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Pudding, Plague and Education: trade and human capital formation in an agrarian economy

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Abstract

During the late 19th century, the increasing popularity of pudding in England, along with the outbreak of phylloxera plague in French vineyards had an unintended effect in the agrarian economy of Greece. In particular, these events escalated the international demand and production of currants in Greece during the 1870s, causing an unprecedented positive shock that was transmitted through trade in the agricultural population. Using novel data from historical archives, we explore how this exogenous event affected investment towards human capital. Consistent with expectations, in an agrarian economy that specializes in unskilled labour-intensive agricultural goods, this shock had a negative effect on human capital formation.

Keywords: Education; Fertility; Agriculture; International Trade

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1 Introduction

Human capital ranks among the most important determinants of growth and income. Recent studies cite human capital as the prime force of divergence in incomes between rich and poor countries (see e.g. Jones, 2014; Lucas, 2015). In a historical context, investment on human capital is considered the main determinant of the transition from an epoch of economic stagnation to the modern era of sustained economic development (see e.g. Galor and Weil, 1999, 2000; Galor and Moav, 2002).

A parallel body of research investigates why some countries invested earlier in mass education whereas others were left behind. In particular, this literature explores how specific historical events affected human capital formation, analyzing the role of domestic institutions (see e.g. Lott, 1999; Gallego, 2010; Acemoglu et al., 2014) and socioeconomic structure (see e.g. Baten and Hippe, 2018) on promoting policies and reforms aimed at the general education of the population.[1] Along the same lines, a number of scholars also highlight the importance of the international trade on the demand of human capital across countries and investigate whether international trade affected industrial and nonindustrial economies in a heterogeneous way (see e.g. Wood and Ridao-Cano, 1999; Redding and Schott, 2003; Blanchard and Olney, 2017).[2]

Focusing on the effect of international trade on comparative development during the second phase of industrial revolution, Galor and Mountford (2008) suggest that gains from trade en-

[1] A strand of this literature focuses on the role of specific events, like agricultural shocks, military treats or conflicts on educational attainment (see e.g. Björkman-Nyqvist, 2013; Baker, 2015; Aghion et al., 2019; Baker et al., 2020). Furthermore, a large body of research explores the role of geography and landownership concentration and cite as a prime determinant of mass education reforms, the historical conflict between the entrenched landownership elite and the emerging capitalist elite within each country (see e.g. Galor et al., 2009; Kourtellos et al., 2013; Cinnirella and Hornung, 2016).

[2] The importance of openness has also been highlighted by a parallel literature that investigates the relationship between agricultural productivity and structural transformation. Although a number of studies suggest that a rise in agricultural productivity may boost human capital accumulation (see e.g., Foster and Rosenzweig, 1996) and reallocate labour towards the industrial sector of the economy (see e.g., Bustos et al., 2016), others conclude that if the economy is sufficiently open, increasing agricultural productivity may strengthen the comparative advantage in agriculture and consequently harness human capital accumulation and industrialization (see e.g., Mokyr, 1977; Field, 1978; Matsuyama, 1992).

hanced the specialization of industrial economies in the production of industrial, skill-intensive, goods. The associated rise in the demand for skilled labour increases human capital accumulation and reduces fertility, stimulating technological progress and further enhancing the comparative advantage of these industrial economies. By contrast, in less technologically advanced economies international trade generated an incentive to specialize in the production of unskilled-intensive, nonindustrial goods. This is expected to increase the demand for unskilled labour, reduce human capital accumulation and increase fertility. Consistent with this theory, Bignon and Garcia-Peñalosa (2021) document how agricultural protectionism in an industrialised economy like France in late 19th-century, reversed the long-term improvements in education and the fertility transition that were well under way.

The paper at hand places the spotlight in a nonindustrial economy, namely Greece, during the second half of the 19th century to explore how a shock that was transmitted through trade in the agricultural population affected education and birth rates. During the period under investigation (i.e. from 1861 to 1879) the Greek economy – a typical agrarian economy with more than 76% of the workforce employed in agriculture – faced an incredible rise in the international demand for currants (i.e. a domestic good that was produced in Southern Greece from the Middle Ages) for two separate and purely exogenous reasons.[3] First, the increasing popularity of pudding (i.e. a dessert made by flour and currants) in Britain, where it was consumed by the British aristocracy as well as the ascending British bourgeois, signifying an increasing welfare (see Bakounakis, 1988). Second, in the mid-1870s French vintners decided to substitute currants for grapes in wine and cognac production, since grapes were contaminated by the "phylloxera plague", which destroyed an estimated 2,000,000 acres of vineyards until 1874 (see Pizanias, 1988).[4] As a result, currants' production in Greece increased by 50% during the 1870's to meet the explosive demand of currant exports, reaching levels around 80% of total exports in the same period [see, Figure 1].[5] Importantly, this increase in currant production did

[3] The first to describe the currant-vine as a distinctive plant, different from the common grape-vive, was the French botanist Bauhin in the 16th century (see Lambrinidis, 1905). He called it Vitis Corinthia sive apyrena and pointed out that its main characteristic was that the berries of currant grapes are seedless and therefore particularly good for consumption in a dried state.

[4] The phylloxera plague has previously been used in notable studies regarding health outcomes (Duflo et al., 2010) and crime rates (Bignon et al., 2017) in 19th century France.

[5] In particular, during the 1860's currants' exports contribute on average 45% of total exports, whereas in 1977

not come as a result of changes in production technology that could increase productivity, but was rather the outcome of the spread of viticulture (see Pizanias, 1988; Franghiadis, 1990). In other words, the shock had an effect on the extensive rather the intensive margin of agricultural production, increasing the amount of arable land used for currant cultivation.

A set of special historical characteristics make the case of Greece unique both from a theoretical and an empirical point of view. First and foremost, Greece was a purely agricultural economy that engaged in international trade with industrialized nations (i.e. Britain, France) after the second half of the 19th century by being specialized in an unskilled labour-intensive, agricultural good (i.e. currants). This guarantees an ideal setup allowing us to check in a direct way the empirical validity of the theoretical predictions formulated by Galor and Mountford (2008). The second characteristic, further solidifying the case of Greece as a very promising setting for the purposes of our analysis, is the nature of the labour requirements related to currant cultivation per se. Currant cultivation requires a set of delicate tasks, based on the use of hand-held tools (i.e. hoe, digging stick) rather than the usage of plough (see Table B.1 from Franghiadis, 1990, for more details on this). Since these operations do not require substantial upper-body strength, grip strength and burst power they can be performed equally well by women or even children.[6] Thus, the incentive of the peasant family to employ their children in the agriculture production rather than sending them to the school is even stronger due to the nature of the labour requirements of this specific cultivation. Third, the fact that currants' production increased for purely exogenous reasons ensures a proper identification for our analysis. The validity of our identification is further reinforced if one takes into account that some regions benefited substantially by this shock (primarilly the coastal areas of North and West Peloponnese) due to their natural endowment to produce currants, whereas other regions remained unaffected.

We develop a unique regional dataset from the mid-19th century Greece, around the period of the increasing pudding consumption on Britain and the outbreak of the phylloxera plague in

this level increases to 79.5%. Between 1878-1880 data are not available, whereas in 1881 this figure remains high at 69%.

[6] Starting from Boserup (1970) a number of scholars suggest that that the origin of differences in the role of women in societies lay in the different types of agriculture traditionally practiced across societies and more precisely on the differences between shifting and plough agriculture (see e.g. Alesina et al., 2011, 2013; Giuliano, 2015).

France. Then, we employ a Difference-in-Difference-in-Difference (DDD) approach to take care of local, time-invariant omitted factors focusing on the change in students' ratio and birth rates between 1870 and 1879. Our empirical specification exploits the uneven spatial variation of land dedicated to currant production prior to the shock (in 1860), as a measure of treatment from the increased demand due to international trade, interacted with the change in the agricultural population during the shock. We use a variable that can be linked to currants' production, since during this period almost all the production of currants was directed to exports, while it also allows us to have variability at the regional level. Furthermore, we use this treatment variable for a period before the shock in an attempt to mitigate endogeneity concerns (see e.g. Cascio and Washington, 2013; Carruthers and Wanamaker, 2015). This variable is interacted with the change in agricultural population, as the shock was materialized at the local level through its settlement in these currant producing areas. To put it more simply, we intend to compare the response of the agricultural population (affected by the shock) towards education and fertility in currant vs non-currant producing areas. Consistent with expectations, our analysis suggests that agricultural population growth is linked with a higher reduction in students' ratio between 1870 and 1879, as the landsize dedicated to currants increases.

Our empirical results are in line with the theoretical prediction of Galor and Mountford (2008) as far as it concerns human capital formation. Namely, since Greece was an agricultural economy that engaged in international trade with industrialized nations (i.e. Britain, France), potential gains from trade generated an incentive of specialization in currant cultivation (i.e. an unskilled labour-intensive agricultural good) which was accompanied by a decrease in investment in mass education. However, our analysis fails to provide evidence of a positive effect on fertility decisions as suggested by Galor and Mountford (2008) in the context of a child quantity-quality trade off. A potential explanation could be that by obliging women to stay away from the field for child bearing activities, the cost of having children increases (see Giuliano, 2015, for more details on this).[7] Moreover, if one takes into account that the time-period

[7] According to Giuliano (2015) one may expect that societies with historical plough use will have higher levels of fertility. When women are less likely to participate in the field, the cost of having children lowers and consequently fertility increases. On the other hand, with plough agriculture, children, like women, are relatively less useful in agricultural production. The plough requires strength and eliminates the need for weeding, a task particularly suitable for women and children. This in turn generates a preference for fewer children,

of our analysis is overly short, this may debilitate an accurate investigation of potential long-run effects on fertility decisions (see e.g. Becker et al., 2010, for more details on this).

Once we differentiate between gender, our analysis provides empirical evidence that potential gains from trade exerted a negative impact on male student ratio, but had no effect on female student ratio. The presence of gender bias in agriculture has been noted in older studies (Boserup, 1970) and empiricaly tested in recent ones (Rose, 2000; Alesina et al., 2013; Giuliano, 2015). Similarly, the impact of agricultural shocks tends to affect women disproportionately as well (Mahajan, 2017; Asfaw and Maggio, 2018), related to either lower expenditures (Cameron and Worswick, 2001), or lower probability of investment towards female education (Björkman-Nyqvist, 2013).

To the best of our knowledge this is the first empirical study that explores the effect of a shock transmitted through international trade on human capital formation during the 19th century in a nonindustrial economy. Previous studies either investigate a similar effect using historical data in an industrialized economy (see e.g. Bignon and Garcia-Peñalosa, 2021), or rely on modern data and provide evidence based on large sets of developing and developed countries (see e.g. Galor and Mountford, 2008; Blanchard and Olney, 2017). By employing historical data from the 19th century, our analysis seeks to explore in a direct way the theoretical predictions formulated by Galor and Mountford (2008) that build their analysis upon a phenomenon which took place after the second phase of the Industrial Revolution. Our analysis also complements the work of Bignon and Garcia-Peñalosa (2021) that investigate the same phenomenon from the point of view of an industrialized economy.

This paper shares much with two strands of the literature that relate human capital formation and historical events, as well as investigating the effects of agricultural shocks on education. The former studies are centered on the potential impacts of agricultural or human diseases such as the boll weevil infestation (Baker, 2015; Baker et al., 2020) or the hookworm disease eradication (Bleakley and Lange, 2009) had on domestic human capital formation. The latter strand of the literature either highlights how extreme weather events, such as droughts (Joshi, 2019) and abnormal deviations in rainfall (Jensen, 2000), have an impact on educational outcomes through their effect on household income (Björkman-Nyqvist, 2013), or labour supply (Shah and Steinberg, 2017). Our analysis investigates how an agricultural supply shock abroad may

lowering fertility.

be transferred through the international trade channel to a foreign economy, undermining the prospects of economic development by harming human capital formation – based on a comparative advantage rationale.

Second, this paper relates much to the literature that investigates the effect of increasing agricultural productivity on human capital formation and consequently domestic structural transformation. The relevant discussion dates back at least to Clark (1940), Lewis (1954) and Kuznets (1957). According to the conventional view – largely based on the experiences of the Industrial Revolution in Britain – there is a positive relationship between agricultural productivity and industrialization.[8] However, several scholars have noted that the positive effect of agricultural productivity on industrialization takes place solely on closed economies, while in open economies a comparative advantage in agriculture can slow down structural transformation and industrial growth (see e.g., Mokyr, 1977; Field, 1978). Similarly, a more recent theoretical literature concludes that a rise in agricultural productivity may boost human capital accumulation (see e.g., Foster and Rosenzweig, 1996) and reallocate labour towards the industrial sector of the economy (see e.g., Bustos et al., 2016). Nevertheless, if the economy is sufficiently open the outcome may be entirely different, since the increasing agricultural productivity may strengthen the comparative advantage in agriculture and consequently harm human capital accumulation and industrialization (see e.g., Matsuyama, 1992; Galor and Mountford, 2008; Carillo, 2021). Our analysis is in accordance with the conclusions of Matsuyama (1992) and Galor and Mountford (2008) by highlighting the important role of international trade on the obtained findings.[9]

[8] This is because (i) rising productivity in food production makes it easier to feed the growing population in the industrial sector and (ii) higher income generated on agriculture provide domestic demand for manufacturing goods.

[9] It is important to note that this literature is at best parallel to our study, since our analysis is based on a positive international demand (rather than supply/technological) shock. In addition, the international demand shock led – in our case – to increasing production of currants by using more arable land (i.e., more extensive agriculture) rather than increasing the productivity of the existing arable land (i.e., more intensive agriculture). During the period under investigation, Greece was an economy characterized by relative abundance of arable land and relative scarcity of labour force (see Petmezas, 2003, for more details on this), therefore the increased employment of the domestic population in agriculture produces similar results to those predicted by Matsuyama (1992) and Galor and Mountford (2008) concerning human capital accumulation. Namely, the positive international demand shock seems to have "locked" large amounts of labour force in

The rest of the paper is organized along the following lines. Section 2 contains an overview of the historical background, along with relevant literature and theoretical arguments. Section 3 goes through a description of the data. Section 4 presents the empirical model, main results, and a series of robustness checks. Section 5 concludes.

2 Historical Background

2.1 Pudding, plague and the international demand for currants

Britain had already entered the pudding era when Charles Dickens in his famous novel "A Christmas Carol" was praising currants as one of those legendary goods that symbolized abundance and the increasing welfare of the British bourgeois during the Victorian Era. Tea, sugar and pudding consumption grew astonishingly in the 1860s and 1870s. While the average British consumer consumed 14 pounds of sugar per year until then, this increased to 60 pounds in 1876, and similarly the total annual currant consumption increased from 14.000 to 46.000 tons in 1874 (see Bakounakis, 1988). The driving force behind this sharp increase in demand for currants was the increasing popularity of pudding, initially consumed by the British aristocracy and the ascending British bourgeois in the late 1840s. A few decades later pudding gradually became part of the diet of the British working class as well, thus a very popular dessert in Britain. Greek currants quickly displaced other similar goods in the markets of London and Liverpool, and their market share reached a level of approximately 70-75% – as a share of the total consumption of raisins – within Britain during the 1870s (see e.g. Hairetis, 1883).[10]

The international demand for currants was further reinforced in the end of the 1870's, after the decision of French wine makers to substitute grapes with currants in order to produce wine and cognac, due to the "phylloxera plague". Phylloxera, a combination of the Greek words phyllo (leaf) and xera/xeros (dry), is a pest of grapevines originating from North America, that had a devastating impact in late 19th century France (Boubals, 1993).[11] The Great French Wine

agriculture, undermining the prospects of human capital formation and structural transformation.

[10]It should be noted, for the sake of clarification, that currants are essentially one specific type of raisins. In other words, not all raisins are currants, but all currants are raisins i.e. dried grapes.

[11]The probable introduction of the pest can be traced to insect samples received from entomologists in England around 1863, and quickly spreaded to other European countries (Powell et al., 2013).

Blight, as it came to be known, affected the majority of France's vineyards during the 1870s and 1880s, destroying a large proportion (40%) of them until the late 1880s (Ordish, 1987), leading up to a 70% decrease of wine production (Meloni and Swinnen, 2013) over the period of the infestation.[12] Greek currants became central to the production of "raisin wines" in France from the 1870s onwards (Figure B.2).[13] Historical evidence shows that the increase in currant demand from France was even larger during the 1880s (Tsiovaridou, 1980), and only came into an abrupt end after wine growers managed to solve the phylloxera plague in the late 1880s (Gale, 2011). Currants had become an increasingly important component of the agricultural economy of Greece during these years (Figure B.3), reaching levels of production similar to dominant crops like wheat and maize by the early 1890s (Figure 2). This overwhelming increase of international demand during the period under investigation, resulted into a specialization in currant production (see e.g. Pizanias, 1988; Franghiadis, 1990).[14]

2.2 Currant viticulture

After the establishment of the Kingdom of Greece (1832) most of the fertile but marshy coastal plains of the North and West Peloponnese were nationalized from the Greek authorities (the so-called *Ethnikes Gaies*). After the 1860s and especially during the 1870s – when the international demand for currants skyrocketed – peasant families from the Peloponnesian highlands migrated, settled and started to cultivate these fertile coastal plains either by paying a specific tax, in essence a form of rent to the Greek State that had the ownership of these lands (the so-called *Epikarpia*, see e.g. Franghiadis, 1990, for more details on this) or by deciding to buy a few – relatively small – pieces of cultivated lands or by entering planting agreements for currant cultivation with a landowner to provide labour in exchange for half of the overall crop yield (the so-called *Emphyteuseis*, see e.g. Petmezas, 2003, for more details on this).[15]

[12]A map showing the impact across regions of southern France is provided in the Appendix, Figure B.1, originally from (Girard, 1883).

[13]Increased exports of French wines towards England during that time [see for example Figure B.5 from Simpson (2004)], may had an additional indirect effect on currant demand.

[14]There are no population censuses available at the same level of aggregation after 1880 and before 1900, thus our analysis only includes the initial period of the shock.

[15]*Epikarpia* was a specific tax on production (i.e. 15% of the gross production) if the cultivated land was granted by the Greek State and the peasants had been using it with the permission of the authorities. *Emphyteuseis*

A clear indication of this phenomenon is that the higher increase in agricultural population between 1870-1879, namely 15%, is observed in the county of Ilia, the biggest producer of currants within the Greek territory. The spread of currant viticulture during the 1870s in several regions of Peloponnese can be better understood if one takes into account that during that period centuries-old olive trees were eradicated in order to expand the land of vineyards. The British consul of Patras Thomas Wood notes in his annual report that *"[...] the olive oil crop in the Morea is likely to show an annual decrease, as many fine olive groves are been ruthlessly cut down to make way for currant and grape vineyards, which the peasants find more remunerative"* (see Franghiadis, 1990; Dertilis, 2015). Given the relative abundance of arable land during that period (see Petmezas, 2003), this is indicative of the degree of expansion in currant's production during that period. Of course, agricultural settlement increased significantly in other areas as well that did not had the natural capacity to produce currants. A stark example is the coastal county of Vonitsis-Xiromerou that has the second highest increase in agricultural population, namely 11%, but has the lowest production of currants among currant producing counties. The latter phenomenon can be attributed to other natural characteristics (e.g., climatic conditions, proximity to the coast) that allowed peasants to settle there and specialise in the production of other agricultural goods (e.g., oat).

Overall, fixed characteristics are principal components of population migration from the Peloponnesian highlands, and natural capacity to produce currants perhaps the most important among them. This agricultural settlement in currant producing areas, allowed some regions of Peloponnese to respond more intensively in the increased international demand for currants. This specialization would not be possible in a context of autarky where the local population would be constrained to cereal cultivation – i.e. the basis of the everyday subsistence during that period (see e.g., Psichogios, 1986). To this end, our goal is to compare the response of the agricultural population (affected by the shock) towards education and fertility as the capacity to produce currants increases.

were agreements between landowners providing land and capital, and peasant families providing labour-related activities. After five to seven years of labour, mature vineyards were divided, generating property titles for each acquired part. All alternative forms of production, i.e. epikarpia and emphyteuseis, came as a respond to an economic environment characterized by land abundance and scarcity of labour.

2.3 International trade and comparative development

To explain the demographic transition and the "Great Divergence" in income per capita across countries in the last two centuries, Galor and Mountford (2008) put the spotlight on international trade. In particular, they argue that the expansion of international trade enhanced specialization of industrial economies in the production of skill-intensive industrial goods, which in turn increased the demand for skilled labour and induced investment in human capital formation. This procedure facilitated the demographic transition, stimulated technological progress and further enhanced the comparative advantage of these countries in the production of skill-intensive goods. On the contrary, in nonindustrial economies international trade generated an incentive to specialize in the production of unskilled labour-intensive agricultural goods and raw materials. The absence of significant demand for human capital failed to produce incentives for investment on education and therefore gains from trade were directed to increases in population size rather than quality of the population. Thus, in nonindustrial economies the demographic transition was significantly delayed, further increasing relative abundance of unskilled labour, delaying the whole process of their economic development.[16].

As we have already noted, the case of Greece ensures an ideal setting that allows us to check the empirical validity of the predictions formulated by Galor and Mountford (2008). Greece was a purely agricultural economy that engaged in international trade with industrialized nations (i.e. Britain, France) after the second half of the 19th century. Given the comparative advantage of the country in an unskilled labour-intensive, agricultural good (i.e. currants), we expect the

[16]On a parallel context, Findlay and Kierzkowski (1983) provide a sound theoretical basis linking the skill-intensity to a country's exports with investment on human capital formation (see e.g. Grossman and Helpman, 1991; Stokey, 1991). Specifically, by following the rationale of the standard Heckscher-Ohlin framework, most of these studies conclude that when a country with a comparative advantage in high-skill intensive goods opens up to trade, the relative price of the skill intensive good will rise and this will drive up demand for high skilled workers and therefore the return to education. Hence, international trade will induce a higher investment in education in countries with comparative advantage in high-skill intensive goods. Obviously, the opposite result will emerge in countries characterized by a comparative advantage in low-skill intensive goods, in which international trade generates incentives to reduce investment on education. This comparative advantage rationale also affects the obtained findings on a parallel literature that investigate the relationship between agricultural productivity shocks and industrialization/structural transformation of the domestic economy (see e.g., Mokyr, 1977; Field, 1978; Matsuyama, 1992, for more details on this)

shock transmitted through trade in the agricultural population to exert a negative impact on investment on education and positive on birth rates. This is because, following the theory, specialization in currants should lessen incentives towards investment in human capital, while on the other hand should increase fertility, since households would benefit from additional labour supply.[17] To better understand these outcomes, it is crucial to elaborate on aspects of this process, such as currant cultivation, the nature of the commercial network and how they affected incentives towards education.

The production of currants was a labour-intensive year-round process, that benefited from extended families (the norm in Greece at the time). Starting around fall various tasks had to take place, such as digging and scrapping of the fields, to prepare the soil for seeding. Afterwards, pruning and similar activities during winter prepared the vineyards, while spring revolved around maintenance chores to ensure the maximization of yields. Finally, early summer was the only period where labour activities were lessened, with harvest taking place around August and September of each year (Kalafatis, 1990).[18] Therefore, due to the nature of this agricultural process (i.e. labour-intensive, long-term cultivation) the increased international demand could be met by cultivators through increased labour supply (Kostelenos et al., 2007). The absence of specific laws against child labour heavily incentivized peasant families to reduce investment in human capital formation of their children, and increase their labour supply instead. That was the main route for families to increase their welfare, as the price of currant remained relative stable during that era (see Figure B.4). Section A.1 in the Appendix elaborates on the nature of the developed commercial network of currants to explain this stability.

[17] It is important to note that at the national level, it is reasonable to postulate that higher demand regardless of type generates a positive aggregate income effect by increasing GDP (as in Feyrer, 2019). A positive aggregate income effect could in turn induce a higher investment in education that could potentially mitigate (or even offset) the incentive effects driven by the basic Heckscher-Ohlin rationale. To evaluate and control for this possibility, we include in our empirical analysis specifications with and without controls for aggregate income. In the absence of household level data, we cannot control for household income effects.

[18] More details about the currant cultivation process can be found in Table B.1 of the Appendix.

3 Data Description

The historical data we use had to be digitized from historical archives, such as population and agricultural censuses from late 19th century Greece. We also recreated the geographical boundaries of Greece during that era, by matching information from databases of local administrative units, in order to create spatial maps and geographical variables for the econometric analysis. The final result is a novel dataset with regional data from Greece between 1860 and 1884. Details about the data construction process can be found in Section A.2 of the Appendix. Definitions and sources of the variables described below can be found in Table B.2.

Our main dependent variables constructed from the censuses of 1870 and 1879 are students, specifically *All Students*, *Female Students* and *Male Students*, as a share of the population (or as we will refer to them, student ratio), as well as births, specifically *Birth Rate*, calculated as the share of births in the total population.[19] Education in Greece between 1850 and 1880 was almost exclusively provided by the state, with private schooling accounting for 5% to 10% of total schooling (Petrogianni, 2005), and more than 80% of students enrolled in primary education (Dimaras, 1975). Schools were distributed evenly across the country (Tsoukalas, 1976), with no notable differences between rural and urban regions at least for the primary level.[20] While the supply of education was relatively homogenous, the quality of primary education largely depended on an ad-hoc basis of each teacher, at least up until 1881 (Lefas, 1942). Both supply of schooling and absolute numbers of male students were substantially higher[21] than female students at the primary level (Tsoukalas, 1977), and such differences were even starker at the secondary level[22], pointing towards an existing gender gap, similar to contemporary agricultural economies (Alderman et al., 1996; WorldBank, 2012).

Our main indepedent variable is *Currant Landsize* (prior to shock in 1860), defined as the amount of arable land devoted for currant agriculture at the county level, as a share of the total land used for currant production in the country.[23] Currants were not produced universally

[19]We use this definition due to the fact that we are unable (in the absence of specific age data) to calculate enrollment rates. To keep our analysis consistent, we apply the same definition for births.

[20]The majority of secondary schools were located in urban areas, due to their low absolute numbers.

[21]In 1865, the number of male-only schools were approximately 7 times that of female-only schools, while male students in primary public education outnumbered female students 4 to 1.

[22]Historical archives estimate that around 4% of secondary education students were female (Chassiotis, 1881).

[23]The data originally comes in the form of *stremmata*, which is the plural of the Greek word *stremma*. One

across the country due to local natural capacity, with less than half of the counties (20 out of 48) being responsible for all currant production in 1860. Detailed regional data are available for different levels of the currant treatment, proxied by the amount of land used for currant production. A map visualizing the amount of land used for currant production in a county (i.e. *Currant Landsize*) of "old Greece" is shown in Figure 3. Deeper shades of brown indicate higher shares of *Currant Landsize*. Evidently, the production of currants was heavily concentrated on the geographical region of Peloponnesus. This information is not available at the samel level of aggregation for any other year around the period of the shock.[24]

We complement data on crop production at the county level with data from the change in agricultural population between 1870 and 1879 at the municipality level. The logic is to compare the reaction of the agricultural population as currant's production and thereby exposure to the shock increases. We provide more details about our empirical strategy in the next section. The variable *Agricultural Population* is the summary of Landowners (Ktimatiai) and Farmers (Agrotai), once again measured as a share of the population.[25] Figure 4 shows the change of *Agricultural Population* in municipalities across "old Greece".[26] Deeper shades of brown indicate higher positive growth rates, while lighter shades indicate negative rates. As can be seen, many regions with growth rates higher than 15 or 20% belong to regions with high currant production. However, it should be noted that similar changes are also observed in non-currant regions (i.e., due to other natural characteristics of the area).

To account for development across different regions, we use the geographical boundaries for the municipalities of 1861 (as described above), to calculate the *Population Density* [see e.g. Acemoglu et al. (2002)]. For the same reason, we create the variable *Industrialists*, defined as the number of industrialists as a share of population. Furthermore, as a proxy for the supply of education at the time, we create the variable *Teachers* as a a share of population, following studies that have used similar measures (see e.g. Cinnirella and Hornung, 2016). Similarly, we

unit of this measurement (stremma) amounts to 1,000 square meters.

[24] Data for currant production are available for 1887, but only at the province level, while data with the same level of aggregation only exist for a period after the shock, namely 1907.

[25] A more relaxed defition of the agricultural population that includes the share of Peasants (Poimenes) and Ploughers (Agogiatai) is used for the robustness checks.

[26] Similar maps for the agricultural population as a share of total population in 1870 and 1879 can be found in the Appendix, namely Figure B.8 and Figure B.9.

create the variable *Buildings*, as a proxy for schools, since we expect a high correlation between the number of total buildings and school buildings. In an attempt to control for additional differential effects over time across regions, we calculate the natural logarithm of distance from the capital of its region (*Distance from Capital*), for each municipality. Finally, we create the dummy variable *Islands*, that takes the value 1 if a municipality belongs to an island, and zero otherwise.

Descriptive statistics for the main dataset (censuses of 1870 and 1879) are summarized in Table B.4. We can observe in the descriptive statistics that *All Students* represent roughly 5% of the overall population, with *Male Students* outnumbering *Female Students* 4 to 1 (on average), while *Birth Rate* represents roughly 3% of the overall population. These ratios are the same between regions that produced currants and the whole country.

4 Empirical Analysis

4.1 Empirical Strategy

To capture the shock that was transmitted through trade in the agricultural population, and explore its effect on education and birth rates, we estimate a Difference-in-Difference-in-Difference model that holds unobserved local characteristics fixed of the following form:

$$\begin{aligned}\Delta ln(Y_{m1879-1870}) = {} & \beta_1 \Delta ln(Agricultural\ Population_{m1879-1870}) + \beta_2 Currant\ Landsize_{c1860} \\ & + \beta_3[\Delta ln(Agricultural\ Population_{m1879-1870}) * Currant\ Landsize_{c1860}] \\ & + \beta_4 \Delta ln(X_{m1879-1870}) + \beta_5 \Gamma_m + \beta_6 Z_p + \beta_7 \Delta ln(Y_{m1870-1861}) + \Delta ln(\epsilon_{m1879-1870}) \quad (1)\end{aligned}$$

where $\Delta\ln(Y_{m1879-1870})$ is municipality m's change of the student ratio (students as a share of population) between the period during (1879) and right before the shock (1870), or alternatively municipality m's change of *Birth Rate* (births as a share of population).[27] $Currant\ Landsize_{c1860}$ is county c's landsize used for currant production as a share of the country's total landsize (for currant agriculture) in the year of the nearest agricultural census (1860) and prior to the shock,

[27] As we noted in Section 3, in the absence of data for births for 1879, we use the closest year available in its place, namely 1884.

while the term $\Delta \ln(Agricultural\ Population_{m1879-1870})$ captures municipality m's change of agricultural population between the two periods, and $\Delta ln(\epsilon_{m1879-1870})$ is an i.i.d. error term.

The main variable we use to capture the shock is the interaction between the change in the share of agricultural population, and the $Currant\ Landsize_{c1860}$. We prefer the latter for three different reasons. First and foremost, during this period almost the entire production of currants was directed to exports, whereas this is the only variable from the historical archives that allows us to capture heterogeneity at the regional level. Second, and related to that, data on land suitability for currants are not available (e.g., Global Agro-Ecological Zones (GAEZ) project). Also, the alternative would be to use more general agricultural suitability data (e.g., soil fertility). The main issues with this choice are: (i) we have less precision to capture the potential exposure to the shock; (ii) data are available for a later period (1960-1990) and as a result they can be affected by human intervention (see e.g. Cinnirella and Hornung, 2016). Third, although we are constrained by data availability to use a fixed measure in 1860, we would prefer this even if we had data for later years as it less likely to be endogenous in comparison to a share that changes over time (see e.g. Cascio and Washington, 2013; Carruthers and Wanamaker, 2015). The logic is that counties with a higher share of the country's overall currant landsize prior to the big shock had the natural endowment to respond more intensively in the increased international demand for currants.[28] A clear indication towards this direction is that the correlation of the landsize dedicated to currants production at the province level between 1861 and 1887 is 94 percent.[29]

We combine $Currant\ Landsize_{c1860}$ with the change in the agricultural population between 1870-1879 in order to observe how the agricultural population reacted as exposure to the shock increases. We expect that municipalities with better natural endowment to produce currants would be able to react to the increased demand through their respective agricultural popu-

[28] Previous studies have also used past values of production to measure suitability (see e.g., Dube et al., 2016). Our difference with that approach is that we lack more observations to take the average of currant production prior to the shock.

[29] It should be noted that data from the agricultural census of 1887 are not used in the empirical analysis for three reasons: (i) because as already mentioned we prefer our lagged measure to mitigate endogeneity concerns; (ii) information is available at the province – not the county level as in the agricultural census of 1860; (iii) information comes much later (1887) in comparison to the last year we have information for the students' ratio (1879).

lations. Thus, we want to explore how this reaction affects decisions towards education and fertility, in comparison to areas that natural characteristics did not allow the transmission of the shock. In other words, if the enormous expansion in international demand for currants incentivized specialization of the agricultural population in this low-skilled agricultural good – thereby prompting households to increase labour supply of their children, rather than investing in their education – we would expect a negative and statistically significant effect of the interaction term. Due to the nature of currant cultivation, this increased demand may have a positive effect on birth rates (incentive to have more children employed in production), while also a negative effect (cost of child bearing activities keeping women away from the field).

As our empirical specification is in changes, we need to worry about the changing rather than fixed characteristics of municipalities. To address these concerns we will use control variables as defined in Section 3 (e.g., *Industrialists*), province specific shocks (Z_p) and the previous change of the dependent variable. For our main analysis we focus on municipalities that were part of the currant regions, thus comparing areas with low and high capacity to produce currants, and expand our sample to include municipalities from the whole country later in the analysis. To address the issue that the amount of landsize dedicated to currants varies at the county level, therefore municipalities within each county are not independent, we cluster the standard errors at the county (eparhia) level, in all specifications. Finally, all regressions are weighted by the population of 1870.

4.2 Baseline Results

The results for the effect of currant and agricultural population on the change of total student ratio are reported in Table 1. We adopt an "incremental" strategy and estimate alternative specifications where we progressively add new controls (regional fixed effects, geographical controls etc). As it can be seen, the interaction term enters the regressions with the expected negative sign and is highly statistically significant throughout, between 5% and 1% level of significance. According to the results, rather than a positive agricultural shock leading to an incentive for further investment in human capital, the overall effect in currant endowed regions with significant agricultural population growth appears to lessen such incentives. For instance, when the agricultural population growth is 30%, a one unit increase in *Currant Landsize* leads to a decrease in the students' ratio by 0.4 percentage points. This finding is in line with the theoretical arguments from Galor and Mountford (2008).

The other side of the argument from Galor and Mountford (2008) stresses that due to the increased specialization towards a low-skilled good, there should be positive effects on fertility rates, due the increased need for labour supply - at least in the long run. To check for this, we repeat our analysis, only now instead of student ratio we use the *Birth Rate* as our dependent variable. The results are reported in Table 2, following the same structure as Table 1. We find no clear evidence of such a positive relationship between the increased demand for currants and birth rates.[30] There are two reasons that may explain this lack of evidence. Firstly, currant cultivation had conflicting effects on fertility decisions, due to the nature of the specific crop. On the one hand, additional children could be used in the field, therefore families had incentives to increase fertility rates. On the other hand, currant cultivation benefited from the participation of women of the household, thus increased child bearing activities may increased the indirect labour cost – i.e. less time spend on the field – therefore lessening incentives towards fertility. Secondly, the relatively short period of our analysis, may not be enough for such changes in fertility to become significant, as in other studies with longer time horizons (e.g. Bignon and Garcia-Peñalosa, 2021).

Overall, it seems that incentives towards specilization in this low-skilled agricultural good had a more pronounced effect compared to any income effects from the increased international demand for currants. In line with findings from relevant literature (e.g. Kruger, 2007), households may primarily responded to the increased demand by adjusting the time allocated to different activities, and most likely opted to increase labour supply from their children, rather than sending them to school. However, the response of households in the aftermath of agricultural shocks has been shown to differ across gender (Beegle et al., 2008; Maccini and Yang, 2009; Björkman-Nyqvist, 2013). To establish whether this holds true in our case, we proceed by analyzing the effects of the shock on the change in male and female student ratio.

[30] We only include our baseline analysis for *Birth Rate*, since we find no evidence of such a relationship in the rest of the analysis as well.

4.3 Differential Effect

Breaking down the differential effects of the agricultural population and currant production on female and male students is reported in Table 3. A similiar analysis to Table 1 is provided, following the same structure, only now columns (1) to (6) report the effect on the change in the female student ratio [$\Delta ln(Female\ Students_{m1879-1870})$]. In all specifications, it is clear that there was no effect on female students. It appears that instead of assisting in the production, households may assigned females an increased amount of domestic work which would not interfere with schooling [e.g. similar to arguments from Björkman-Nyqvist (2013)], or just maintained current schooling enrollment.

The rest of Table 3 repeats the analysis in an equivalent fashion, but the dependent variable is replaced with the change in the male student ratio [$\Delta ln(Male\ Students_{m1879-1870})$]. Columns (7) to (12) report the results in the same way as the previous six columns. The interaction between the change of the agricultural population in regions with higher currant production has a negative effect on male students, similar to our baseline results. For males, it seems that being able to contribute more to the household income, as well as making it easier to support a family of their own in the future, was more important. On the other hand, females were less likely to attend school during this period, which would explain why they were probably not affected, since any effects from changes due to this shock were smaller to begin with.

4.4 Robustness checks

4.4.1 Placebo tests

Given that we find no effect on birth rates, in this section we investigate the robustness of the results we obtain for students. Our first robustness check is to perform two placebo tests where we first replace *Currant Landsize* with *Wheat Landsize*, and then *Agricultural Population* with *Shepherd Population*, in our empirical specification. The logic for the first test is that wheat was the main agricultural crop produced at the time (in both total landsize and volume of production), and – perhaps unsurprisingly – was primarily consumed inside the country. An important consideration for our analysis is whether the change in agricultural population may had an effect on the student ratio of municipalities, regardless of the presence of currant production, thereby violating our assumption that the exogenous shock in currant demand had an effect on education through currant agriculture. To test our assumption, we interact the change in agricultural population with the amount of land (as a share % of total country production) that was dedicated to wheat agriculture (*Wheat Landsize*). Along the same lines, in a second specification we interact *Currant Landsize* with a part of the agricultural population that we do not expect to respond to the shock of increased demand for currants, namely *Shepherd Population*.

Results of the two tests are reported in Tables 4 and 5, respectively. Columns (1) and (2) report results without controls, and results with the full set of controls, respectively, for the total student ratio. Columns (3) and (4) repeat the same analysis (baseline and full controls), for the female student ratio, whereas columns (5) and (6) for the male student ratio. We can observe in Table 4 that the interaction between the wheat landsize and the agricultural population is not statistically significant for the total and the male student ratio. Interestingly, the joint effect of the amount of land used for wheat agriculture and the change in agricultural population on female students, is positive and statistically significant. This effect only applies for this placebo crop, and not for other crops (like maize), and has the opposite sign than our baseline results. Moreover, in Table 5 the interaction term is not statistically significant, in all cases. Overall, these placebo tests support the validity of our assumptions regarding the way the shock was transmitted within the Greek territory, and in particular through the currant agriculture of farmers.

4.4.2 All counties

Our next step is to expand the sample to include all regions of "old Greece". While the baseline comparison was between 1870 and 1879 within regions with higher and lower currant production, now we extend our sample to all regions that we have data availability. This increases our observations from 120 to 270.[31] The reason we did not use these additional

[31] We exclude two specific counties from the large sample, due to data concerns. Specifically, we exclude the counties "Gytheiou" and "Oitylou", which formed a well-known sub-region in Greece called "Mani", that famously enjoyed a special tax-free status for a long time (due to historical reasons related to the Ottoman empire). Therefore, there was no documented information available in general for most aspects of the agricultural production at the time. This reduces the total number of municipalities used from 280, down to 270.

observations until now was to avoid having values of zero or very low natural capacity to produce currants, in the majority of observations. Our main variable remains the amount of land used for currant agriculture, as a share (%) of the total country's production, which is available at the county level.

The results from the expansion of our sample are reported in Table 6. The effects for all three categories of students - all students, males and females - are summarized in the same table, following the structure of Table 4 (i.e. two columns for total student ratio, two for females, two for males). Similar with our baseline results, there is no effect on female student ratio, but the effect on male student ratio remains negative, and statistically significant at the 5% level, driving the results for the ratio of all students.

4.4.3 Pre Trend

Another severe identification concern is that our interaction term could capture pre-existing trends. To alieviate such concerns, we re-estimate Eq.1 by changing the dependent variable from $\Delta ln(Students_{m1879-1870})$ to $\Delta ln(Students_{m1870-1861})$ All other variables remain identical as defined above, apart from the lagged dependent variable (no data available prior to 1861). If our assumption is correct, our results should show no significant effect of the differences from 1870 and 1879 to the differences in the number of students in the earlier period (1861 to 1870).

Table 7 reports the results from the change in time period of the dependent variables, with the same structure as Table 4. There is no evidence of a pre-trend for the total and the male student ratios, confirming our assumption, that the main effect of the exogenous shock on education took place after 1870. There is an indication of that in the female student ratio, but once all controls are added, the effect is not statistically significant. Overall, our baseline analysis maintains its importance.

4.4.4 Viticulture and in-migration

As already mentioned, currant viticulture became feasible mostly through in-migration and permanent settlement of peasant families, previously inhabited on the Peloponnesian highlands to the fertile but marshy coastal plains of the North and West Peloponnese (see e.g. Psichogios, 1986). As a result, one threat to our identification strategy is that the observed impact on schooling is due to a selection effect – i.e. migrants coming from the mountains have a lower valuation of education and are less likely to send their children to school. We attempt to provide evidence against this possibility in Table 8.

In particular, using two empirical specifications in levels for the years in 1861 and 1870 (i.e., prior to the shock and the large wave of in-migration), we introduce the natural logarithm of elevation (*Elevation*) on its own and interacted with the variable *Agricultural Population*. In that way we can check if in higher altitudes – columns (1) and (3) – or in higher altitudes with higher presence of agricultural population – columns (2) and (4) – the students' ratio is lower. As can be seen, in all cases the coefficients of the variable *Elevation* and its interaction with the variable *Agricultural Population* are not statistically significant. Of course, this evidence is not conclusive against a selection effect, but at least we have a clear indication that pre-migration education of agricultural population is not correlated with the dimension of elevation.

4.4.5 Other robustness checks

We conduct a battery of additional robustness checks. In particular, Table B.5 of the Appendix presents our results after interacting our main variable of interest, namely *Currant Landsize*, with all the controls that are differenced. The effects remain similar to our baseline analysis (negative for total number of students and males, no effect for females).

Moreover, in Table B.6 the baseline analysis is repeated, only now instead of currant, maize landsize is used, transformed in the same way. Table B.7 drops the two biggest and smallest counties that produced currants, and while our results lose some significance, we must note that removing these counties equals to roughly 40% of the total landsize used for currant agriculture. A similar exercise can be found in Table B.8 which presents the results when we windsorize outliers, based on a 90% interval.

Regarding alternative measurement of currant production, we use a per capita measurement of *Currant Landsize* in Table B.9. Finally, we run the baseline regressions with no population weights in the regressions presented in Table B.10. Our main results remain robust to all these different specifications.

5 Conclusion

The effect of historical events on determinants of economic significance such as human capital is increasingly being scrutinized. In this paper, we connected historical events in European countries of 19th-century, in order to investigate how a shock transmitted through international trade in the agricultural population played a crucial role in the formation of human capital, focusing on Greece. The increasing popularity of pudding in England, combined with the devastating plague of phylloxera in France, significantly increased demand and production of currants.

The magnitude of this exogenous shock was substantial and went on for most the 1870s and 1880s, as documented in historical evindence. We detailed how the transformation of the agricultural Greek economy following the increased demand for currants took place in specific parts of Greece. Following the shock, we argued that the incentive towards specilization in this low-skilled labour-intensive agricultural good, would lead to a decreased focus on the formation of human capital, in line with theoretical models describing the dynamics of trade between agricultural and industrialized economies (Redding and Schott, 2003). In line with findings from existing literature, we expected that this shock may had a differential gender effect as well (Giuliano, 2015; Asfaw and Maggio, 2018). Similarly, a positive effect on birth rates would be expected, since labour-intensive crop cultivations would be able to benefit from increased child labour supply.

Our findings show that higher exposure of the agricultural population in the shock, had a negative effect on the formation of human capital. This is in line with the theoretical framework of Galor and Mountford (2008), regarding the effects of trade on human capital formation. However, we do not obtain evidence of a positive impact on birth rates, which can probably be attributed to the conflicting effects between currant cultivation and fertility decisions, as well as the short period in consideration. Other studies have pointed out similar effects for contemporary economies (Kruger, 2007), namely that positive shocks in agricultural demand decrease school enrollment. Differentiating between males and females, we document that the effect was negative on male student ratio, but there was no effect on female ratio. In accordance with literature on the effects of adverse shocks on female education (Beegle et al., 2008; Björkman-Nyqvist, 2013), we document a similar gender bias.

This is the first study providing evidence on the effects of the currant trade on the development of human capital in late 19th-century Greece. Our focus on the historical case of a nonindustrialized economy trading with industrialized economies, seeks to underline the importance of human capital formation in earlier stages of development, and how a transition towards a developed economy may be delayed due to seemingly unrelated historical events. While the historical aspects of this event may be exclusive to Greece, we believe that it can serve as an interesting case study demonstrating the effects that shocks through international trade may have on human capital formation, a fundamental aspect of growth and income.

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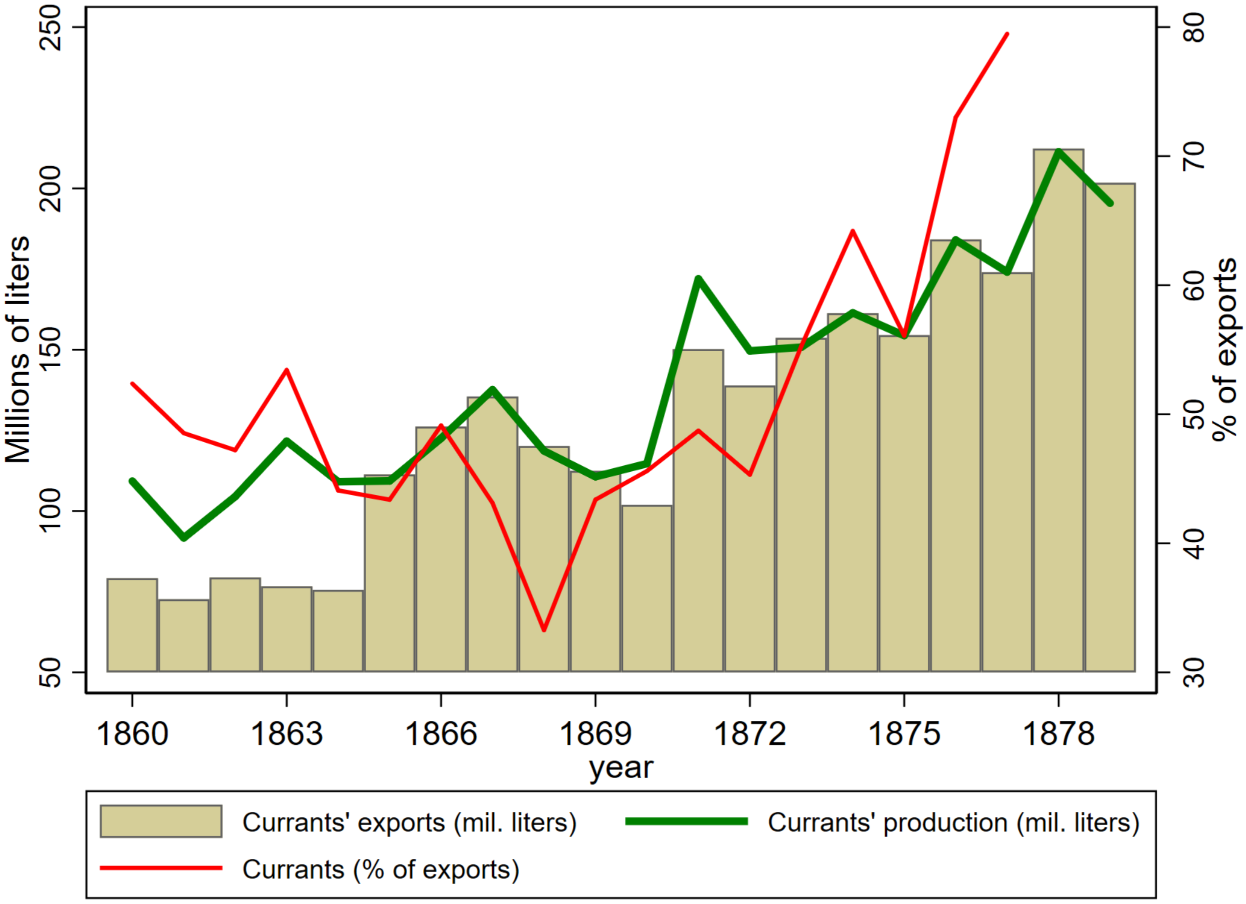
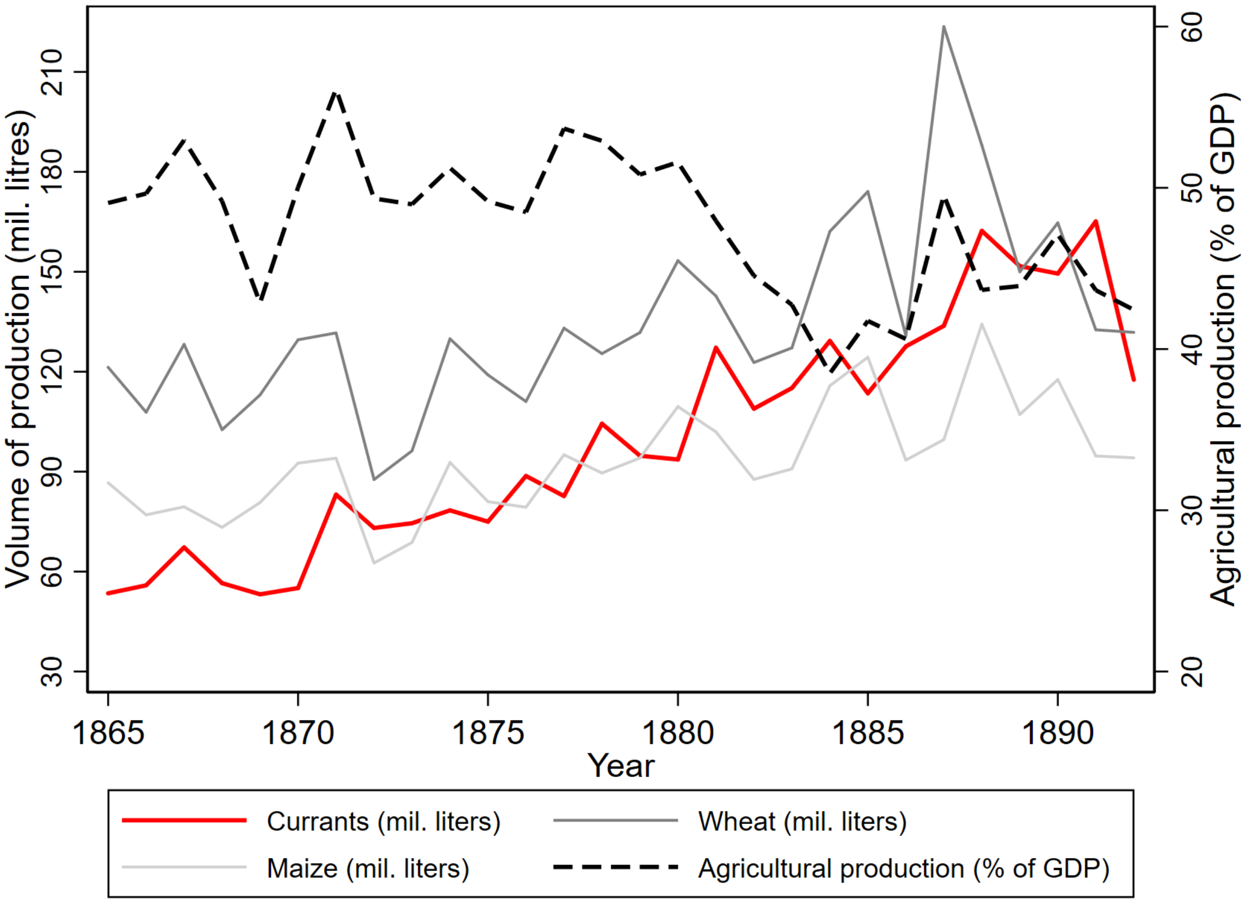
Figures and Tables

Figure 1: Currant Production and Exports Over Time



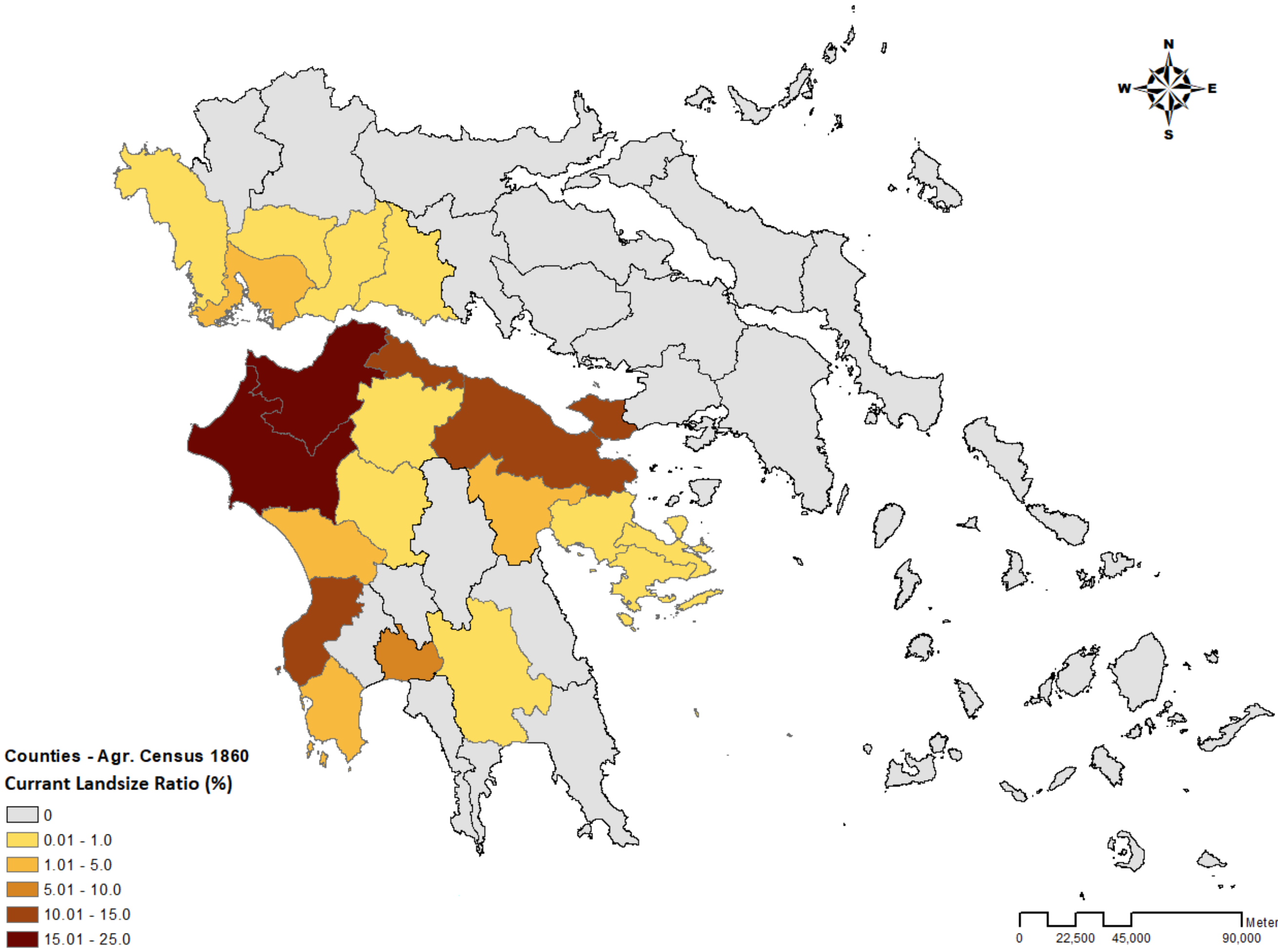
Notes: Graphical representation of the quantity of currant production exports over time, from 1860 until 1878. Data come from the work of Pizanias (1988).

Figure 2: Agricultural Production Quantity - Over Time



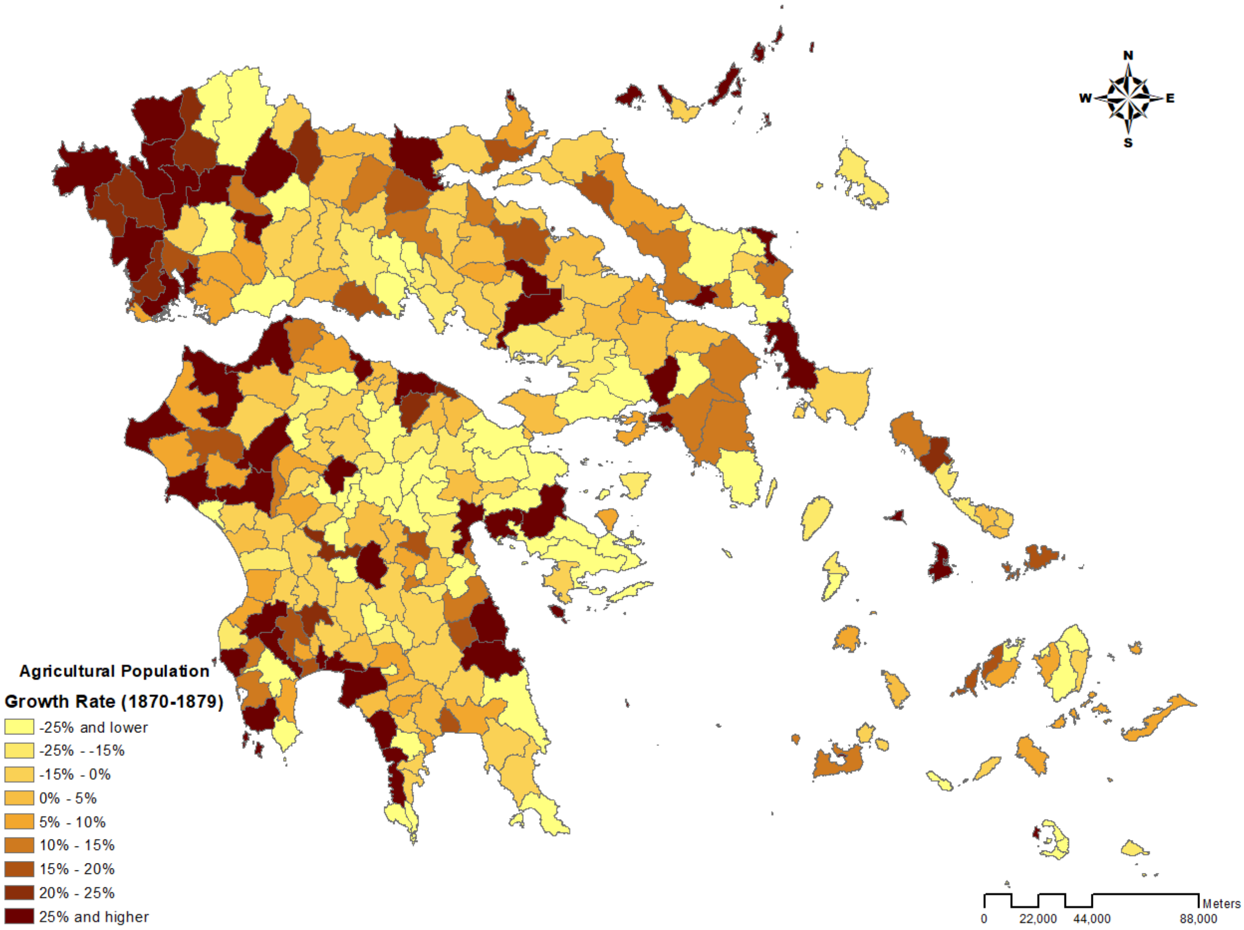
Graphical representation of the production of currants (red line), wheat (grey line), and maize (light grey line) over time, compared to the overall agricultural production in the country as a share of GDP (dashed black line), between 1865 and 1892. Data come from Kostelenos et al. (2007).

Figure 3: Agricultural Census of 1860 - Currant Landsize



Notes: Land used for currant agriculture, taken from the Agricultural Census (1860). Transformed as a share (%) of each county's (eparhia) land to the total land used for currant production in the country. Deeper shades of colour indicate higher shares. Original source is Petmezas (2003).

Figure 4: Population Census of 1870 and 1879 - Agricultural Population



Notes: Growth rate of the agricultural population between 1870 and 1879. Agricultural population is defined as the summary of landowners and farmers, taken from the population censuses of 1870 and 1879. Transformed as a growth rate (%) for each municipality. Deeper shades of brown indicate higher positive growth rates, while lighter shades indicate negative rates. Original source is ELSTAT (1870, 1879).

Table 1: Effect of Currant and Agricultural Pop. on Education - All Students

	(1) All Students	(2) All Students	(3) All Students	(4) All Students	(5) All Students	(6) All Students
Currant Landsize	-0.064	1.234**	1.268	1.464**	1.494**	1.363**
	(0.510)	(0.541)	(0.776)	(0.674)	(0.645)	(0.623)
Δ(Agricultural Population)	0.873***	0.841***	0.881***	0.832***	0.975***	0.969***
	(0.278)	(0.278)	(0.297)	(0.284)	(0.213)	(0.209)
Agricultural*Currant	-5.503***	-5.021**	-5.238**	-5.169**	-5.321***	-5.187***
	(1.687)	(1.806)	(1.883)	(1.916)	(1.347)	(1.311)
R^2	0.225	0.265	0.288	0.314	0.396	0.421
Regional FE	No	Yes	Yes	Yes	Yes	Yes
Geographical	No	No	Yes	Yes	Yes	Yes
Controls	No	No	No	Yes	Yes	Yes
Levels	No	No	No	No	Yes	Yes
LagDependent	No	No	No	No	No	Yes
Observations	120	120	120	120	120	120

Notes: The dependent variable is the (log) change of the student ratio between 1879 and 1870. Currant Landsize at the county (eparhia) level is transformed into the percentage of land used for currant as a share of the total country production. Δ(Agricultural Population) is the (log) change of agricultural population between 1879 and 1870. Column (2) includes fixed effects at the province (nomos) level. Column (3) includes geographical variables (islands, natural logarithm of distance of a municipality from the capital of its region). Column (4) includes the first difference of the controls (population density, buildings, industrialists,teachers). Column (5) includes the level of the controls from column (4). Column (6) includes the lagged depedent variable. Standard errors are clustered at the county (eparhia) level, and presented in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 2: Effect of Currant and Agricultural Population on Birth Rate

	(1) Birth Rate	(2) Birth Rate	(3) Birth Rate	(4) Birth Rate	(5) Birth Rate	(6) Birth Rate
Currant Landsize	-0.670	-0.554	-0.131	-0.137	-0.252	-0.607
	(0.568)	(0.614)	(0.770)	(0.696)	(0.643)	(0.456)
Δ(Agricultural Population)	0.102	0.117	0.035	0.004	-0.003	0.146
	(0.133)	(0.108)	(0.143)	(0.125)	(0.163)	(0.152)
Agricultural*Currant	0.588	-0.294	0.096	0.257	0.283	0.071
	(1.910)	(1.737)	(1.734)	(1.743)	(2.150)	(1.658)
R^2	0.021	0.118	0.145	0.169	0.176	0.548
Regional FE	No	Yes	Yes	Yes	Yes	Yes
Geographical	No	No	Yes	Yes	Yes	Yes
Controls	No	No	No	Yes	Yes	Yes
Levels	No	No	No	No	Yes	Yes
LagDependent	No	No	No	No	No	Yes
Observations	120	120	120	120	120	120

Notes: The dependent variable is the (log) change of the birth rates between 1879 and 1870. Columns (1)-(6) follow the structure of columns (1)-(6) of Table 1. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 3: Effect of Currant and Agricultural Population on Education - Female and Male Students

	(1) Female	(2) Female	(3) Female	(4) Female	(5) Female	(6) Female	(7) Male	(8) Male	(9) Male	(10) Male	(11) Male	(12) Male
Currant Landsize	-0.883	-1.385	-0.732	-0.723	-0.523	-1.006	-0.064	1.320**	1.355	1.544**	1.507**	1.458**
	(0.990)	(1.066)	(1.068)	(1.057)	(1.388)	(1.204)	(0.551)	(0.614)	(0.846)	(0.722)	(0.633)	(0.624)
Δ(Agricultural Population)	0.269	0.252	0.125	0.169	0.256	0.180	0.854**	0.825**	0.869**	0.815**	0.953***	0.948***
	(0.211)	(0.244)	(0.265)	(0.236)	(0.238)	(0.174)	(0.308)	(0.309)	(0.321)	(0.306)	(0.230)	(0.224)
Agricultural*Currant	0.813	-0.455	0.156	-0.072	-1.861	-0.758	-5.592**	-5.038**	-5.276**	-5.175**	-5.116***	-5.046***
	(4.888)	(4.711)	(4.737)	(4.662)	(4.415)	(4.000)	(1.988)	(1.995)	(1.961)	(1.935)	(1.452)	(1.408)
R^2	0.018	0.069	0.085	0.096	0.182	0.281	0.213	0.254	0.281	0.309	0.382	0.414
Regional FE	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Geographical	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Levels	No	No	No	No	Yes	Yes	No	No	No	No	Yes	Yes
LagDependent	No	No	No	No	No	Yes	No	No	No	No	No	Yes
Observations	120	120	120	120	120	120	120	120	120	120	120	120

Notes: The dependent variable in columns (1) to (6) is the (log) change of the female student ratio, while in columns (7) to (12) is the change of the male student ratio. Columns (1)-(6) and (7)-(12) follow the structure of columns (1)-(6) of Table 1. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 4: Effect of Currant and Agricultural Population on Education - Placebo (Wheat)

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Wheat Landsize	2.887	6.926	7.092	0.480	2.859	6.994
	(4.826)	(4.978)	(6.241)	(3.782)	(5.084)	(4.867)
Δ(Agricultural Population)	0.805*	1.011***	-0.629	-0.502**	0.812*	1.034***
	(0.390)	(0.291)	(0.364)	(0.235)	(0.431)	(0.300)
Agricultural*Wheat	-8.500	-9.535	43.546***	27.469**	-9.905	-11.013
	(10.821)	(8.466)	(14.293)	(10.456)	(12.163)	(8.642)
R^2	0.182	0.384	0.062	0.297	0.171	0.381
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Levels	No	Yes	No	Yes	No	Yes
LagDependent	No	Yes	No	Yes	No	Yes
Observations	120	120	120	120	120	120

Notes: The alternative crop used is wheat landsize at the county (eparhia) level, transformed into the percentage of land used for wheat as a share (%) of the total country production. Columns (1), (3) and (5) report specifications for All, Female and Male Students, respectively, without additional covariates as in column (1) of Table 1. Columns (2), (4) and (6) include fixed effects (province level), geographical effects, controls, levels of controls and lagged depedent variable, as in column (6) of Table 1, for the same dependent variables as their previous column. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 5: Effect of Currant and Agricultural Population on Education - Placebo (Shepherds)

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Currant Landsize	0.678	3.060***	-1.003	-0.803	0.706	3.155***
	(0.751)	(0.891)	(1.219)	(1.195)	(0.768)	(0.875)
Δ(Shepherd Population)	-0.040	-0.076	0.126	0.110	-0.054	-0.085
	(0.174)	(0.169)	(0.116)	(0.105)	(0.179)	(0.175)
Shepherd*Currant	0.844	1.084	-1.531	-0.714	1.026	1.203
	(1.379)	(1.569)	(1.359)	(1.145)	(1.426)	(1.648)
R^2	0.009	0.244	0.010	0.283	0.011	0.249
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Levels	No	Yes	No	Yes	No	Yes
LagDependent	No	Yes	No	Yes	No	Yes
Observations	120	120	120	120	120	120

Notes: Δ(Shepherd Population) is the (log) change of shepherd population between 1879 and 1870. Columns (1), (3) and (5) report specifications for All, Female and Male Students, respectively, without additional covariates as in column (1) of Table 1. Columns (2), (4) and (6) include fixed effects (province level), geographical effects, controls, levels of controls and lagged depedent variable, as in column (6) of Table 1, for the same dependent variables as their previous column. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 6: Effect of Currant and Agricultural Population on Education - All Counties

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Currant Landsize	0.253	1.684**	-0.150	-1.086	0.131	1.762**
	(0.444)	(0.683)	(0.924)	(1.049)	(0.443)	(0.664)
Δ(Agricultural Population)	0.403**	0.447**	-0.110	0.086	0.457***	0.456**
	(0.182)	(0.182)	(0.276)	(0.117)	(0.169)	(0.183)
Agricultural*Currant	-2.363**	-2.072**	3.157	1.579	-2.914***	-2.275**
	(0.986)	(1.017)	(5.063)	(4.478)	(1.014)	(0.879)
R^2	0.078	0.209	0.005	0.281	0.097	0.202
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Levels	No	Yes	No	Yes	No	Yes
LagDependent	No	Yes	No	Yes	No	Yes
Observations	270	270	270	270	270	270

Notes: Columns (1)-(6) follow the structure of columns (1)-(6) of Table 4. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 7: Effect of Currant and Agricultural Population on Education - Pre Trend

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Currant Landsize	0.344 (0.760)	-0.867 (1.029)	-1.687** (0.794)	-1.318 (1.297)	0.886 (1.056)	-0.285 (1.140)
Δ(Agricultural Population)	-0.181** (0.085)	-0.039 (0.133)	-0.286 (0.263)	-0.208 (0.266)	-0.117 (0.133)	-0.028 (0.137)
Agricultural*Currant	1.933 (1.441)	0.889 (1.310)	4.241** (2.022)	3.011 (2.386)	1.479 (1.880)	0.399 (1.328)
R^2	0.010	0.147	0.038	0.179	0.014	0.153
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Levels	No	Yes	No	Yes	No	Yes
LagDependent	No	No	No	No	No	No
Observations	120	120	120	120	120	120

Notes: The dependent variables are defined as the (log) change of the student ratio (All, Female and Male) between 1861 and 1870. Columns (1)-(6) follow the structure of columns (1)-(6) of Table 4. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 8: Effect of Currant and Agricultural Population on Education - Elevation

	(1) Students (1861)	(2) Students (1861)	(3) Students (1870)	(4) Students (1870)
Elevation	0.001 (0.002)	-0.000 (0.006)	-0.003 (0.002)	0.002 (0.005)
Agricultural Population	-0.050 (0.037)	-0.089 (0.158)	-0.039 (0.047)	0.136 (0.140)
Agricultural*Elevation		0.007 (0.027)		-0.031 (0.026)
R^2	0.496	0.496	0.634	0.640
Regional FE	Yes	Yes	Yes	Yes
Geographical	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	120	120	120	120

Notes: Elevation is measured as the natural logarithm of mean altitude in meters, calculated using World Climate data. The dependent variables are defined as the student ratio of 1861 and 1870. Columns (1) and (3) include all controls, while columns (2) and (4) include the interaction between Elevation and Agricultural Population. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1861 census in columns (1) and (2), and from 1870 census in columns (3) and (4). *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Appendix

Section A

A.1 Commercial network of currants

The commercial network of currants had specific characteristics, which affected the incentives of agricultural households. While the international demand for currant increased, the international price seemed to remain relatively constant, which may seem puzzling at first, however can be explained by the intricate routes through which the final good was exported to the international ports of London, Manchester and Marseille.

The highest level within the frontiers of Greece was constituted by domestic and foreign exporting houses, with offices in Patras, Aigion and Pirgos. The supply of fruits to the exporting houses was assured by smaller merchants established in the currant-producing villages to whom they provided cheap loans against promise of delivery of determined quantities of currants immediately after the harvest at an "open price" (i.e. at a price that would be determined according to the market forces at the time of the fruit's sale). Village merchants in turn were committing these funds to the direct cultivators (i.e. small peasants) against promise of delivery of determined quantities following a similar "open price" practice. Hence, both the exporting houses and the village merchants were buying in advance predetermined quantities from the domestic cultivators at an "open price" that would be determined later (i.e. September to December of each year) according to the demand and supply in the international market (see e.g. Hairetis, 1883; Franghiadis, 1990).

By applying "open prices", exporters and village merchants were insured against the risks from price fluctuations which fell entirely on the cultivators. More importantly, since the direct cultivators were unable to check the exact date their production was exported – therefore the real price paid by the foreign markets – exporters and village merchants were able to apply specific speculative practices that ensured them the maximum amount of profits.[32] These

[32] A usual speculative practice was to exploit for themselves the high prices traditionally attributed to the first arrivals of fruits abroad (from August to September) and in turn (usually from November to December) to export second quality currants – or produce of previous years that were kept at warehouses – so as to devaluate the international price and therefore to reimburse the domestic growers at the lower prices of the end of the year.

price manipulation practices – which become obvious if one analyzes the changes of currant prices from September to December in each year (see Hairetis, 1883; Franghiadis, 1990, fore more details on this) – can illuminate the stability of international price of currant during the whole period under investigation. This price stability is further corroborated by the price index provided from Dertilis (1993), where it is evident that currant prices only fluctuated around the mean (Figure B.4). Thus, peasant families faced an unprecedented increase in demand and, in the abscence of significant price increase, were heavily incentivized to reduce investment in human capital formation of their children, and increase their labour supply instead. The abscence of specific laws against child labour, combined with the nature of the educational system of Greece at the time, allowed this to take place.

A.2 Data construction details

Population censuses from pre-1900 Greece were digitized, namely the censuses of 1861, 1870 and 1879, and can be found in the archives of the Hellenic Statistical Authority (ELSTAT, 1861, 1870, 1879). They contain information regarding various aspects of the Greek population such as professions (e.g. farmers, landowners, industrialists), as well as the number of buildings and teachers.[33] Most importantly, information about the number of male and female students is provided. Moreover, population movement censuses had to be digitized as well, coming from the same archives of ELSTAT (ELSTAT, 1870). They include the number of births for 1870, however instead of 1879, only data from a latter date are available (1884). For both sources, the level of aggregation is the municipality (demos), with many municipalities forming a county (eparhia), and many counties forming a province (nomos).

Two important aspects of these aggregations must be noted. Firstly, during the period of the first census (1861), Greece was notably smaller in size than today. The parts that form "old Greece" were the geographical regions called Peloponnesus and Sterea Ellada (alternatively known as Roúmeli at the time), along with the islands of Evia, Sporades and finally Cyclades. In 1864, the Ionian Islands (alternatively known as Eptanisa i.e. Seven Islands) became a part of "old Greece" as a gesture of support from Britain towards the newly enthroned King George I (Temperley, 1937). Even though they appear in both the 1870 and 1879 censuses, there is

[33] An example of the original data can be found in Figure B.6.

no information available regarding currant production, as well as being absent from the 1861 census, therefore the Ionian Islands were excluded from our sample. Secondly, during the years between 1861 and 1879 certain municipalities either changed name or were splitted/unified. In order to make them comparable, all the names were formalized following the census of 1861, and certain municipalities were merged accordingly to reflect the information provided for the municipalities of 1861. Overall, this resulted in a dataset aggregated in 10 provinces, divided in 48 counties, and finally 280 municipalities.

To create the geographical boundaries of these 280 municipalities, geodata files from the website of the Instutute of Informational Systems / Research Center "Athina" were used. Specifically, data on the boundaries of local authorities of the pre-Kapodistrian reform era (i.e. for 1990s Greece).[34] The modern communities and municipalities were individually matched by tracing them back in time using the online database of the Hellenic Society of Local Development and Local Government (EETAA)[35], to create the boundaries of the 280 municipalities, as they existed in 1861. The exact process is outlined in Table B.3.

Another historical archive that had to be digitized was the agricultural census of 1860, and can be found from the work of Petmezas (2003). It contains information on agricultural aspects such as value, landsize and volume of production for various crops such as wheat, maize and currants, across "old Greece". Our main interest lies with currant production, and specifically with the amount of land used in currant agriculture prior to the shock (in 1860) as a proxy for the natural capacity of different areas within the Greek territory to respond to the shock. The data provided in the census has a different level of aggregation to the population censuses. While the latter provide data on the municipality (demos) level, the agricultural census only documents information about currant production in the county (eparhia) level. In order to make further analysis, each municipality was assigned the value of its county.

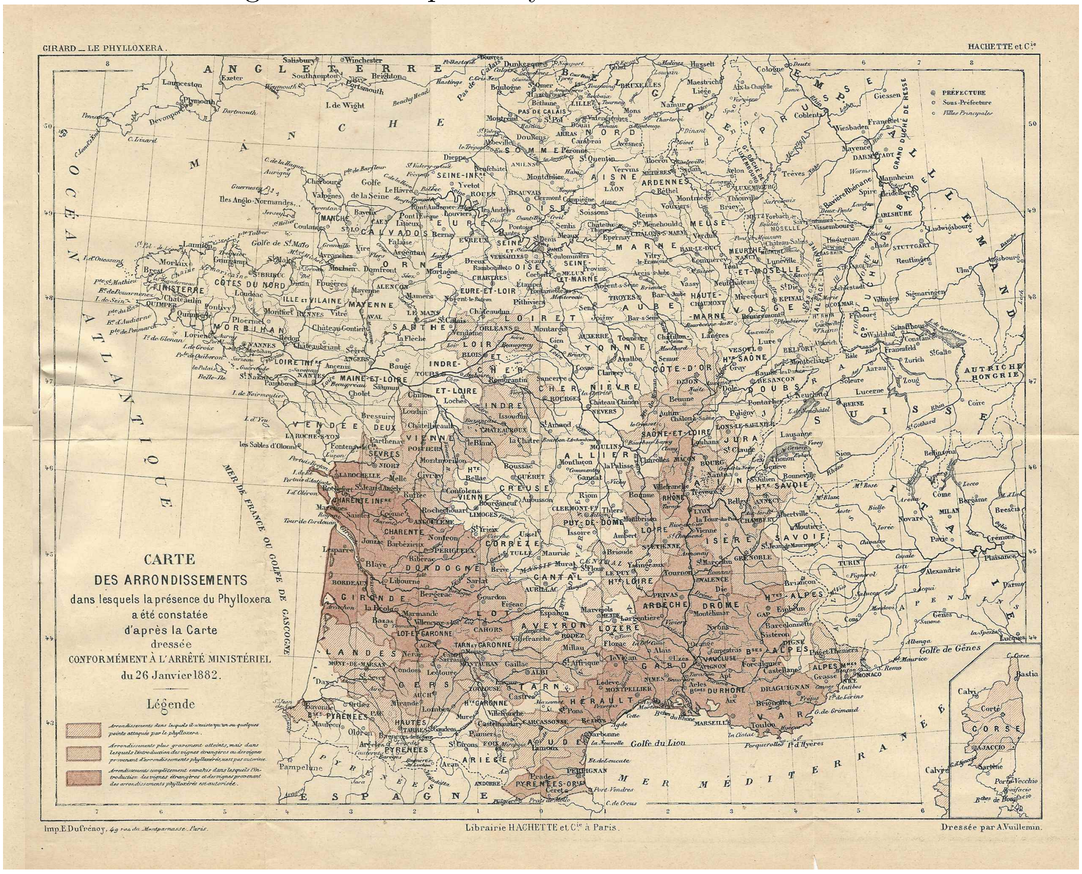
[34] Link for the Geodata.gov.gr data.

[35] An example is provided in Figure B.7.

Section B

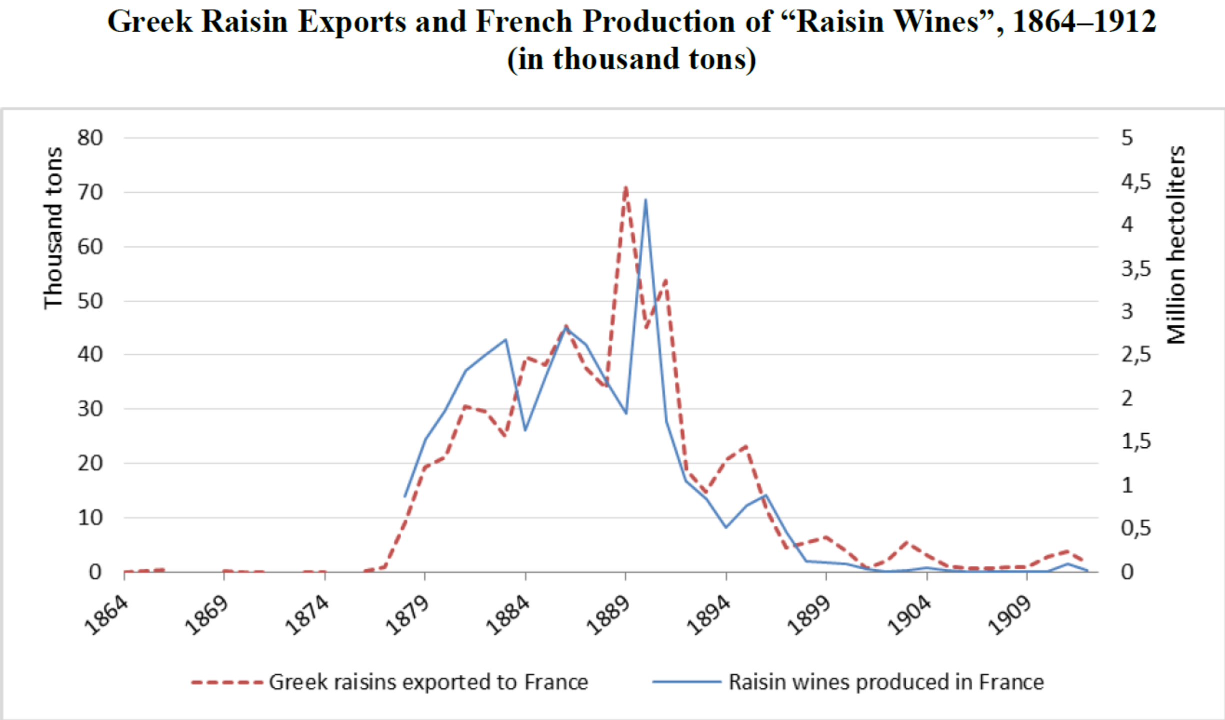
Additional Figures and Tables

Figure B.1: Map of Phylloxera in France - 1882



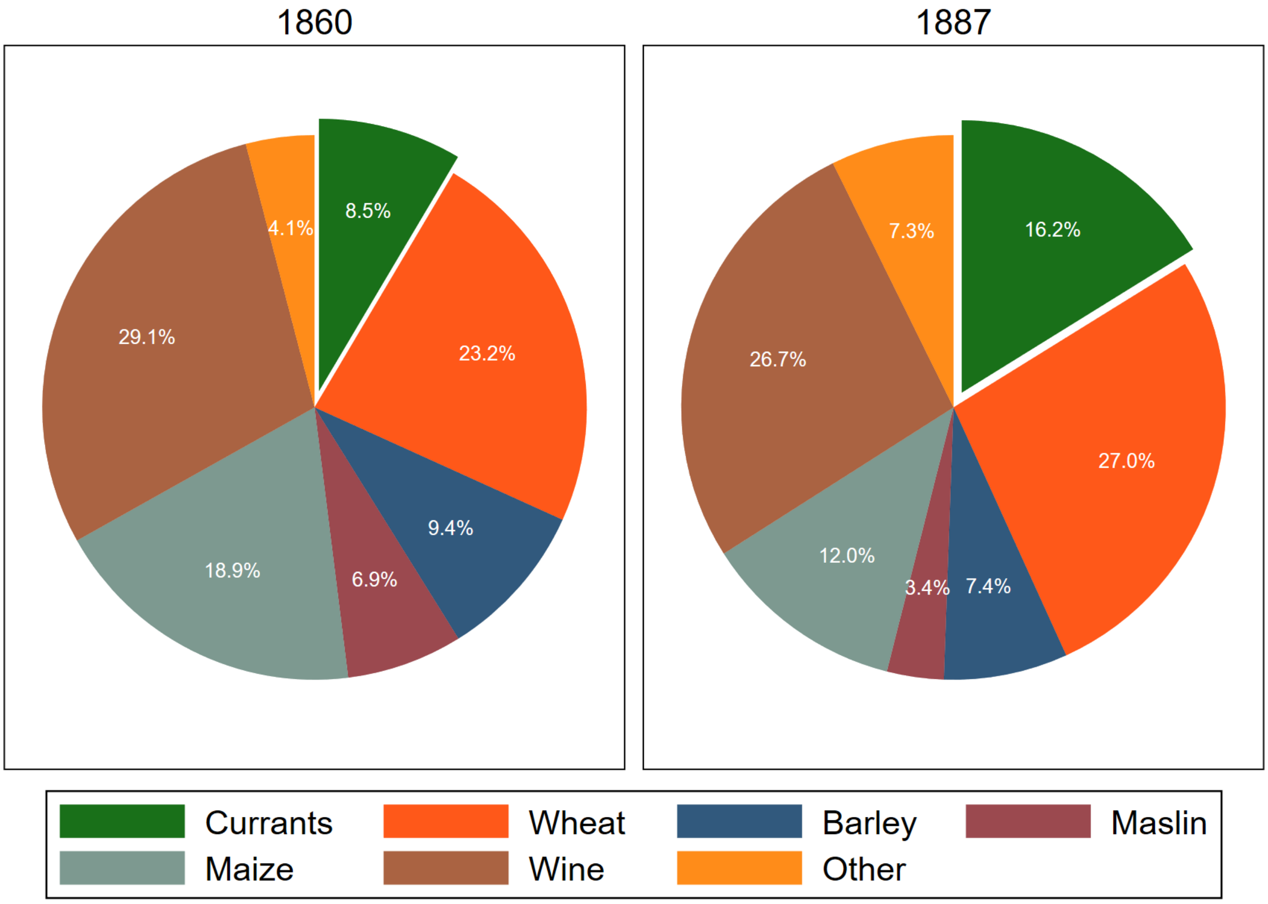
Notes: Map of Phylloxera plague across 1882 France. Carte au 26 Janvier 1882 de l'avancée du Phylloxéra en France. Source: (Girard, 1883)

Figure B.2: Greece and France - Exports and Production



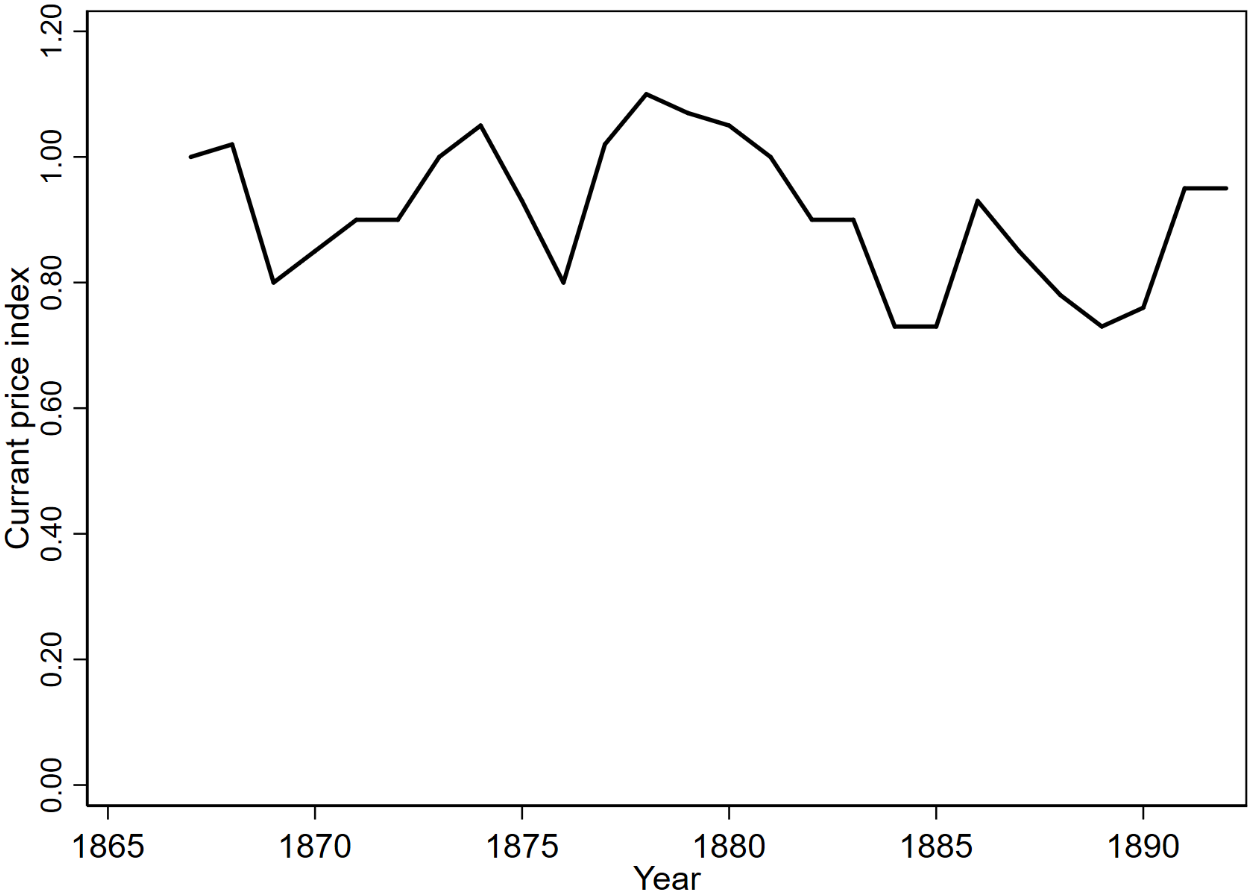
Notes: Graphical representation of Greek raisin exports towards France and French "raisin wines", over time. Source: Figure 11 from Meloni and Swinnen (2016) Original sources (Galet, 1964; Pizanias, 1988).

Figure B.3: Agricultural Production Quantity



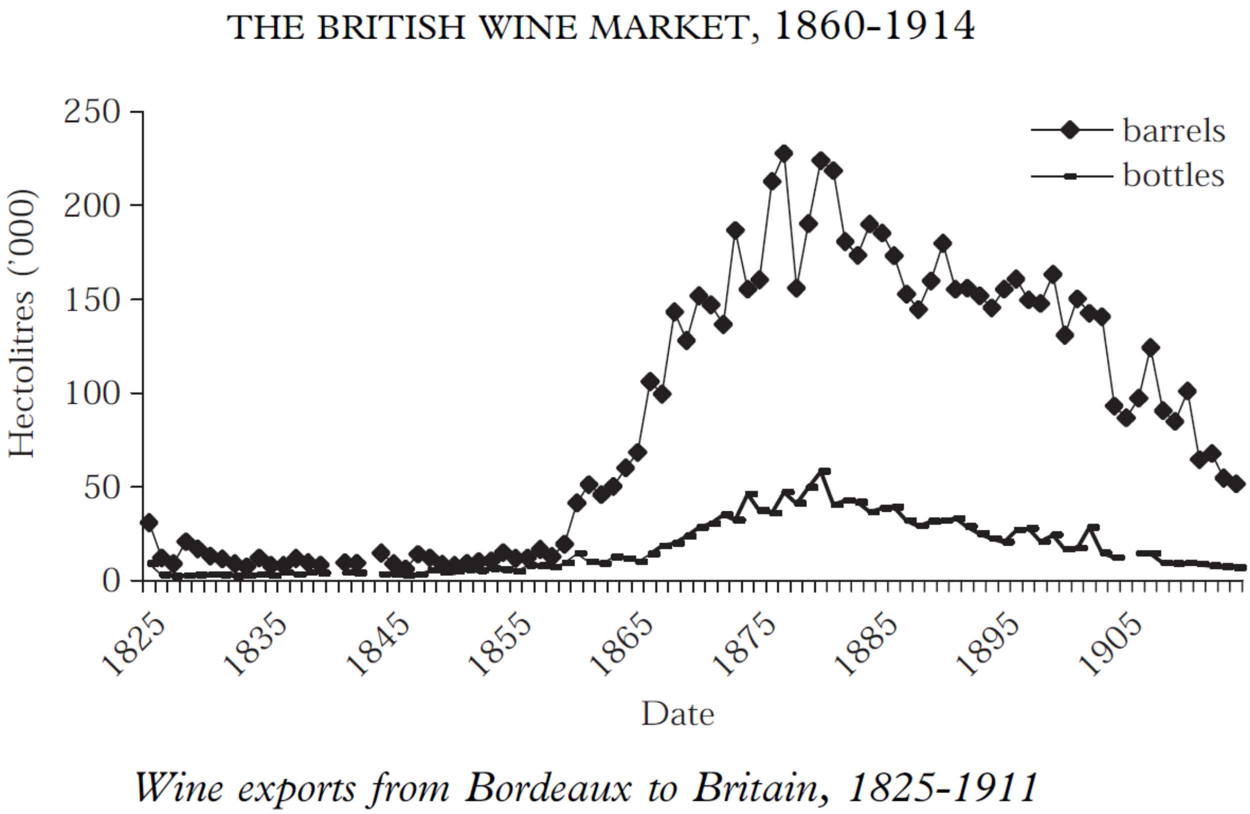
Graphical representation of percentages of agricultural production in 1860 and 1887. Category "Other" includes rye, oats, tobacco, cotton, and edible olives. Data come from Kostelenos et al. (2007).

Figure B.4: Currant Price Index - Over Time



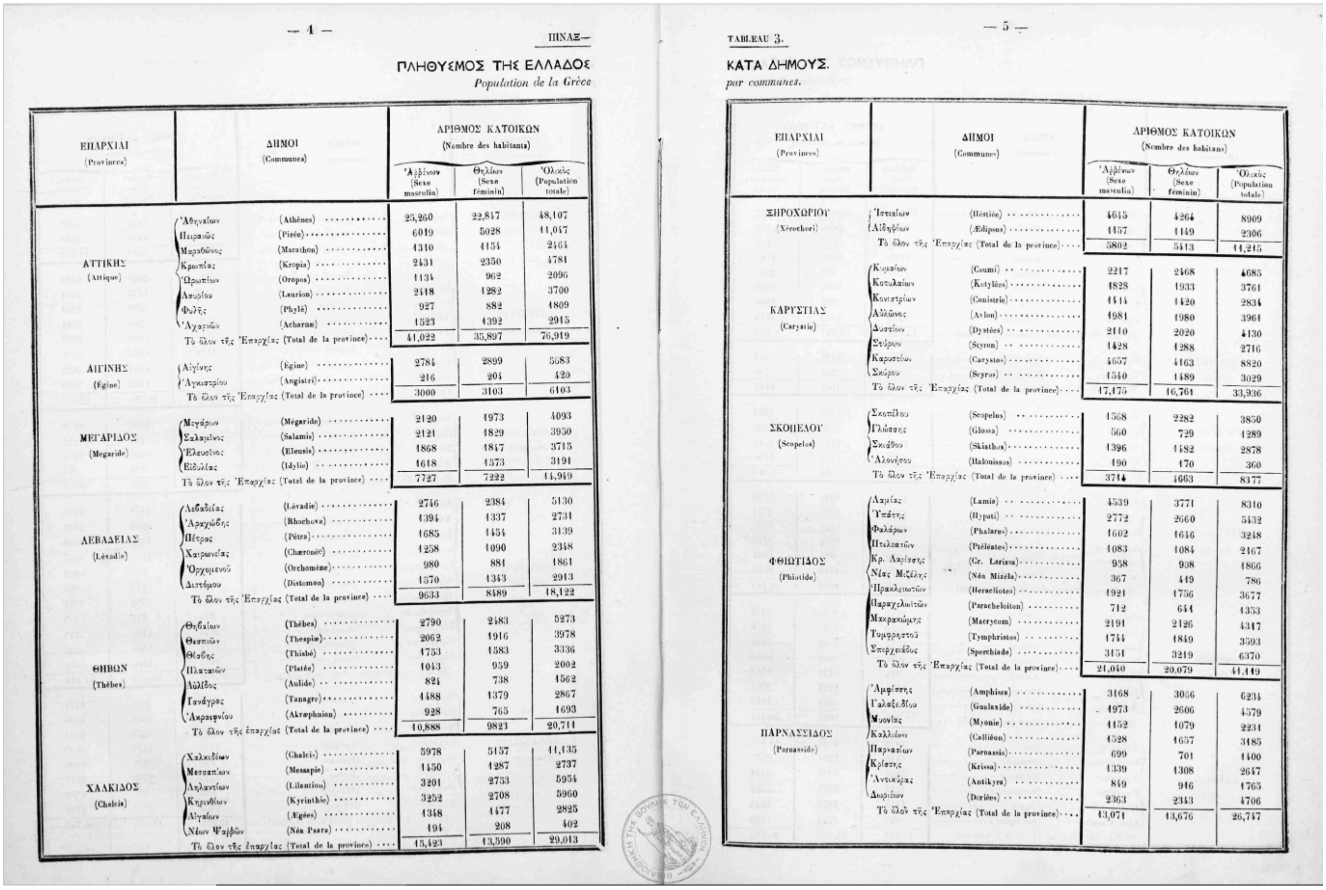
Notes: Graphical representation of the price index of currants over time, between 1867 and 1892. Data come from Dertilis (1993).

Figure B.5: British Imports of French Wine



Notes: Historical data of wine exports from France to Britain during the 19th century. Source: Figure 3 from (Simpson, 2004).

Figure B.6: Population Census of Greece in 1870 - Example of Population



— 4 —

ΠΙΝΑΞ—

ΠΛΗΘΥΣΜΟΣ ΤΗΣ ΕΛΛΑΔΟΣ

Population de la Grèce

ΕΠΑΡΧΙΑΙ (Provinces)	ΔΗΜΟΙ (Communes)	ΑΡΙΘΜΟΣ ΚΑΤΟΙΚΩΝ (Nombre des habitants)		
		Ἀῤῥένων (Sexe masculin)	Θηλέων (Sexe féminin)	Ὁλικὸς (Population totale)
ΑΤΤΙΚΗΣ (Attique)	Ἀθηναίων (Athènes)	25,260	22,847	48,107
	Πειραιῶς (Pirée)	6019	5028	11,047
	Μαραθῶνος (Marathon)	1310	1154	2464
	Κρωπίας (Kropia)	2431	2350	4781
	Ὠρωπίων (Oropos)	1134	962	2096
	Λαυρίου (Laurion)	2418	1282	3700
	Φυλῆς (Phylé)	927	882	1809
	Ἀχαρνῶν (Acharnæ)	1523	1392	2915
	Τὸ ὅλον τῆς Ἐπαρχίας (Total de la province)	41,022	35,897	76,919
ΑΙΓΙΝΗΣ (Égine)	Αἰγίνης (Égine)	2784	2899	5683
	Ἀγκιστρίου (Angistri)	216	204	420
	Τὸ ὅλον τῆς Ἐπαρχίας (Total de la province)	3000	3103	6103
ΜΕΓΑΡΙΔΟΣ (Megaride)	Μεγάρων (Mégaride)	2120	1973	4093
	Σαλαμῖνος (Salamis)	2121	1829	3950
	Ἐλευσῖνος (Eleusis)	1868	1847	3715
	Εἰδυλίας (Idylie)	1618	1573	3191
	Τὸ ὅλον τῆς Ἐπαρχίας (Total de la province)	7727	7222	14,949
ΛΕΒΑΔΕΙΑΣ (Lévadie)	Λεβαδείας (Lévadie)	2746	2384	5130
	Ἀραχώβης (Rhachova)	1394	1337	2731
	Πέτρας (Pétra)	1685	1454	3139
	Χαιρωνείας (Chæronée)	1258	1090	2348
	Ὀρχομενοῦ (Orchomène)	980	881	1861
	Διστόμου (Distomon)	1570	1343	2913
	Τὸ ὅλον τῆς Ἐπαρχίας (Total de la province)	9633	8489	18,122
ΘΗΒΩΝ (Thèbes)	Θηβαίων (Thèbes)	2790	2483	5273
	Θεσπιῶν (Thespiæ)	2062	1916	3978
	Θίσβης (Thisbé)	1753	1583	3336
	Πλαταιῶν (Platée)	1043	959	2002
	Αὐλίδος (Aulide)	824	738	1562
	Τανάγρας (Tanagre)	1488	1379	2867
	Ἀκραιφνίου (Akræphnion)	928	765	1693
	Τὸ ὅλον τῆς ἐπαρχίας (Total de la province)	10,888	9823	20,711
ΧΑΛΚΙΔΟΣ (Chalcis)	Χαλκιδέων (Chalcis)	5978	5157	11,135
	Μεσσαπίων (Messapie)	1450	1287	2737
	Ληλαντίων (Lilantion)	3201	2753	5954
	Κηρινθίων (Kyrinthie)	3252	2708	5960
	Αἰγαίων (Ægées)	1348	1477	2825
	Νέων Ψαῤῥῶν (Néa Psara)	194	208	402
	Τὸ ὅλον τῆς ἐπαρχίας (Total de la province)	15,423	13,590	29,013

TABLEAU 3.

— 5 —

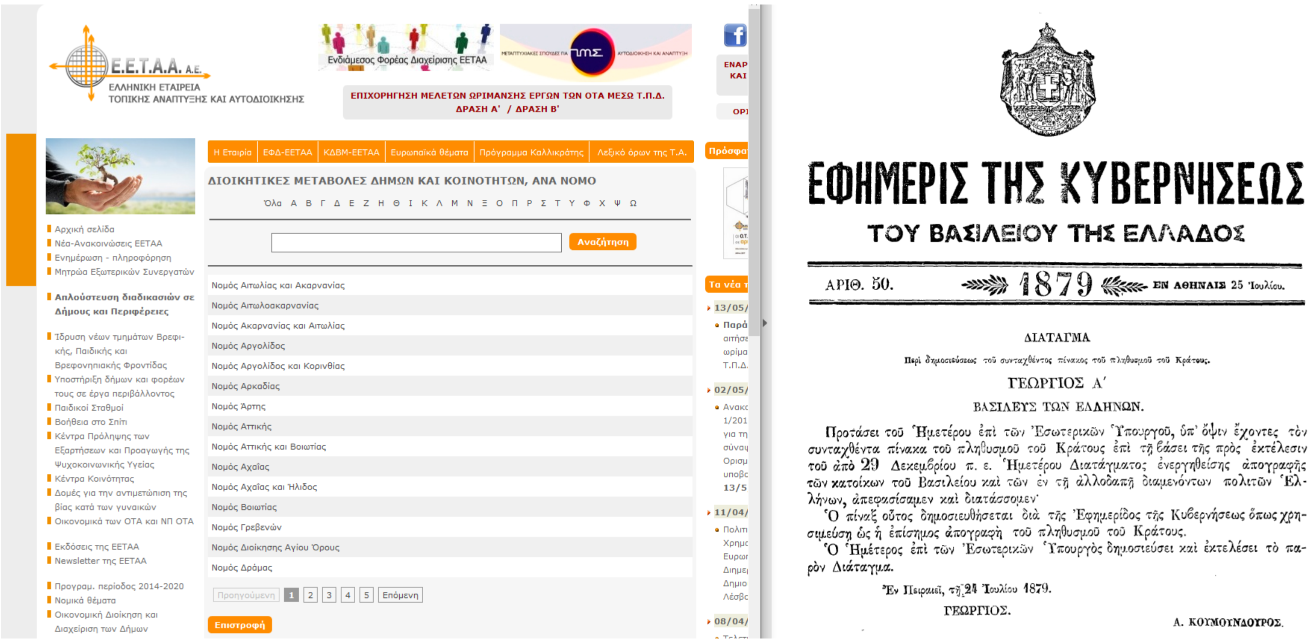
ΚΑΤΑ ΔΗΜΟΥΣ.

par communes.

ΕΠΑΡΧΙΑΙ (Provinces)	ΔΗΜΟΙ (Communes)	ΑΡΙΘΜΟΣ ΚΑΤΟΙΚΩΝ (Nombre des habitans)		
		Ἀῤῥένων (Sexe masculin)	Θηλέων (Sexe féminin)	Ὁλικὸς (Population totale)
ΞΗΡΟΧΩΡΙΟΥ (Xérochori)	Ἱστιαίων (Héstiée)	4645	4264	8909
	Αἰδηψίων (Ædipsos)	1157	1149	2306
	Τὸ ὅλον τῆς Ἐπαρχίας (Total de la province)	5802	5413	11,215
ΚΑΡΥΣΤΙΑΣ (Carystie)	Κυμαίων (Coumi)	2217	2468	4685
	Κοτυλαίων (Kotylées)	1828	1933	3761
	Κονιστρίων (Conistrie)	1414	1420	2834
	Αὐλῶνος (Avlon)	1981	1980	3961
	Δυστίων (Dystées)	2110	2020	4130
	Στύρων (Styron)	1428	1288	2716
	Καρυστίων (Carystos)	4657	4163	8820
	Σκύρου (Scyros)	1540	1489	3029
	Τὸ ὅλον τῆς Ἐπαρχίας (Total de la province)	17,475	16,761	33,936
ΣΚΟΠΕΛΟΥ (Scopelos)	Σκοπέλου (Scopelos)	1568	2282	3850
	Γλώσσης (Glossa)	560	729	1289
	Σκιάθου (Skiathos)	1396	1482	2878
	Ἁλοννήσου (Halonissos)	190	170	360
	Τὸ ὅλον τῆς Ἐπαρχίας (Total de la province)	3714	4663	8377
ΦΘΙΩΤΙΔΟΣ (Phiotide)	Λαμίας (Lamia)	4539	3771	8310
	Ὑπάτης (Hypati)	2772	2660	5432
	Φαλάρων (Phalares)	1602	1646	3248
	Πτελεατῶν (Ptéléates)	1083	1084	2167
	Κρ. Λαρίσσης (Cr. Larissa)	958	908	1866
	Νέας Μιζέλης (Néa Mizéla)	367	419	786
	Ἡρακλειωτῶν (Heracliotes)	1921	1756	3677
	Παραχελωϊτῶν (Paracheloiten)	712	641	1353
	Μακρακώμης (Macrycom)	2191	2126	4317
	Τυμφρηστοῦ (Tymphristos)	1744	1849	3593
	Σπερχειάδος (Sperchiade)	3151	3219	6370
	Τὸ ὅλον τῆς Ἐπαρχίας (Total de la province)	21,040	20,079	41,119
ΠΑΡΝΑΣΣΙΔΟΣ (Parnasside)	Ἀμφίσσης (Amphissa)	3168	3066	6234
	Γαλαξειδίου (Gualaxide)	1973	2606	4579
	Μυονίας (Myonie)	1152	1079	2231
	Καλλιέων (Calliéon)	1528	1657	3185
	Παρνασσίων (Parnassis)	699	701	1400
	Κρίσσης (Krissa)	1339	1308	2647
	Ἀντικύρας (Antikyra)	849	916	1765
	Δωριέων (Doriées)	2363	2343	4706
	Τὸ ὅλον τῆς Ἐπαρχίας (Total de la province)	13,071	13,676	26,747

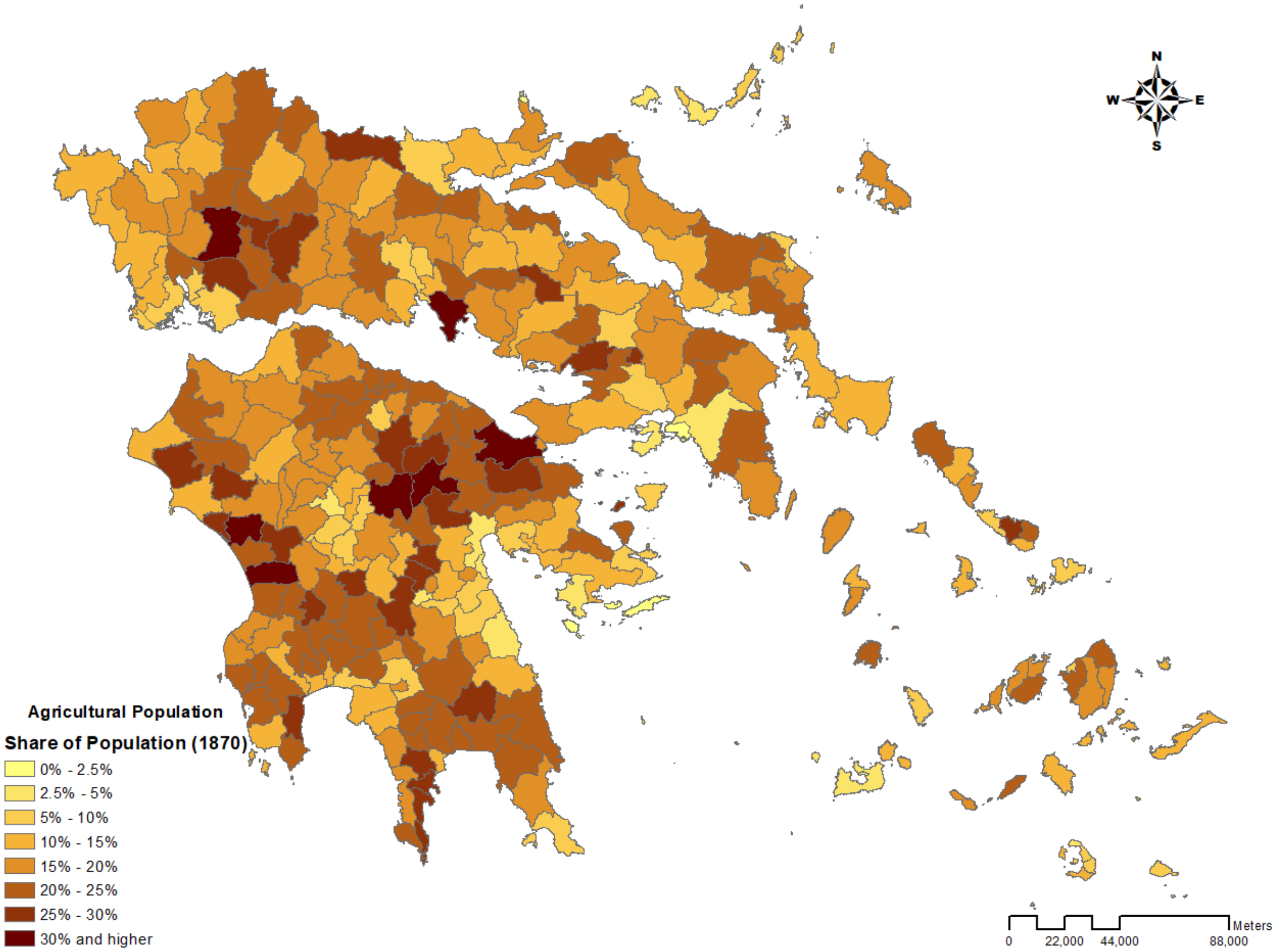
Notes: Example of historical data from the 1870 population census. The level of aggregation is municipality (demos). Source: ELSTAT (1870)

Figure B.7: Matching Municipalities over time



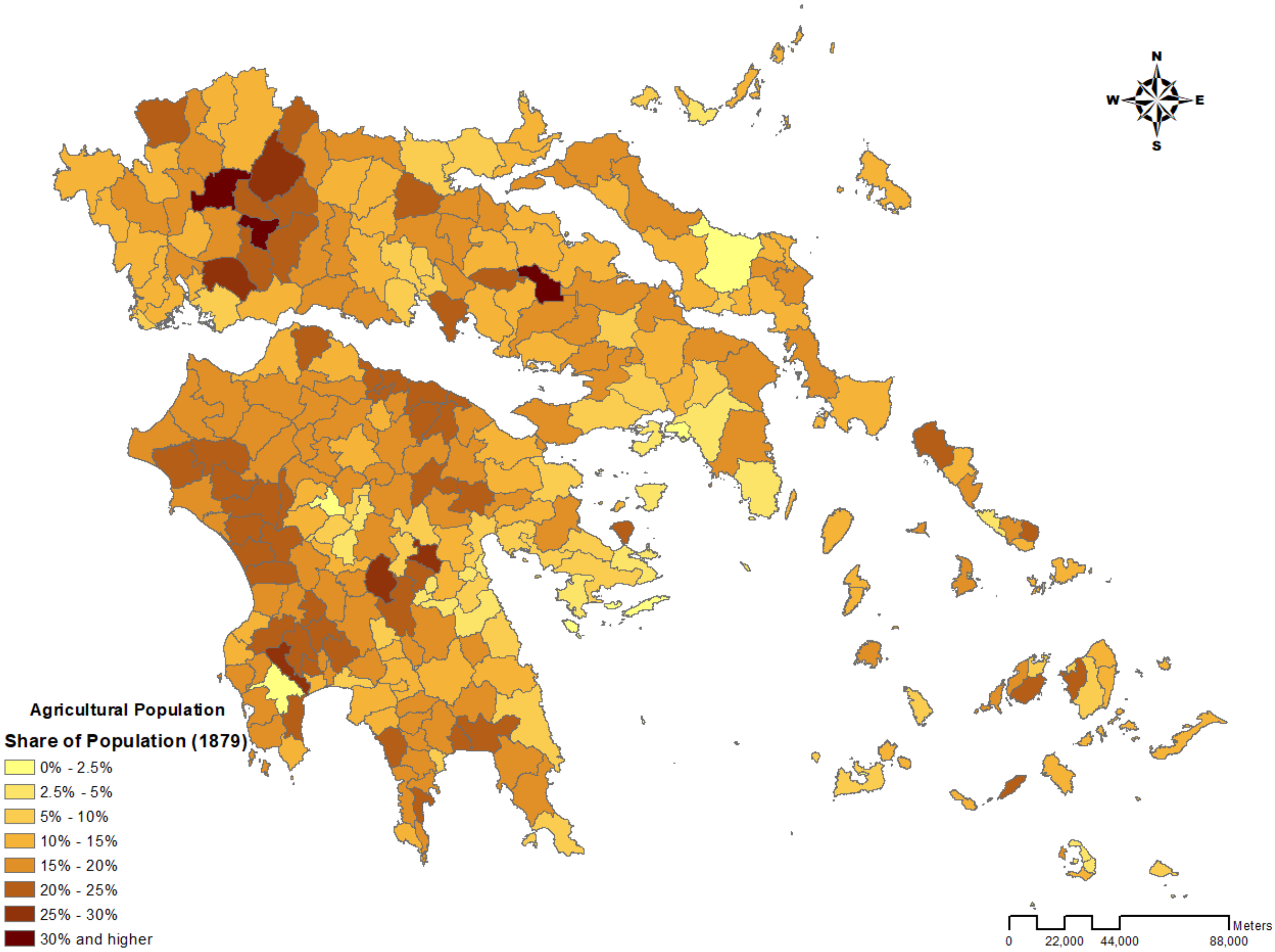
Notes: Tools used to trace and match communities and municipalities back in time to create boundaries for 1861. The website of the online database of the Hellenic Society for Local Development and Local Government (EETAA) is on the left, and an example of a royal decree is shown on the right. Link for website: eetaa.gr.

Figure B.8: Census 1870 - Agricultural Population



Notes: Summary of Landowners and Farmers, taken from the Population Census of 1870. Transformed as a share (%) of the population. Deeper shades of brown indicate higher shares. Original source is ELSTAT (1870).

Figure B.9: Population Census of 1879 - Agricultural Population



Notes: Summary of Landowners and Farmers, taken from the Population Census of 1879. Transformed as a share (%) of the population for each municipality. Deeper shades of brown indicate higher shares. Original source is ELSTAT (1879).

Table B.1: Tasks of currant cultivation: Days of labour required per stremma

	Task	Period	Maximum duration	Male Labour	Female Labour	Total
1	round-digging (once every 4 years)	October		1-1.5	–	1-1.5
2	manuring (ditto)	October		–	0.5	0.5
3	cleaning and pruning	January	15 days	1.3	–	1.3
4	propping up the stock	February		0.3-0.5	0.5	0.8-1
5	hoeing	March			3.5	3.5
6	harrowing	April			1-1.5	1-1.5
7	sulphuring	May		0.3-1		0.3-1
8	ring-cutting	May	7-12 days	0.77		0.77
9	lopping tops etc	June and July			1.7	1.7
10	harvesting	August	7 days	1.5	2	3.5
11	drying etc.	August	7-10 days	1.5		1.5
12	Total (rounded)			10-12	5	15-17

Notes: One stremma equals to 0.247 acres. Data Source: (Franghiadis, 1990)

Table B.2: Definition and sources of variables

All / Male / Female Students	Number of total / male / female students as a share of municipal population, for each census year (1861, 1870 and 1879).
Birth Rate	Number of total births as a share of municipal population, for each population movement census year (1870 and 1884).
Agricultural Population	Number of farmers and landowners as a share of municipal population, for each census year (1861, 1870 and 1879). For the alternative measurement in robustness checks, the number of shepherds is used.
Teachers	Number of teachers as a share of municipal population, for each census year (1861, 1870 and 1879).
Industrialists	Number of industrialists as a share of municipal population, for each census year (1861, 1870 and 1879).
Buildings	Number of total buildings in each municipality, as a share of municipal population, for each census year (1861, 1870 and 1879).
Population	Total number of municipal population, for each census year (1861, 1870 and 1879).
Population Density	Number of people per square kilometre in every municipality. Calculated using Geodata files available from Geodata.gov.gr.
Currant Landsize	Amount of arable land used for currant agriculture in each county, as a share of land used for currant agriculture in the country. Originally measured in *stremmata*, with one unit (stremma) equal to 1,000 square meters.
Wheat Landsize	Amount of arable land used for wheat agriculture in each county, as a share of land used for wheat agriculture in the country. Originally measured in *stremmata*, with one unit (stremma) equal to 1,000 square meters.
Maize Landsize	Amount of arable land used for maize agriculture in each county, as a share of land used for maize agriculture in the country. Originally measured in *stremmata*, with one unit (stremma) equal to 1,000 square meters.
Currant Landsize Per Capita	Amount of arable land used in currant agriculture in each county, per capita. Originally measured in *stremmata*, with one unit (stremma) equal to 1,000 square meters.
Distance from Capital	Natural logarithm of distance between a municipality and the capital of its region. Originally measured in meters, calculated using Geodata files available from Geodata.gov.gr.
Elevation	Natural logarithm of mean altitude of each municipality. Originally measured in meters, calculated using data from WorldClim, as provided by (Fick and Hijmans, 2017).

Notes: The source of the 1861, 1870 and 1879 censuses is the digital archive of ELSTAT (1861, 1870, 1879). Source of agricultural census of 1860 is Petmezas (2003).

Table B.3: Creation of Boundaries for Municipalities of 1861

	The process for creating the boundaries of the municipalities and counties in 1861 can be outlined as follows:
1.	Main shape file used is provided by the Geodata.gov.gr website, and specifically the one with the boundaries of the Local Authorities (LAs) (pre-Kapodistrian) (link: Geodata.gov.gr)
2.	The file contains the administrative boundaries for 1990s Greece, before the so-call Kapodistrian administrative reform of 1997, for local communities and municipalities.
3.	Using ArcGIS, only the relevant communities and municipalities of "Old Greece" were kept (3339 communities and/or municipalities), in order to begin the matching process.
4.	Using the online database of the Hellenic Society of Local Development and Local Government (EETAA, link: eetaa.gr), each of the modern day name of a community and/or municipality was matched with the earliest (chronologically) mention of the municipality of 1861 available.
5.	After a community/municipality was identified as the by-product of the changes (name or administrative unit) that occurred between 1861 and 1997, the value of the municipality (as found in the 1861 census), was assigned to it. Afterwards, the counties and regions that each municipality belonged to, were assigned as well.
6.	The process was repeated for each of the communities/municipalities that belonged to "Old Greece".
7.	After the matching was complete, the boundaries of the communities/municipalities of 1997 were dissolved in the new boundaries of the municipalities of 1861. Similarly, the same process was used to create the boundaries of the counties and regions of 1861.

Table B.4: Descriptive Statistics for Municipalities

	Currant Regions				All Regions			
	mean	sd	min	max	mean	sd	min	max
All Students	0.05	0.02	0.00	0.12	0.05	0.03	0.00	0.21
Male Students	0.04	0.02	0.00	0.09	0.04	0.02	0.00	0.12
Female Students	0.01	0.01	0.00	0.03	0.01	0.01	0.00	0.09
Currant Landsize	0.07	0.08	0.00	0.21	0.03	0.06	0.00	0.21
Currant Landsize (Per Capita)	1.68	2.34	0.00	13.41	0.76	1.78	0.00	13.41
Wheat Landsize	0.03	0.01	0.01	0.06	0.03	0.02	0.00	0.07
Maize Landsize	0.04	0.02	0.00	0.08	0.03	0.03	0.00	0.08
Agricultural Population	0.16	0.06	0.00	0.31	0.15	0.07	0.00	0.31
Shepherd Population	0.04	0.03	0.00	0.15	0.03	0.03	0.00	0.16
Population Density	45.56	41.67	3.82	293.87	137.51	672.98	2.93	5349.30
Industrialists	0.02	0.02	0.00	0.13	0.03	0.03	0.00	0.13
Buildings	0.21	0.04	0.12	0.56	0.21	0.05	0.06	0.56
Teachers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Islands	0.06	0.24	0.00	1.00	0.14	0.34	0.00	1.00
Distance from Capital	7.29	4.30	0.00	11.12	7.15	4.53	0.00	11.80
Elevation	5.85	0.93	3.15	7.25	5.78	0.88	3.15	7.25
N	120				280			

Notes: The table reports the number of observations, mean, standard deviation, minimum and maximum values of the regression variables. Analytical defitions for all variables are provided in Section 3, and Table B.2 in the appendix.

Table B.5: Effect of Currant and Agricultural Population on Education - Interactions

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Currant Landsize	-0.057	0.861	-3.981*	-1.382	0.295	1.114
	(1.085)	(1.266)	(1.937)	(1.352)	(1.154)	(1.396)
Δ(Agricultural Population)	1.008***	0.958***	0.235	0.191	0.975***	0.934***
	(0.192)	(0.206)	(0.179)	(0.186)	(0.205)	(0.222)
Agricultural*Currant	-4.972***	-4.332***	2.288	0.677	-4.913***	-4.206***
	(1.112)	(1.163)	(5.418)	(4.895)	(1.297)	(1.339)
R^2	0.400	0.447	0.257	0.330	0.386	0.437
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Levels	Yes	Yes	Yes	Yes	Yes	Yes
LagDependent	Yes	Yes	Yes	Yes	Yes	Yes
Observations	120	120	120	120	120	120

Notes: In each specification, the currant landsize variable is interacted with all the controls that are differenced (i.e. population density, buildings, industrialists,teachers). Columns (1)-(6) follow the structure of columns (1)-(6) of Table 4. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table B.6: Effect of Currant and Agricultural Population on Education - Placebo (Maize)

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Maize Landsize	0.008	6.532	0.940	-5.099	0.509	6.909
	(3.091)	(5.037)	(4.225)	(3.394)	(3.150)	(4.869)
Δ(Agricultural Population)	0.508	0.790**	0.061	-0.038	0.450	0.749**
	(0.382)	(0.319)	(0.369)	(0.193)	(0.416)	(0.332)
Agricultural*Maize	3.644	0.094	7.106	3.624	4.784	1.049
	(10.431)	(7.985)	(11.503)	(10.037)	(11.150)	(7.869)
R^2	0.168	0.374	0.016	0.283	0.156	0.369
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Levels	No	Yes	No	Yes	No	Yes
LagDependent	No	Yes	No	Yes	No	Yes
Observations	120	120	120	120	120	120

Notes: The alternative crop used is maize landsize at the county (eparhia) level, transformed into the percentage of land used for maize as a share (%) of the total country production. Columns (1)-(6) follow the structure of columns (1)-(6) of Table 4. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table B.7: Effect of Currant and Agricultural Population on Education - Dropping Biggest and Smallest Counties

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Currant Landsize	0.301	1.189	-1.522	0.073	0.290	0.932
	(1.510)	(1.367)	(1.759)	(1.098)	(1.568)	(1.356)
Δ(Agricultural Population)	0.891***	1.030***	0.058	0.007	0.888**	1.028***
	(0.296)	(0.187)	(0.242)	(0.205)	(0.334)	(0.201)
Agricultural*Currant	-5.767*	-4.417*	10.151*	10.284***	-6.557*	-5.369**
	(3.030)	(2.113)	(5.074)	(2.301)	(3.425)	(2.266)
R^2	0.243	0.457	0.068	0.290	0.235	0.458
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Levels	No	Yes	No	Yes	No	Yes
LagDependent	No	Yes	No	Yes	No	Yes
Observations	98	98	98	98	98	98

Notes: The biggest and smallest two currant production counties are excluded (equal to 22 municipalities). Columns (1)-(6) follow the structure of columns (1)-(6) of Table 4. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table B.8: Effect of Currant and Agricultural Population on Education - Windsoring Outliers

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Currant Landsize	-0.254	1.064*	-0.262	-0.818	-0.261	1.192**
	(0.417)	(0.565)	(0.661)	(1.210)	(0.444)	(0.552)
Δ(Agricultural Population)	0.463***	0.434***	0.323	0.172	0.448**	0.421***
	(0.142)	(0.096)	(0.197)	(0.164)	(0.175)	(0.101)
Agricultural*Currant	-3.015***	-2.259***	-1.820	-0.761	-3.104**	-2.162***
	(0.935)	(0.701)	(3.128)	(3.773)	(1.186)	(0.708)
R^2	0.116	0.366	0.017	0.287	0.107	0.364
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Levels	No	Yes	No	Yes	No	Yes
LagDependent	No	Yes	No	Yes	No	Yes
Observations	120	120	120	120	120	120

Notes: The Table shows estimates of the dependent variables (All, Female, Male Students) being winsorized at the 90% percentile. Columns (1)-(6) follow the structure of columns (1)-(6) of Table 4. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table B.9: Effect of Currant and Agricultural Population on Education - Alternative Currant Measure (Per Capita)

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Currant Landsize (Per Capita)	-0.002	0.019	-0.005	-0.006	-0.003	0.019
	(0.025)	(0.028)	(0.026)	(0.022)	(0.026)	(0.028)
Δ(Agricultural Population)	0.864***	0.980***	0.258	0.148	0.851**	0.970***
	(0.276)	(0.219)	(0.199)	(0.154)	(0.304)	(0.229)
Agricultural*Currant	-0.201**	-0.181*	0.017	-0.029	-0.209**	-0.182**
	(0.081)	(0.087)	(0.153)	(0.117)	(0.081)	(0.082)
R^2	0.234	0.423	0.013	0.279	0.224	0.417
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Levels	No	Yes	No	Yes	No	Yes
LagDependent	No	Yes	No	Yes	No	Yes
Observations	120	120	120	120	120	120

Notes: Currant landsize at the county (eparhia) level is transformed into the per capita currant landsize. Columns (1)-(6) follow the structure of columns (1)-(6) of Table 4. Robust standard errors, clustered by county are reported in parentheses. All regressions are weighted using the population from the 1870 census. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table B.10: Effect of Currant and Agricultural Population on Education - No Weights

	(1) All Students	(2) All Students	(3) Female	(4) Female	(5) Male	(6) Male
Currant Landsize	0.308	1.402*	-0.695	-1.479	0.318	1.491*
	(0.687)	(0.727)	(0.891)	(1.572)	(0.701)	(0.713)
Δ(Agricultural Population)	0.823***	0.900***	0.169	0.149	0.817***	0.888***
	(0.253)	(0.230)	(0.287)	(0.199)	(0.262)	(0.239)
Agricultural*Currant	-6.126***	-5.383***	1.525	0.497	-6.421***	-5.472***
	(1.459)	(1.526)	(5.369)	(4.971)	(1.539)	(1.466)
R^2	0.165	0.334	0.011	0.249	0.163	0.331
Regional FE	No	Yes	No	Yes	No	Yes
Geographical	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Levels	No	Yes	No	Yes	No	Yes
LagDependent	No	Yes	No	Yes	No	Yes
Observations	120	120	120	120	120	120

Notes: All regressions are not weighted for population. Columns (1)-(6) follow the structure of columns (1)-(6) of Table 4. Robust standard errors, clustered by county are reported in parentheses. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

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