial year-to-year variation in tea imports and mortality rates. Tying these phenomena together will prove useful in the proposed identification strategy below.

4.2 Descriptive statistics

Table 1 presents descriptive statistics for the data sources used in the analysis. Panel A includes mean and standard deviations for the three measures of water quality used below: parish altitude, slope, and parish population density in 1700. Table 1, Panel B describes the demographic data that vary over time which will be used in the identification strategy which looks at the period before and after tea first became popular in England, 1700-1839. Finally, Table 1, Panel C describes the data on tea imports for the years 1761-1834 which are used in the second identification strategy outlined above.

The descriptive statistics might better illustrate the spirit of the identification strategy in graphical form. To this end, Figures 2 through 4 graph death rates against tea imports for the three measures of water quality used in the analysis. Figure 2 graphs the death rates against tea imports distinguished by whether the parishes were in high altitude (better water quality) versus low altitude (worse water quality) areas. The fitted line for the low water quality areas appears to be steeper than that for high water quality areas, suggesting that increased tea consumption had a bigger impact on lowering mortality rates in areas where water quality was worse. A similar relationship between tea and mortality is observed in Figure 3, where the fitted line for parishes with relatively shallow slopes and thus flatter terrain (worse water quality) is steeper than for parishes with steeper slopes (better water quality). In Figure 4, where population density in 1700 is used as the measure of water quality, worse water quality (higher population density) again appears to be linked with a bigger decline in death rates relative to areas with better water quality (lower population density), and thus produces a steeper fitted line for higher density parishes.

5 Preliminary Results

Tables 2A through 2C present the main results using the first identification strategy relying on the interaction between parish water quality and an indicator for the post-tea-drinking era which coincided with the dramatic drop in the tea tariff in 1785 (equation 1). Table 2A shows the results with the constructed population measure as a control whereas births and marriages are used as controls in Table 2B, and marriages alone are used as a control for the parish population in Table 2C. Across all three tables, the coefficients of interest on the interaction between the post-1785 indicator and the water quality variables all have the anticipated signs. The coefficients on the interaction terms positively correlated with water quality (altitude and slope) are positive, suggesting that a lower altitude or lower slope (worse water quality) was associated with a bigger decline in deaths after tea drinking became widespread. The coefficients on the slope and altitude interaction terms (columns 1 and 2 across Tables 2A through 2C) are also similar in magnitude ranging from 0.02 to 0.05, suggesting that they are measuring similar phenomena. Although the coefficients on the interaction between initial population density and the post-tea indicator (column 3 across Tables 2A through 2C) are not statistically significant in these specifications, their signs are nevertheless consistent with the above interpretation. While the coefficients are negative, they also suggest that worse water quality (a rise in population density) is associated with a drop in mortality after tea drinking is widespread.

For robustness, Tables 3A through 3C present the analogous results after including two pre-trend indicators interacted with water quality. These include two lead variables for the post-1760 era as well as the post-1770 era. As can be seen from the tables, most coefficients on interaction terms with the lead variables are small and statistically insignificant, with a few exceptions on the interactions with the 1760 indicator in tables 3A and 3B. The latter estimates, however, are in the opposite direction of the coefficient on the water quality variable interacted with post-1785, the treatment period thought to coincide with the widespread adoption of tea as the national drinking custom. In Table 3C, where the lead analysis is conducted with marriages as the population control, all coefficients on lead indicators interacted with water quality are statistically insignificant. At the same time, it should be noted that in all specifications in Tables 3A through 3C, the coefficient of interest on the interaction between the 1785 indicator and the water quality measure remains statistically significant and has the anticipated sign. Thus, this evidence mitigates concerns over whether pre-existing changes in mortality rates are driving the effects of interest and supports the notion that areas with worse water quality had greater declines in mortality after tea drinking became widespread in 1785.

Tables 4A through 4C present the main results using the second identification strategy relying on actual shocks to tea imports (equation 2), with the constructed population measure as a control (Table 4A), births and marriages as controls (Table 4B), and marriages alone as a control for the parish population (Table 4C). In each table, Columns (1) through (3) show the results with the altitude, slope, and initial population density measure as indicators of water quality, respectively. The coefficient on the interaction terms between water quality and lagged tea imports suggest the same pattern that was observed in Figures 2-4. First, the interaction term between tea imports and altitude has a positive coefficient (column 1 in Tables 4A through 4C). This suggests that lower altitude areas (with worse water quality) had relatively larger declines in mortality rates when England experienced a positive shock to tea imports. A similar pattern is true for the slope coefficient in column 2 of Tables 4A through 4C, which is also positively correlated with water quality. The interaction term between population density and tea imports (column 3 in Tables 4A through 4C) shows a negative coefficient, but a similar pattern of results, since population density is negatively correlated with water quality. The similarity of coefficient estimates across all tables also suggests that it makes little difference whether the population control is the constructed measure or the combinations of controls for marriages and births. These results validate those from the first identification strategy and point to tea shocks reducing mortality rates more in areas with worse initial water quality.

For robustness, Tables 5A through 5C address concerns over whether the coefficients of interest are picking up correlations between the variables of interest and some unobserved variables that are actually driving the results. For instance, one might be concerned that the measures of water quality are actually picking up some underlying wealth distributions or proximity to trade routes that are actually driving the correlation with mortality rates. To purge the coefficient of interest of these sources of variation, I include other parish characteristics interacted with the tea imports such as the distance to the nearest market town in 1700 (in km) and a variable indicating that the parish is within 10 km of the coast. A related concern is that the tea import data might be reflecting changes in income over time across parishes and these changes simply had a differential impact on mortality across different types of parishes. To address this, I make use of the East India Company's records on other (miscellaneous) imports and interact them with the measures of water quality used for identification. While the coefficient on the distance to market town interaction term is statistically significant across all specifications, none of the interaction terms between miscellaneous imports and the water quality measures are statistically significant. More importantly, Tables 5A through 5C show that the inclusion of these additional controls makes very little difference to the magnitudes or statistical significance of the original estimates using altitude and slope as the water quality measures from Tables 4A through 4C. This is true regardless of whether the population control used is the constructed measure (Table 5A), births and marriages (Table 5B), or marriages alone (Table 5C). Again, these results point to larger declines in mortality in areas with worse water quality following years with higher tea imports.   .

6 Conclusion

Preliminary results on the link between tea and mortality rates suggest that the rise of tea consumption in 18th century England resulted in larger declines in mortality rates in areas that had worse water quality to begin with. Areas with lower initial water quality also appear to have experienced larger declines in mortality rates in years following relatively high tea imports. While the magnitudes of the effects may seem small, note that they are most certainly underestimates, because tea likely played a role in reducing mortality rates in parishes with relatively good water quality over this period as well.

Although the broader impact of tea consumption on mortality rates at the dawn of the Industrial Revolution has been hypothesized by the historians noted above, to my knowledge this paper provides the first quantitative evidence on this relationship. Consequently, this paper has the potential to make a significant contribution to the literature on the origins of the Industrial Revolution. This article also makes a significant contribution to the field of economic development which has recently seen a surge in attention devoted to improvements in water quality in currently developing countries. While the literature has primarily focused on evaluations of policy interventions and randomized trials, this paper is an important exception. Here, I present a case in which water quality was improved without concerted intervention, but instead through a change in culture and custom that ultimately may have proved critical for long-run economic development.

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Table 1: Descriptive Statistics

Panel A: Parish Characteristics	Mean	Std Dev	Median	N
Parish on coast or within 10 km of coast	0.267	0.443	0	404
Distance to Nearest Market Town in 1700 (km)	4.433	3.534	4	404
Area (acres)	5750.579	5348.921	4237	394
Population Density in 1700 (Pop_Constructed_1700/Area)	1.916	19.367	0.144	394
Parish altitude (meters)	83.502	60.246	76.61662	402
ln(Altitude)	4.112	0.907	4.338814	402
Parish slope (degrees)	2.407	1.579	1.924	402
ln(Slope)	0.702	0.591	0.654	402

Panel B: Parish-year characteristics, 1700-1839	Mean	Std Dev	Median	N
Deaths (burials)	31.438	43.998	20	52516
ln(Deaths)	2.963	0.993	2.996	52516
Births (baptisms)	41.029	60.276	27	52637
ln(Births)	3.253	0.958	3.296	52637
Marriages	11.558	20.553	7	50662
ln(Marriages)	1.911	0.997	1.946	50662
Population (Constructed Measure)	1247.764	1648.759	839.614	52849
ln(Population, Constructed)	6.735	0.852	6.733	52849

Panel C: Annual Imports, 1761-1834	Mean	Std Dev	Median	N
East India Company Tea Imports, millions of pounds, lagged	18.005	11.778	17.324	74
ln(Tea), lagged	2.590	0.878	2.851	74

Table 2A: Mortality & Post-Widespread Adoption of Tea
Controlling for Constructed Population

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
Post1785*ln(Altitude)	0.0194***		
	(0.00696)		
Post1785*ln(Slope)		0.0203*	
		(0.0109)	
Post1785*ln(1700PopDensity)			-0.00730
			(0.00608)
ln(Population)	0.807***	0.808***	0.817***
	(0.0440)	(0.0441)	(0.0451)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	52,223	52,223	51,163

Robust standard errors clustered at parish level in parentheses
below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 2B: Mortality & Post-Widespread Adoption of Tea
Controlling for Births and Marriages

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
Post1785*ln(Altitude)	0.0502***		
	(0.0120)		
Post1785*ln(Slope)		0.0478**	
		(0.0188)	
Post1785*ln(1700PopDensity)			-0.0138
			(0.0127)
ln(Births)	0.287***	0.284***	0.285***
	(0.0176)	(0.0175)	(0.0182)
ln(Marriages)	0.0639***	0.0647***	0.0654***
	(0.00622)	(0.00640)	(0.00655)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	49,965	49,965	48,926

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 2C: Mortality & Post-Widespread Adoption of Tea
Controlling for Marriages

	(7)	(8)	(9)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
Post1785*ln(Altitude)	0.0404***		
	(0.0150)		
Post1785*ln(Slope)		0.0459**	
		(0.0233)	
Post1785*ln(1700PopDensity)			-0.0207
			(0.0155)
ln(Marriages)	0.0923***	0.0926***	0.0936***
	(0.00830)	(0.00840)	(0.00871)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	50,102	50,102	49,063

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 3A: Mortality & Post-Widespread Adoption of Tea
Controlling for Leads and Constructed Population

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
Post1760*ln(Altitude)	-0.00901		
	(0.0128)		
Post1770*ln(Altitude)	0.00370		
	(0.0117)		
Post1785*ln(Altitude)	0.0227***		
	(0.00774)		
Post1760*ln(Slope)		-0.0378**	
		(0.0164)	
Post1770*ln(Slope)		0.0133	
		(0.0171)	
Post1785*ln(Slope)		0.0359***	
		(0.0119)	
Post1760*ln(1700PopDensity)			0.0132**
			(0.00599)
Post1770*ln(1700PopDensity)			-0.000172
			(0.00633)
Post1785*ln(1700PopDensity)			-0.0165***
			(0.00575)
ln(Population)	0.808***	0.810***	0.818***
	(0.0444)	(0.0443)	(0.0451)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	52,223	52,223	51,163

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 3B: Mortality & Post-Widespread Adoption of Tea
Controlling for Leads, Births and Marriages

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
Post1760*ln(Altitude)	0.0121		
	(0.0113)		
Post1770*ln(Altitude)	0.00961		
	(0.00975)		
Post1785*ln(Altitude)	0.0339***		
	(0.00988)		
Post1760*ln(Slope)		-0.0277*	
		(0.0166)	
Post1770*ln(Slope)		0.0223	
		(0.0147)	
Post1785*ln(Slope)		0.0489***	
		(0.0143)	
Post1760*ln(1700PopDensity)			0.0129*
			(0.00704)
Post1770*ln(1700PopDensity)			0.00242
			(0.00602)
Post1785*ln(1700PopDensity)			-0.0248***
			(0.00910)
ln(Births)	0.287***	0.284***	0.286***
	(0.0175)	(0.0175)	(0.0182)
ln(Marriages)	0.0635***	0.0647***	0.0653***
	(0.00622)	(0.00640)	(0.00653)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	49,965	49,965	48,926

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 3C: Mortality & Post-Widespread Adoption of Tea
Controlling for Leads and Marriages

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
Post1760*ln(Altitude)	0.0185		
	(0.0129)		
Post1770*ln(Altitude)	0.00853		
	(0.0102)		
Post1785*ln(Altitude)	0.0205*		
	(0.0118)		
Post1760*ln(Slope)		-0.0153	
		(0.0190)	
Post1770*ln(Slope)		0.0143	
		(0.0160)	
Post1785*ln(Slope)		0.0449***	
		(0.0169)	
Post1760*ln(1700PopDensity)			0.00476
			(0.00807)
Post1770*ln(1700PopDensity)			0.00170
			(0.00667)
Post1785*ln(1700PopDensity)			-0.0255**
			(0.0107)
ln(Marriages)	0.0918***	0.0926***	0.0936***
	(0.00827)	(0.00839)	(0.00871)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	50,102	50,102	49,063

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 4A: Impact of Tea on Mortality, Controlling for Constructed Population

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
lnTea*lnAltitude	0.0107***		
	(0.00327)		
lnTea*lnSlope		0.0178***	
		(0.00489)	
lnTea*lnPopulationDensity_1700			-0.00601**
			(0.00246)
ln(Population)	0.720***	0.717***	0.722***
	(0.0537)	(0.0534)	(0.0543)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	26,745	26,745	26,199

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 4B: Impact of Tea on Mortality, Controlling for Births and Marriages

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
lnTea*lnAltitude	0.0130***		
	(0.00438)		
lnTea*lnSlope		0.0230***	
		(0.00618)	
lnTea*lnPopulationDensity_1700			-0.0104**
			(0.00404)
ln(Births)	0.233***	0.232***	0.230***
	(0.0166)	(0.0165)	(0.0168)
ln(Marriages)	0.0439***	0.0437***	0.0443***
	(0.00674)	(0.00675)	(0.00690)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	25,986	25,986	25,446

Robust standard errors clustered at parish level in parentheses below point estimates

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4C: Impact of Tea on Mortality, Controlling for Marriages

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
lnTea*lnAltitude	0.00778		
	(0.00513)		
lnTea*lnSlope		0.0202***	
		(0.00734)	
lnTea*lnPopulationDensity_1700			-0.00997**
			(0.00456)
ln(Marriages)	0.0608***	0.0606***	0.0606***
	(0.00763)	(0.00760)	(0.00779)
Constant	2.904***	2.937***	2.929***
Year FEs	YES	YES	YES
Observations	26,086	26,086	25,546

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 5A: Robustness to Additional Controls
Controlling for Constructed Population

	(1) ln(Deaths)	(2) ln(Deaths)	(3) ln(Deaths)
lnTea*lnAltitude	0.00908**		
	(0.00425)		
lnMiscImports*lnAltitude	0.00496		
	(0.00660)		
lnTea*lnSlope		0.0163***	
		(0.00623)	
lnMiscImports*lnSlope		0.00918	
		(0.00970)	
lnTea*lnPopDensity_1700			-0.000801
			(0.00256)
lnMiscImports*lnPopDensity_1700			-0.00719
			(0.00458)
lnTea*NearCoast	-0.000552	-0.00944	-0.00701
	(0.00717)	(0.00674)	(0.00686)
lnTea*DistanceToMarket	0.00269***	0.00293***	0.00181*
	(0.000842)	(0.000844)	(0.000947)
ln(Population)	0.718***	0.716***	0.722***
	(0.0532)	(0.0527)	(0.0538)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	26,745	26,745	26,199

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 5B: Robustness to Additional Controls
Controlling for Marriages and Births

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
lnTea*lnAltitude	0.0122***		
	(0.00455)		
lnMiscImports*lnAltitude	0.00737		
	(0.00609)		
lnTea*lnSlope		0.0213***	
		(0.00623)	
lnMiscImports*lnSlope		0.0122	
		(0.00976)	
lnTea*lnPopDensity_1700			-0.00299
			(0.00319)
lnMiscImports*lnPopDensity_1700			-0.00987*
			(0.00568)
lnTea*NearCoast	0.00789	-0.00440	-0.00190
	(0.00981)	(0.00935)	(0.00941)
lnTea*DistanceToMarket	0.00399***	0.00430***	0.00275**
	(0.00122)	(0.00123)	(0.00135)
ln(Marriages)	0.0445***	0.0443***	0.0445***
	(0.00673)	(0.00672)	(0.00689)
ln(Births)	0.233***	0.232***	0.230***
	(0.0164)	(0.0163)	(0.0166)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	25,986	25,986	25,446

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Table 5C: Robustness to Additional Controls
Controlling for Marriages

	(1)	(2)	(3)
	ln(Deaths)	ln(Deaths)	ln(Deaths)
lnTea*lnAltitude	0.00877*		
	(0.00497)		
lnMiscImports*lnAltitude	0.00514		
	(0.00663)		
lnTea*lnSlope		0.0193***	
		(0.00676)	
lnMiscImports*lnSlope		0.0104	
		(0.0111)	
lnTea*lnPopDensity_1700			-0.00242
			(0.00359)
lnMiscImports*lnPopDensity_1700			-0.00972
			(0.00616)
lnTea*NearCoast	0.0118	0.00307	0.00582
	(0.0114)	(0.0109)	(0.0109)
lnTea*DistanceToMarket	0.00406***	0.00437***	0.00296*
	(0.00147)	(0.00148)	(0.00160)
ln(Marriages)	0.0613***	0.0612***	0.0609***
	(0.00763)	(0.00759)	(0.00780)
Parish FEs	YES	YES	YES
Year FEs	YES	YES	YES
Observations	26,086	26,086	25,546

Robust standard errors clustered at parish level in parentheses below point estimates
*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Team Imports from China and the English Crude Death Rate

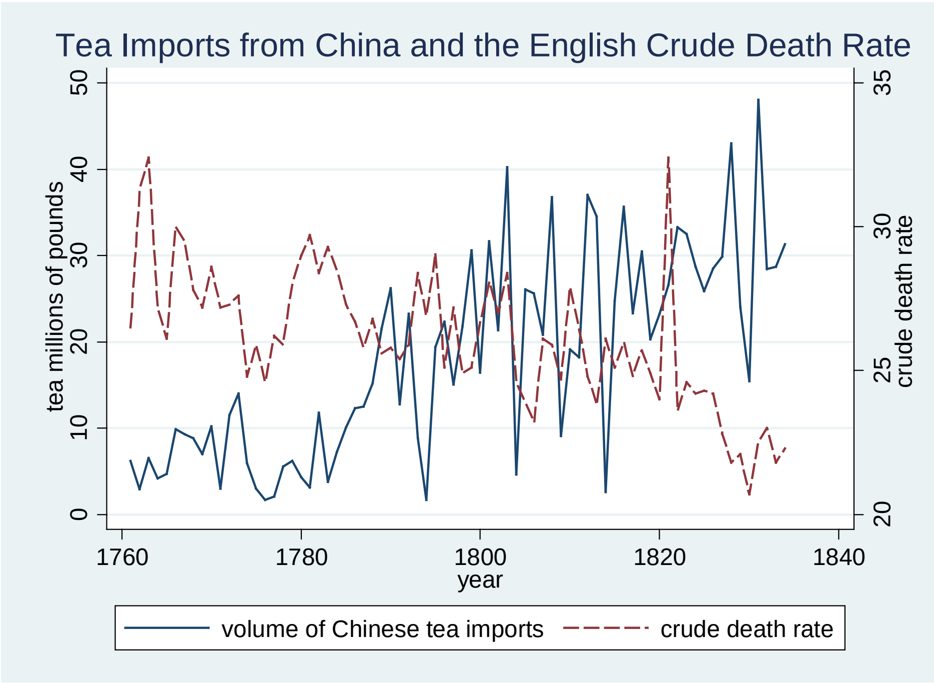

Figure 2: Average Parish Death Rates by Altitude and Lagged Tea Imports

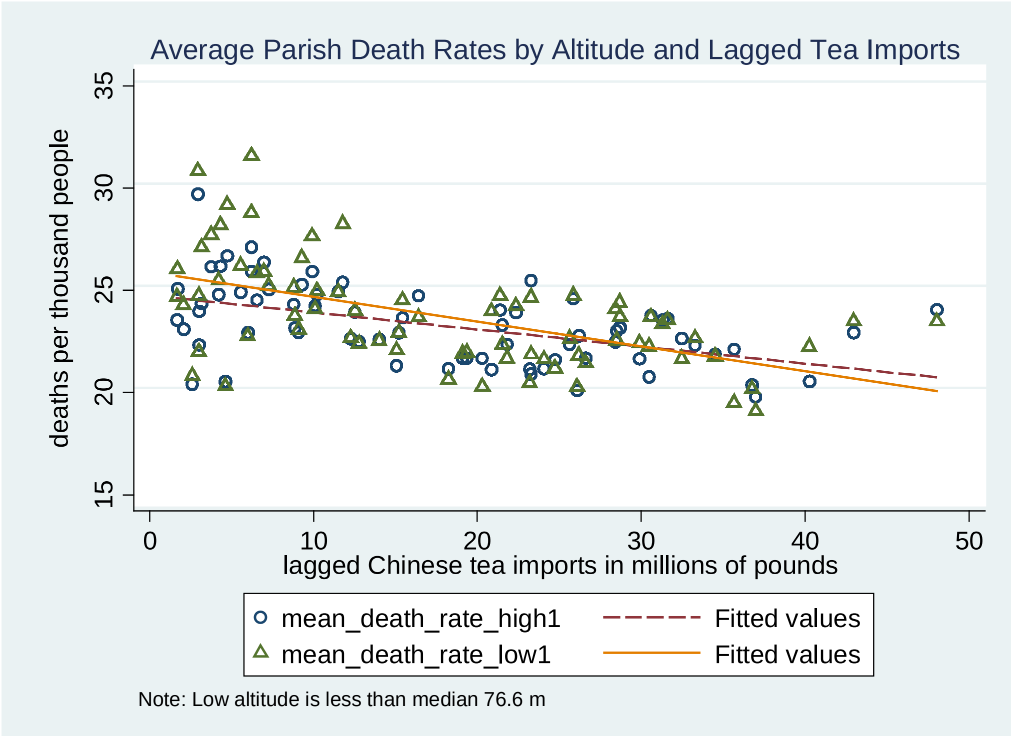

Figure 3: Average Parish Death Rates by Slope and Lagged Tea Imports

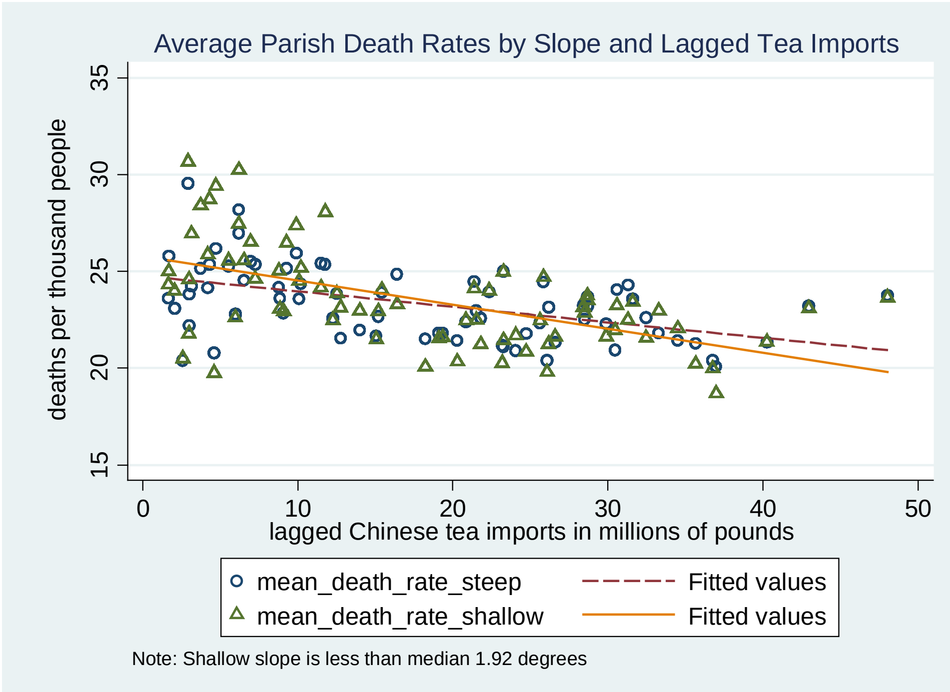

Figure 4: AverageParish Death Rates by Population Density in 1700 and Lagged Tea Imports