A Poor but Efficient Crop: Supply-Side Responses in the Greek Tobacco Sector, 1953-64

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*W*e analyzed the price elasticities of the Greek tobacco supply at three different levels of analysis (cross-varietal, cross-regional, and two-dimensional) using secondary-level data published by the Greek National Tobacco Board for the years 1953 to 1964. Our panel suggest that the development of postwar Greece's tobacco sector was largely determined by market forces rather than by state-led purchasing programs. However, market pressures impacted production and sales volume to varying degrees, depending on the tobacco varieties grown in different parts of the country. Given that tobacco was postwar Greece's most important export crop, and that it was the object of considerable state support, the often-made claim that state interventionism has disincentivized the adaptation of the Greek agricultural sector to evolving markets needs to be revised. Our findings support Shultz's poor-but-efficient hypothesis regarding farmers.*

Un cultivo pobre, pero eficiente: efectos de los precios sobre la oferta en el sector tabaquero griego (1953-64)

*S*e analiza la elasticidad de la oferta de tabaco en relación con los precios desde tres perspectivas (según variedad, región, y combinación de variedad y región) utilizando datos de nivel secundario publicados por el Organismo Nacional del Tabaco de Grecia para el periodo 1953-1964. Las estimaciones de panel indican que en el desarrollo del sector tabaquero griego en la segunda mitad del siglo XX fue más determinante el mecanismo de mercado que los programas estatales de compra. Sin embargo, los efectos del mercado tuvieron un impacto desigual sobre los volúmenes de producción y venta, según la variedad de tabaco que se cultivaba en las distintas zonas del país. Dado que el tabaco era el cultivo de exportación más importante de la Grecia de posguerra, y que recibía considerable apoyo estatal, las conclusiones de este estudio implican la necesidad de cuestionar la percepción, bastante extendida, de que el intervencionismo estatal desincentivaba que el sector agrícola griego se adaptara a lo que pedía el mercado. Los resultados de nuestro análisis se alinean con la hipótesis del agricultor pobre pero eficiente formulda por Schultz.

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1. INTRODUCTION

With regard to Greek agriculture in the second half of the 20th century, historians have emphasized its limited modernization, the demographic impact of rural outmigration, and the high level of state interventionism in the form of public investment and redistribution through price-support schemes (Kazakos, 2007: 145-50, 218-19; Kostis, 2019: 396-97, 403; Iordanoglou, 2020: 105-06, 116-17, 216-17). State expenditures in the agricultural sector have been described as serving "mainly income-supporting goals and only secondarily development-related goals" (Kazakos, 2007: 150). At the same time, state support for peasant incomes, it is argued, perpetuated the existence of backward agricultural practices and the small size of farms, which purportedly prevented the sector from becoming more efficient and oriented towards more competitive crops. At the core of these somewhat pessimistic claims lies the assumption that a dichotomy exists between supporting the rural economy for the sake of helping it develop on the one hand, and pursuing political gain and/or improving farmer's wellbeing in the short run on the other (Kazakos, 2007: 150, 221; Kostis, 2019: 396-97, 403). We find this assumption problematic. With this article, we hope to contribute to ongoing discussions in Greek economic historiography by strengthening its empirical foundations. Whether state intervention in the agricultural sector disincentivized farmers from adapting to the demands of the market is an empirical question after all, regardless of how politically contentious it might become at times. Our data appear to confirm that the Schultzian hypothesis of the poor-but-efficient farmer (Schultz, 1964) applies to the case of Greek tobacco producers in the second half of the twentieth century. Market prices functioned as incentives in farmer's production plans.

Many Greek farmers left their villages to find employment in urban areas in the 1950s and 1960s, in a context of expanding opportunities for higher incomes in Greece and abroad. Outmigration was especially visible in the mountainous areas of Macedonia and Thrace, where tobacco production had been of crucial importance for many local economies (Vermeulen, 1979: 30, 43-4; Fakiolas & King, 1996: 171-90; Petmezas, 2012: 274-81). The economic incentive for leaving the countryside for the city seems obvious: workers prefer higher incomes, all things equal. A thornier question is that of how economic incentives influence on-farm behavior. In this article, we demonstrate that, by and large, Greek tobacco farmers responded to price incentives by adapting their production plans, against a background of intensive state intervention in the tobacco market which included large purchasing programs. Our analysis pays attention to regional and intra-crop (*i.e.*, variety-related) variation.

We carried out a straightforward comparison between the supply-side effects caused by changes in market prices and the degree of state interventionism. We also explored the

long-run dynamics between prices on the one hand, and production and sales volume on the other. In doing so, we take into account the possible lagged effects, *e.g.* the prices of 1958 having an effect on the production and sales of 1959, 1960, 1961, etc. We also tested the direction of causality between our main variables of interest by checking whether prices determined the amount of tobacco being produced and sold, the other way around (production/sales determining prices), or both (mutual determination). One original component of our approach as far as the economic historiography on Greece is concerned is that, in order to gain a more detailed understanding of what might explain divergences in price elasticities in the tobacco supply across the country, we have paid attention to the broad range of tobacco varieties cultivated in Greece, as well as their uneven spatial distribution.

The article is structured as follows: section 2 provides the historical context for our analysis. Section 3 presents the type, and origins, of the data that have informed our research. Section 4 reviews the existing bodies of scholarship with which this article is in dialog, *i.e.* the agricultural economics literature on supply responses to price changes, and the historiography on Greek agricultural policy in the post-Second World War period. Section 5 presents the general price and supply trends in the Greek tobacco sector for the period under study, as well as the correlations between them. Such correlations constitute the core of the findings presented in this article. In section 6 we apply a panel autoregressive distributed lag (ARDL) model to check for a possible long-run cointegrating relationship between output and market prices. Section 7 summarizes the conclusions of our research.

2. HISTORICAL CONTEXT

Tobacco leaf production and exports became one of Greece's most important economic sectors in the 1920s, after the annexation of what became the country's northernmost provinces. Eastern Macedonia and Thrace were already specialized in the production of high-quality leaf since the 19th century. The settlement of hundreds of thousands of Asia Minor refugees in these regions in the 1920s led to the expansion of the land dedicated to tobacco cultivation in these areas (Dankas, 2003: 212-13), although we can speak of a general increase in tobacco output in many other parts of Greece as well during the 20th century. In the postwar decades, despite the broad consensus among Greek elites regarding the need to industrialize the country (Kakridis, 2009), tobacco exports were expected to supply the hard currency necessary to sustain the reconstruction effort, in addition to providing urgently needed income to the northern Greek rural communities, ravaged by years of war (Apostolopoulos, 2020).

While manufacturing grew in importance within the overall Greek economy in the second half of the 20th century, tobacco production remained a strategic sector, whether measured by how many people's livelihood depended on it, or as a share of the country's exports. In 1955 there were approximately 185,000 families involved in tobacco cultivation ("The Autonomous Tobacco Board", 1956). In the mid-1960s, Greek tobacco represented more than a third of the country's total exports in terms of value (National Statistical Service of Greece, 1966). Quantitative considerations alone, however, can hardly do justice to the historical importance of the tobacco sector for 20th century Greece. A labor-intensive crop with high profitability per land unit, tobacco made the nation of smallholders established by the land reform of the 1920s viable in a sizable portion of the country, at least in the short run. Starting in the interwar period, tobacco farmers were among the main targets of the state's modernizing agenda. A number of policies prompted them to rationalize their productive activities and financial decisions, and to improve the homes where they not only lived, but also processed and stored their tobacco (Carmona-Zabala, 2021). The militancy of urban tobacco workers and their participation in communist organizations made them an actor to reckon with in the politically volatile context of the interwar period. Arguably no other crop was the object of such intense state involvement in 20th century Greece than tobacco, which was plagued with frequent overproduction crises from the late 1920s onwards. This explains in no small part the activist stance of tobacco merchant associations, whose representatives often called to specific policies through publications and direct communication with state officials (*e.g.* Mantzaris, 1939: 36-59).

The postwar dirigiste state made a sustained effort to alleviate the internal imbalances of a tobacco sector that remained of crucial importance, despite the growing size of Greece's industrial sector and the expansion of other crops in the countryside (Lemontzoglou & Carmona-Zabala, 2023). It did so through a number of means, most prominently by purchasing tobacco directly from farmers to cushion the vagaries of the market, increase liquidity within the sector, and diminish stress sales. Before the establishment of the National Tobacco Board in 1957, *i.e.* when the state lacked the necessary organizational infrastructure for buying tobacco directly from farmers, it would charge the Agricultural Bank of Greece with the task of executing purchasing programs. In turn, the bank would then place a large order with the Cooperative Union of Tobacco Farmers of Greece, a tobacco leaf trading company owned by farmers' cooperatives ("Recent News", 1950; "Tobacco Purchasing Campaign", 1950; "Purchased Tobaccos…", 1953). Whether carried out through the Agricultural Bank or the NTB, the process was by and large the same since the late 1940s: the government announced its intention to purchase tobacco on that specific year, as well as the amount of money that it would allocate for that purpose, and the amount of tobacco that it intended to purchase. Purchases would then start.

3. DATA

The chronological scope of our study is limited by the availability of detailed data disaggregated by tobacco variety and region of origin. The period that we cover (1953-64) is, nonetheless, sufficiently representative of postwar trends for two reasons. First, the period starts before the state established the National Tobacco Board (NTB), which made intervention in the market a relatively predictable affair from 1957 onwards. Second, as Iordanoglou (2020: 44-93) has pointed out, the "rules of the game" of Greek economic policy varied little throughout the 1953-73 period, since they were largely accepted by all political factions with real access to the state apparatus.

The data informing our research was originally collected, and published, by the NTB (National Tobacco Board, 1967). We found a copy of that publication in the historical archive of the National Bank of Greece. Since its establishment in 1957, the main tasks of the NTB included the purchasing of unsold tobacco directly from the farmers in order to support their incomes and push up prices (Karanikolas *et al.,* 2009: 27-8). Our dataset contains year-by-year information on the production volume and average market prices, disaggregated by tobacco variety and geographic area. It also contains annual data on the level of government intervention, the use of arable land for tobacco production, sales and revenues associated with this activity.

In this article we focus on the supply side, without factoring in the fluctuation of international demand. Here we should point out the inexistence, to our knowledge at least, of consistent, detailed datasets on the amounts of Greek tobacco consumed overseas in any given year, or the prices paid for it. The same applies to the tobacco exported from neighboring Bulgaria or Turkey, with which Greek varieties were in direct competition because of their similar characteristics. The textual sources from the period under study consistently point out that Greek tobacco was in a state of crisis because of the international shift away from Oriental varieties, and towards Virginia-type tobacco (*e.g.* Centre of Planning and Economic Research, 1966: 86-7). Yet when it comes to quantitative data on demand, we face the same problem that Christodoulopoulos (1931) refers to in his study on Greek tobacco in the first third of the 20th century: data produced in customs houses are distorted by the tobacco stocks kept by trading firms and cigarette manufacturers. Furthermore, the data do not differentiate between regions of origin or tobacco varieties in any detail. Neither do they record the wide range of year-to-year variation regarding the quality of this non-standardized crop. Last, most data on prices appear in the specialized press of the time, more often than not as anecdotal evidence delivered through journalistic writing rather than in the form of perusable datasets. For these reasons, to the extent that demand is documented in our study, it is in the form of prices directly paid to

producers, whether through free market operations or by the agents of the state's purchasing programs.

4. THEORY AND EVIDENCE IN THE EXISTING LITERATURE

The main core of the supply-side economics literature is premised upon the hypothesis that a positive linkage exists between the price of a commodity and the quantity of it that is supplied (Daniels & VanHoose, 2017). Based on this assumption, many agricultural economists have studied how farmers' respond to economic incentives (Askari & Cummings, 1977; Rao, 1989). According to Pubols and Klaman (1945), not only the present but also past and future prices constitute one of the most important factors guiding farmers' decision making with regard to their production plans. This mechanism can be summarized as follows: Farmers appear likely to increase the supply of crops that receive relatively high prices. Likewise, they tend to reduce the supplied quantities of crops that obtain relatively low prices.

In support of Pubols and Klaman's argument, Schultz (1964) has referred to peasants as *economic men* that behave similarly to other capitalist entrepreneurs, in the sense that they seek to maximize their profits. Following the Schultzian paradigm of the poor-but-efficient farmer, agricultural output is assumed to respond positively to improved price incentives, while, at the same time, state intervention through public investments in human capital (education), skills and new technologies, especially in rural areas, is regarded as a necessity for obtaining the greatest possible returns in the long-run (Schultz, 1980). Contrary to Schultz' hypothesis, Chayanov (1966) has suggested that small peasant farmers behave in a way completely different from large capitalist farms, manifesting a two-fold nature as both producers and consumers. Hence, according to Chayanov, peasants are primarily concerned with satisfying their household's consumption needs, rather than seeking profit (Zong & Davis, 1998). Similarly, the economic target income hypothesis predicts very low, or even negative, supply responses to price changes (Madan, 1958; Mathur & Ezekiel, 1961; Neale, 1959; Ogbu & Gbetibouo, 1990; Olson, 1960). Specifically in the Greek context, Vergopoulos (1975, 1978) has argued that peasant households allocate increased amounts of labor and capital for agricultural production *precisely in response to* falling prices.

The question of how agricultural prices feature in farmers' production plans has not remained circumscribed to theoretical debates. It also lies at the core of a substantial body of empirical scholarship. With its proposed distributed-lag modeling approach to the estimation of short- and long-run supply elasticities, the pioneering work by Nerlove

(1956, 1958) on farmers' price expectations has greatly influenced this literature. A number of studies examining supply price elasticity in agricultural markets have built upon Nerlove's research. While positive, significant responses to changes in commodity prices have been observed in most cases. There is also visible variation in the degree of elasticity between products, as well as intra-product variation over time. The observed variety of responses has raised some fundamental questions regarding farmer behavior in a market-based economy. On the one hand, a first group of scholars has shown that peasants act as rational economic agents, and, therefore, any significant improvement in market prices will directly result in increased volume of agricultural production (Bauer & Yamey, 1959; Narain, 1965; Falcon, 1964; Hopper, 1965; Krishna, 1963). Specific evidence in support of the existence of a positive supply response of tobacco growers to increased prices appears in Askari and Cummings (1976), Chembezi (1991), Madhavan (1972) and Shahzad *et al.* (2018). In contrast, other scholars have claimed that farmers are generally characterized by weak or total absence of any significant supply reaction to price changes (Bloom & Sachs, 1998; Boeke, 1953; Di Marcantonio *et al.,* 2014; Furnivall, 1944; Georgescu-Roegen, 1970; Johnson, 1978; Knack & Keefer, 1995; Lundahl & Ndulu, 1987; Oyejide, 1990; Tshibaka, 1997; Wharton, 1970). This second group of scholars have often highlighted the importance of non-price factors that may influence agricultural supply, such as weak rural infrastructure, poorly developed market institutions, lack of competitiveness, absence of technology, or weather and soil conditions, etc. (Binswanger, 1990; Chhibber, 1988; Limbu, 1997; Mungekar, 1997; Palanivel, 1995; Ogbu & Gbetibouo, 1990; Opira, 1997).

Very little quantitative evidence can be found in the existing scholarship regarding Greek farmers' responses to market incentives, other than a number of studies on livestock production (Apostolopoulos & Stoforos, 1997; Baltas, 1987; Baltas & Alogoskoufis, 1991; Drakatos, 1965; Fotopoulos, 1995; Ghatak, Manolas & Vavouras, 1999; Lianos & Katranidis, 1992; Papaioannou & Jones, 1972; Tsingos, 1976; Rezitis & Stavropoulos, 2012). Christodoulopoulos' (1931) study on the impact of international demand on Greece's tobacco production is mainly based on data on export prices and national-level output for all countries that produced Oriental-type tobacco, *i.e.* Greece, Bulgaria and Turkey. His analysis is too far removed from the farm level to tell us much about farmers' responses.

A blind spot in the existing scholarship remains with regard to the price responsiveness of Greek tobacco, a purely market-oriented crop that played a significant role in the development of Greece. This small Mediterranean country constitutes an unexploited source of valuable case studies, as it successfully leaped from a largely agricultural productive model to one based on industry and services in the course of the 20th century.

Neither a former colony nor a core country in the capitalist world economy, Greece's historical record calls for additional inquiry if the claim that market-based incentives encourage farmers to produce more is to remain relevant. Tobacco farmers in particular provide an interesting case study for testing the Schultzian poor-but-efficient hypothesis.

That Greek tobacco farmers were poor is a well-known fact in the existing historiography. The northern Greek areas that specialized in tobacco production saw the highest emigration rates in the 1950s, 1960s and 1970s (Vermeulen, 1979: 30, 43-4; Fakiolas & King, 1996: 171-90; Petmezas, 2012: 274-81). This happened despite, or rather in combination with, policies aimed at diversifying the income of farmers in these regions through subsidies and non-agricultural work. Such measures were intended to reduce the pace of outmigration, and enable a state-managed, orderly relocation of surplus population to other rural areas that were experiencing development and, as a result, required new laborers. In the end, emigration abroad was necessary to absorb the demographic surplus of northern Greece regardless of these plans (Center of Planning and Economic Research, 1966: 86-95, 156-58).

Incomes from tobacco production were not only low but also perceived by the state authorities as having little prospect of ever growing significantly. This argument was put forward to justify the decision to invest in infrastructure in other areas and other crops such as cotton (Center of Planning and Economic Research, 1966: 80-95). From the point of view of Bhaduri's (1989) notion of rural labor process, the Greek policy of providing alternative sources of income to tobacco farmers and slowing down the emigration of small landholders to cities was probably beneficial, in the sense that it reduced the downward pressure of immigrants upon urban wages, and prevented generalized farmer impoverishment through indebtedness and stress selling. There was little room for alternative approaches, such as boosting the domestic tobacco industry for the purpose of absorbing unsold leaf stocks. The Greek cigarette industry had a small consumer base relative to leaf output. Furthermore, Greek smokers were accustomed to cigarettes largely made of specific tobacco varieties orientated towards domestic consumption rather than exports (Alexis, 2023).

Other than emigrating and engaging in non-farm work, tobacco growers had few options. The usual strategy of shifting to more profitable crops (Bhaduri, 1989) was, for the most part, not available in the small plots of infertile land well-suited to tobacco farming. Tobacco has the particularity of benefiting from low-fertility soils while also further depleting them, which means that plot repurposing is difficult (Gennadios, 1886: 6-10; Swanson, 2014: 100-08). But the question remains whether the tobacco growers who remained on their farms and continued growing tobacco were responsive to market in-

centives or, to put it in Schultz's terms, whether they were both poor *and* inefficient. Considering the environmental and institutional particularities of the Greek tobacco sector, it is safe to assume that the reduction of a farm's tobacco output is indicative of a rural household's labor being allocated to a more profitable activity even if we lack detailed local-level data for other crops.

For the most part, quantitative studies on the Greek tobacco sector have had a descriptive rather than explanatory orientation (*e.g.* Lamprou & Tzanides, 1939; Karanikolas *et al.,* 2009). In this article, we provide some new evidence in favor of the Schultzian hypothesis that market forces, primarily prices, can effectively determine farmers' production planning. Our findings suggest the presence of positive and significant supply responses to market incentives by Greek tobacco growers during the 1950s and 1960s. In addition to market prices, we take into consideration the state's support for tobacco farmers, which usually took the form of tobacco purchases, carried out either directly or indirectly by state institutions. The picture of the Greek peasantry in the 1950s and 1960s that emerges from our study is one where the Schultzian hypothesis applies, and where state intervention does not trump the market mechanism as a determinant of production volumes. The picture is also one of heterogeneity, as prices, although generally relevant, operate with different degrees of intensity depending on geographic location and tobacco subtype.

Thus far, Greek economic historians of the post-Second World War period have placed their focus on producing general descriptions of agricultural policy, and on interpretations of how class dynamics featured in its formulation and effects. Some Greek economic historians have highlighted the protection of peasant incomes through state purchasing schemes and price floors (Kazakos, 2007: 221; Kostis, 2019; Iordanoglou, 2020: 116-17, 124-25, 138-39). They see in these initiatives a form of wealth redistribution towards the peasants that has disincentivized the modernization of Greek agriculture, in the sense that it prevents market forces from signaling to farmers the need to pivot to more lucrative crops. In contrast, some Marxist scholars (Amin & Vergopoulos, 1974; Vergopoulos, 1975; Sakellaropoulos, 2011) have interpreted state-led purchasing schemes, and agricultural policy more generally, as a mechanism for perpetuating the otherwise unsustainable extraction of value from peasants by merchant and industrial capital. While tobacco is a prime example of how the state intervened in agricultural markets, none of the historians of Greece mentioned above have made a detailed study of the crop's trajectory over time. To be fair, it is understandable that a specific crop, however important in its own right, might remain understudied, given the broader, national-economy level of analysis of the work of these historians. Work remains to be done that focuses on single crops and their particularities.

5. TRENDS, CORRELATIONS AND SUPPLY ELASTICITIES OF GREEK TOBACCO

In this section we discuss the trajectories of the crop based on statistical analyses of production and prices, disaggregated by region and tobacco varieties. We processed our data by first applying a pooled panel data regression model to determine the supply-side responses of tobacco producers on a given year to changes in prices on the same year (t), taking into account different locations and tobacco varieties. Given the stability of exchange rates and the low levels of inflation that characterized the period under study, we have kept current prices as they appear on the published data for the purposes of our analysis. We have also applied fixed-effects panel regression models in order to control for possible unobserved characteristics that remain constant across all the varieties or regions over time. We used the econometric software *EViews* for all calculations.

5.1. Aggregate levels

In terms of production volume, Greek tobacco followed a clear upward trend throughout almost the entire 20th century (Fig. A1)[1]. From 1953 to 1964, the production of tobacco in Greece, measured in tons, increased by nearly 125%, while the amount of land used for tobacco cultivation rose by 64% in the same period. Tobacco sales and exports in Greece also showed a remarkable increase in volume. They rose by 115% and 80% respectively over the 1953-64 decade. Similarly, upward trends are noticeable in the numbers of both farmers and villages dedicated to tobacco farming in Greece in the same period: +58% and +30%, respectively. The average yield, measured in kilograms per unit of cultivated land, rose by 35% over the same period. Gross annual income for tobacco growers in Greece has increased by more than 200% during the period under study (1953-64). These are all noteworthy increases, especially considering that by 1953 the Greek economy was already beginning to surpass its prewar levels of output (Kazakos, 2007: 124-25).

With regard to trends in the evolution of prices, Greek tobacco showed a noteworthy increase in both the domestic and export markets in the period under discussion: 45% and 52%, respectively. On the policy side, a rising trend was also noted in government support for tobacco farming. Between 1955 and 1964, the yearly amount of tobacco that

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1. Figures, tables and maps included in the annex to this article carry an *A* before their number (*e.g.* "Figure A1"). If included in the main body of the text, the number appears on its own (*e.g.* "Figure 1").

the Greek state would purchase at a price above 8 drachmae/kg increased by 268%, while the price per kilogram increased by 115%. Between 1957 and 1959, the state also purchased deteriorated tobaccos at less than 8 drachmae/kg in order to remove low-quality leaves from the market, thereby shoring up the reputation of the country's most prominent export crop. Given the limited reach of this measure, however, we have treated it as negligible for the purposes of our analysis. We have analyzed the data concerning state purchases above 8 drachmae/kg only. At the national level, the correlation coefficients between tobacco production in Greece and its average prices (Table 1) indicate that we can speak of significantly, positively correlated magnitudes. We now move to a level of analysis that distinguishes between different tobacco varieties and regions.

TABLE 1

Pearson correlation coefficients between the yearly amount of Greek tobacco produced and its price level, 1955-64

	Prices		
	Market (drachmae/kg)	State > 8 (drachmae/kg)	Exports (US dollars/kg)
Production (tons)	0.93	0.92	0.68

Source: authors' calculations based on data from National Tobacco Board (1967).

5.2. Cross-varietal comparisons

When we take into consideration the wide range of tobacco varieties grown in Greece (14 according to the NTB data), a highly unequal composition in terms of production volume becomes apparent (Fig. A2). Such heterogeneity should come as no surprise, given the different requirements that different varieties have in terms of ecological factors (*e.g.* soil, climate) and farming skills. Furthermore, different varieties of tobacco have different properties. Some are sought for their pleasant flavor, whereas others are preferred as filling that will reduce the overall cost of the mixes used in cigarette production. Because of the strictly national scope of many cigarette industries around the world in the period under study, it is also the case that the smoking public from different countries were used to different tobacco mixes. Therefore, certain varieties were more likely to be exported to some countries and not others. Some varieties, in fact, were usually consumed mainly by Greece's domestic cigarette industry, although they represented a small percentage of overall output. While varieties were not defined by international standards commonly agreed on, one should keep in mind that tobacco has traditionally been a highly differentiated crop, marketed through various, distinct commercial networks.

The *Basma* variety was the most widely cultivated of all throughout the 1953-64 period, accounting for an average of 36% of the total domestic output of tobacco in

Greece. In distant second and third places, the *Samsun* and *Myrodata Smyrnis* varieties represented, on average, 12% and 10% of total production, respectively. Other varieties such as *Mavra (Thessaly)*, *Tsembelia*, *Basi Bagli* and *Kaba Koulak* also contributed significantly to Greece's overall annual production throughout the period under study. The average shares for this group of varieties ranged between 7% and 9% annually. Somewhat lower, but still significant levels (nearly 4% on average) were reported in *Mavra (Argos)* and *Myrodata (Agrinion)*. All remaining varieties represented less than 1% each.

In addition to differences in terms of production levels between tobacco varieties, there was also wide variation with regard to prices paid on the market (Fig. A3). The *Basma* variety received the highest average price of 32.5 drachmae/kg, followed by *Tsembelia* at an average price of 28.1 drachmae/kg. The price of most other varieties ranged from 20 to 25 drachmae/kg, *i.e.* close to the average price of the whole country. Closer to the bottom of the distribution, *Myrodata Smyrnis*, *Sari*, *Zichnomyrodata* and *Mavra (Argos)* reached the lowest prices (below 20 drachmae/kg). The other varieties falling within the label "Other varieties" in the available data also failed to reach 20 drachmae/kg on average.

FIGURE 1

Correlation between annual volume of Greek tobacco production and farm sales, and average market prices, disaggregated by variety, 1953-64
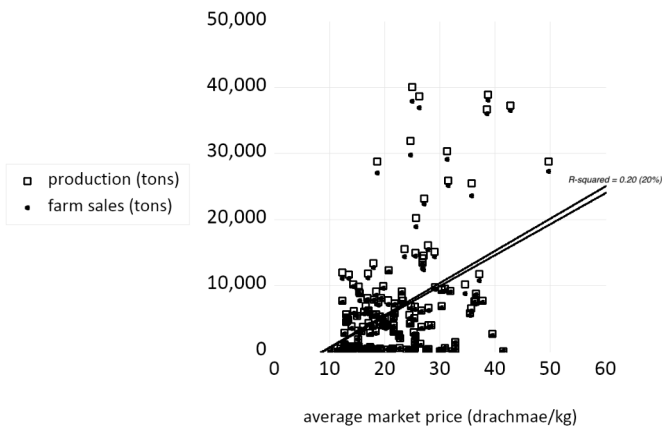
Source: authors' calculations based on data from National Tobacco Board (1967).

Still at the cross-varietal level of analysis, the data depicted in Figure 1 provide some preliminary evidence suggesting a strong positive relationship between annual volumes of both production and sales on one hand, and market prices on the other, over the entire 1953-64 period. This holds after taking into account observations from 14 different to-

bacco varieties. Our pooled cross-sectional panel regression analysis allows us to predict high (defined as >1) or very high (>2) supply side responses to price changes in terms of both production and volume of sales (Table 2). These results indicate that tobacco growers in Greece responded positively and significantly (significance of 1% or more) to higher market prices. In other words, an increase of 1% in market prices caused supplied quantities and sales to increase by more than 1%. Between 7% and 27% of all the fluctuation in production and sales is attributed to changes in prices.

TABLE 2
Coefficients of elasticity of supply (production and farm sales)
in response to market price changes, 1953–64

	log_price (t)	log_price (t-1)	log_price (t-2)	log_price (t-3)	log_price (t-4)
Model	(1)	(2)	(3)	(4)	(5)
log_production(R-squared)	+1.83***(0.07)	+2.56***(0.14)	+3.09***(0.19)	+4.20***(0.27)	+4.98***(0.26)
Response	high	very high	very high	very high	very high
Observations	168	154	140	126	112
Model	(6)	(7)	(8)	(9)	(10)
log_farm sales(R-squared)	+1.92***(0.07)	+2.54***(0.13)	+3.09***(0.18)	+4.18***(0.25)	+5.04***(0.26)
Response	high	very high	very high	very high	very high
Observations	168	154	140	126	112

Pooled cross-varietal panel estimates for the equation: $Q\_i,t = a + b \cdot P\_i,t$ (where: Q is the quantity of tobacco produced/sold in tons, P is the market price of tobacco in drachmae per kg., a is the constant term, b is the main coefficient of interest, i denotes different tobacco varieties, and t denotes the time).

Note: asterisks indicate statistical significance at level a=1% (***), a=5% (**), a=10% (*).

Source: authors' calculations based on data from National Tobacco Board (1967).

Even after controlling for possible unobserved time fixed-effects to address endogeneity problems of the pooled-OLS panel model, the price elasticities observed in the supply of Greek tobacco remain highly elastic (Table A1). With regard to the possible unobserved period effects that might affect the results that we present throughout this article, it is worth noting that we performed Hausman tests to make sure that a fixed-effects model is more desirable than a random-effects model. Standard errors have been computed through the SUR-PCSE coefficient variance matrix to account for both cross-sectional heteroskedasticity and correlation.

Our analysis goes deeper than a crop-wide approach, and takes differences between tobacco varieties into consideration. Upon examination of the data on each variety separately, we observe some noteworthy differences in the level of responsiveness to price changes. Varieties such as *Kaba Koulak, Zychnomyrodata* and *Mavra Thessalias* pre-

sent a higher responsiveness to prices (Table A2). At the other end of the spectrum, *Mavra Argous* and *Trabzon* show very limited, even non-significant or negative, responsiveness.

5.3. Cross-regional comparisons

Like variety, geography played a crucial role in generating significant variation, in both production volumes and market prices, throughout our study period (maps A1 and A2). This is hardly surprising, considering the diversity of ecological, institutional and demographic conditions that one has historically encountered in the territories that today make up the Greek Republic. The territories of Macedonia and Thrace, annexed at the expense of the Ottoman Empire in the 1910s and 1920s respectively, produced an average of nearly 32,000 tons of tobacco per year between 1953 and 1964 (almost 3 times greater than the average volume for all Greek districts). During the same period and further south, Aetolia-Acarnania, which had been part of the Greek state since the War of Independence of the 1820s, produced an average of 10,000 tons of tobacco annually. Thessaly follows with an average annual volume of 6,000 tons per year. The Peloponnese and Phthiotis-Phocis reported an average production of 3,000 tons per year each, while all other areas, including the Islands, Epirus and Thebae, produced less than 2,000 tons each.

With regard to price differences across regions, Eastern Macedonia and Thrace were found to sell tobacco for an average price of 32.2 drachmae/kg in the period 1953-64, followed by Aetolia-Acarnania and Phthiotis-Phocis at an average price of 27 and 23.8 drachmae/kg, respectively. Epirus, Central-Western Macedonia and the Islands show average prices for tobacco ranging from 20 to 23 drachmae/kg, *i.e.* close to the average farm price for the whole country. The lowest prices are registered for Thessaly, Thebae and Peloponnesos, at average price levels below 20 drachmae/kg.

Once again, the data seem to confirm our argument that market prices are an important determinant of both production and sales volumes as far as Greek tobacco is concerned, for the period 1953-64 (Fig. 2). Much like when we observed the data disaggregated by tobacco variety, an analysis that distinguishes between different regions indicates a high (>1), or very high (>2) response of farmers to prices (Table 3). Once again, a 1% increase in the average price of Greek tobacco would result in an increase of over than 1% in both production and sales volumes. It seems that nearly 14% to 26% of total variance of both production and sales volumes was the result of market changes. Very high supply-side elasticities (>2) with respect to price are also found when period fixed-effects are taken into account in our models (Table A3).

FIGURE 2

Correlation between annual volume of Greek tobacco production and farm sales, and average market prices, disaggregated by region, 1953-64
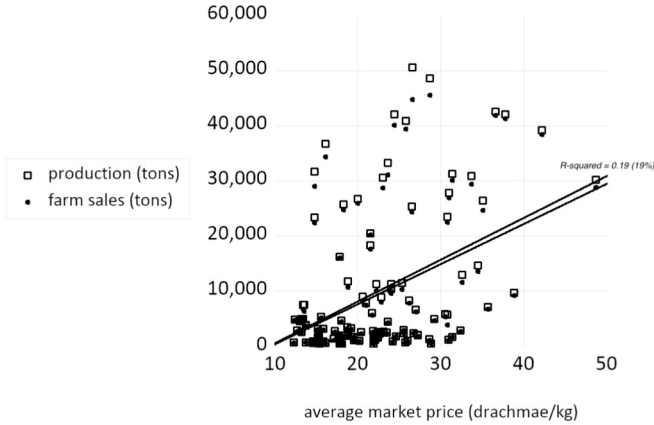
Source: authors' calculations based on data from National Tobacco Board (1967).

TABLE 3

Coefficients of elasticity of supply (production and farm sales) in response to market price changes, 1953–64

	log_price (t)	log_price (t-1)	log_price (t-2)	log_price (t-3)	log_price (t-4)
Model	(1)	(2)	(3)	(4)	(5)
log_production(R-squared)	**+1.59***(0.14)**	**+1.86***(0.19)**	**+1.93***(0.20)**	**+2.41***(0.26)**	**+2.40***(0.20)**
Response	high	high	high	very high	very high
Observations	108	99	90	81	72
Model	(6)	(7)	(8)	(9)	(10)
log_farm sales(R-squared)	**+1.59***(0.14)**	**+1.83***(0.19)**	**+1.91***(0.20)**	**+2.36***(0.25)**	**+2.36***(0.19)**
Response	high	high	high	very high	very high
Observations	108	99	90	81	72

Pooled cross-regional panel estimates for the equation: $Q_{j,t} = a + b*P_{j,t}$ (where: Q is the quantity of tobacco produced/sold in tons, P is the market price of tobacco in drachmae per kg., a is the constant term, b is the main coefficient of interest, j denotes different regions, and t denotes the time).

Note: asterisks indicate statistical significance at level a=1% (***), a=5% (**), a=10% (*).

Source: authors' calculations based on data from National Tobacco Board (1967).

Our claim that prices were significant determinants of supply holds for virtually all parts of Greece, with the only exception of the Peloponnese (Table A4). There are, nonetheless, differences across regions in terms of elasticity. Phthiotis-Phocis, Epirus and Thebes were the most responsive. The discussion on the effects of prices on Greek tobacco pro-

duction becomes more interesting when the prices paid to producers through the state's purchasing schemes enter the picture. These intervention prices had a much lower impact on both production and sales volumes, although they remained positive and significant at 1% and 5% levels. Table 4 represents the pooled estimates of the baseline model that connects production and sales volumes with prices. Here, we took into consideration state purchases of tobacco at prices above 8 drachmae/kg.

TABLE 4
Coefficients of elasticity of supply (production and farm sales)
in response to state intervention price changes, 1953–64

	log_st. price (t)	log_st. price (t-1)	log_st. price (t-2)	log_st. price (t-3)	log_st. price (t-4)
Model	(1)	(2)	(3)	(4)	(5)
log_production(R-squared)	+1.04**(0.11)	+1.45***(0.22)	+1.88***(0.28)	+2.52***(0.26)	+2.08***(0.18)
Response	high	high	high	very high	very high
Observations	37	30	23	20	20
Model	(6)	(7)	(8)	(9)	(10)
log_farm sales(R-squared)	+1.04**(0.11)	+1.42***(0.22)	+1.85***(0.27)	+2.47**(0.21)	+2.09**(0.18)
Response	high	high	high	very high	very high
Observations	37	30	23	20	20

Pooled cross-regional panel estimates for the equation: $Q\_j,t = a + b*P\_j,t$ (where: Q is the quantity of tobacco produced/sold in tons, P is the state price of tobacco in drachmae per kg., a is the constant term, b is the main coefficient of interest, j denotes different regions, and t denotes the time).

Note: asterisks indicate statistical significance at level a=1% (***), a=5% (**), a=10% (*).

Source: authors' calculations based on data from National Tobacco Board (1967).

State intervention appeared to have a lower impact on output volumes in comparison to relative effects caused due to market price changes even after controlling for period fixed effects (Table A5). This means that the supply responses by tobacco growers to price incentives were much more attached to market-determined forces rather than state intervention. This finding is indicative of how state purchasing programs that built up, and kept, tobacco stocks might have cushioned the impact of market fluctuations upon tobacco growers to some extent, but they were not the main factor driving tobacco production in Greece during the period under study. Some historians consider the existence of stocks in the hands of state institutions indicative of policy getting on the way of the market's regulatory effects (*e.g.* Iordanoglou, 2020: 231). However, these stocks did not prevent the market mechanism from guiding farm-level decisions regarding what to produce. In other words, the fact that production levels would sometimes create stocks of unsold tobacco in Greece was primarily due to farmers following market incentives, specifically prices.

5.4. Two-dimensional analysis

We now turn to a discussion of tobacco farmers' responses to prices in which we simultaneously take into account variation across geography and tobacco varieties. Our analysis reveals that the *Basma* variety in Eastern Macedonia and Thrace reported a much larger average volume of production when compared to any other varieties across the country (Fig. A4). The *Samsun* variety grown in Central-Western Macedonia occupies a very far second. Among the varieties grown in areas other than the north, the most significant one is *Tsembelia* from Aetolia-Acarnania.

Production volume is not the only characteristic that varies widely between tobacco varieties and regions. Price differences are also noteworthy (Fig. A5). The *Basma* variety in Eastern Macedonia & Thrace was sold at an average price of 33.5 drachmae/kg, followed by *Tsembelia* in Aetolia-Acarnania, *Basma* in Central-Western Macedonia and *Basi Bagli* in Eastern Macedonia & Thrace, at 29.2, 27.6 and 27 drachmae/kg, respectively. It is interesting to note that the same variety could reach very different price ranges depending on where it was grown. Compare, for instance, the values for *Tsembelia* grown in Aetolia-Acarnania and in Epirus, or those for *Basi Bagli* grown in Eastern Macedonia & Thrace on the one hand, and Central-Western Macedonia on the other.

FIGURE 3
Correlation between annual volume of Greek tobacco production and farm sales, and average market prices, disaggregated variety and region, 1953-64
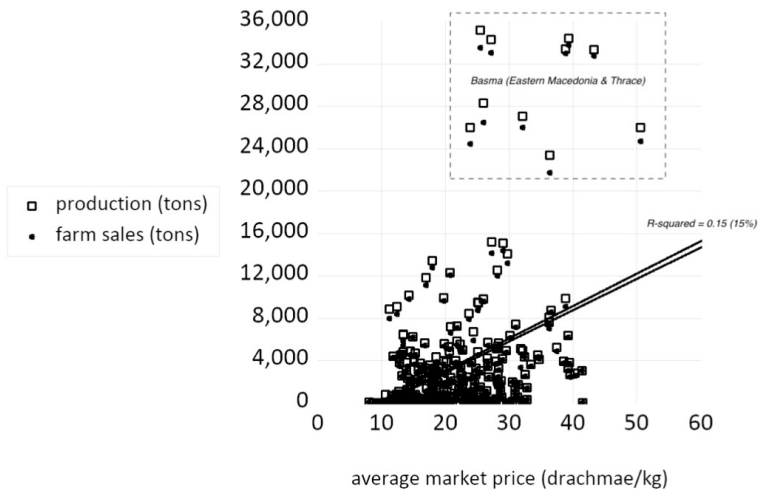
Source: authors' calculations based on data from National Tobacco Board (1967).

TABLE 5

Coefficients of elasticity of supply (production and farm sales) in response to market price changes, 1953–64

	log_price (t)	log_price (t-1)	log_price (t-2)	log_price (t-3)	log_price (t-4)
Model	(1)	(2)	(3)	(4)	(5)
log_production(R-squared)	+2.28***(0.12)	+2.99***(0.21)	+3.27***(0.24)	+4.35***(0.31)	+5.09***(0.30)
Response	very high	very high	very high	very high	very high
Observations	258	229	203	176	149
Model	(6)	(7)	(8)	(9)	(10)
log_farm sales	+2.35***(0.12)	+3.02***(0.21)	+3.32***(0.24)	+4.32***(0.30)	+5.09***(0.29)
Response	very high	very high	very high	very high	very high
Observations	258	229	203	176	149

Panel analysis (two-dimensional) for the equation: $Q_{i, j, t} = a + b \cdot P_{i, j, t}$ (where: Q is the quantity of tobacco produced/sold in tons, P is the market price of tobacco in drachmae per kg., a is the constant term, b is the main coefficient of interest, i denotes different tobacco varieties, j denotes different regions, and t denotes the time).

Note: asterisks indicate statistical significance at level a=1% (***), a=5% (**), a=10% (*).

Source: authors' calculations based on data from National Tobacco Board (1967).

This two-dimensional level of analysis confirms the existence of a positive relationship between annual volumes of tobacco and its market prices (Fig. 3). In other words, the correlation is evident not only when one looks at *either* variety or regions separately, but also when *both* varietal and regional differences are taken into account at the same time. Once again, a 1% increase in the average price of Greek tobacco would result in an increase in production and sales volumes by far more than 1% (Table 5). At this level of analysis, the total variance of both production and sales volumes that should be attributed to price changes ranges from 12% to 31%. We checked for possible unobserved time fixed-effects to address endogeneity problems (Table A6).

It is worth noting that, while a generalized responsiveness to prices can be appreciated both in terms of production and sales volumes, there are important differences across varieties and depending on the part of the country. The *Basma* variety grown in Greece's northern regions (Macedonia and Thrace) presents by far the largest deviation from the general trend in relative terms, in the sense that it amounts to comparative large volumes of production (Fig. 8). However, this does not mean that northern Greek *Basma* constitutes an exception with regard to the responsiveness of its supply to prices. A number of varieties, including northern Greek *Kaba Koulak*, appear as more responsive. Others appear as less responsive (Table A7). This relative dullness of northern Greek *Basma* becomes remarkable when one takes into consideration its export-oriented character. Since both *Kaba Koulak* and *Basma* were largely produced for foreign markets, it is safe to claim

that foreign demand, at least to the extent that it is indirectly observable through on-farm prices, impacted export-oriented tobaccos unevenly across varieties and regions.

6. ESTIMATING THE LONG-RUN SUPPLY RESPONSES OF GREEK TOBACCO

In the previous section we have demonstrated that price increases were not just positively correlated to increases in production and sales volumes in the short run, but also for the following three or four years, depending on the case, after a price increase. In this section, we apply a panel autoregressive distributed lag (ARDL) model (Pesaran, Shin & Smith, 2001; Pesaran & Shin, 1999) in order to examine whether there is a long-run cointegrating relationship between the total amount of tobacco produced and sold, and its average market price in post-war Greece at both cross-varietal (i, t) and cross-regional (j, t) levels. Such investigation allows us to compute the long-run supply elasticity of Greek tobacco for the time period 1953 to 1964, taking into account the possible lagged effects of market prices on both production and sales volumes. This appears to be an even more reliable method for analyzing the growers' response to price changes than that described in the previous section, in the sense that farmers' decision making process at time *(t)* can best be determined by taking into consideration not only a current market price but also its past values in periods *(t-1)*, *(t-2)*, *(t-3)*, etc. Furthermore, the ARDL method produces consistent estimates, even in the presence of possible endogeneity, while allowing us to test for the direction of causation between variables. For the calculations presented in this section we used, like we did for section 5, the statistical package *EViews*.

A number of scholars have implemented methods similar to ours in order to calculate long-run correlations. Askari and Cummings (1977) provide a compilation of results from multiple studies on the elasticity of supply in relation to prices for a number of agricultural products and geographic contexts. While the studies that they cite focus mostly on south Asian countries, they are valuable in that they roughly cover the same time period and the same crop that we study. This approach has been more popular among agricultural economists working on developing nations "in real time" than among historians studying European farmers in earlier periods, especially when it comes to tobacco farmers. Hence our choice of cases for comparison. It appears that Greek tobacco farmers were more responsive to price changes than tobacco farmers in the countries studied in the literature cited in Askari and Cummings (1977).

Before applying our panel ARDL specification, we first need to check whether cross-sectional dependence exists in the time series as well as the model in order to avoid un-

reliable results. Table A8 shows that there is indeed cross-sectional dependence for all series and the model, in each of the two panels used here (Breusch & Pagan, 1980; Pesaran, 2004). All tests rejected the null hypothesis of "no cross-sectional dependence" at the 1% significance level. In the presence of cross-sectional dependence, traditional procedures for testing the existence of unit roots in time series (*i.e.* first-generation unit root tests) may produce biased results. We addressed this problem by using second-generation unit root tests allowing for cross-sectional dependence. The findings of the CIPS unit root tests are listed in Table A9, indicating that all the series are stationary at level values (Pesaran, 2007). The test rejected the null hypothesis of unit root (non-stationarity) at either 1% or 5% significance level for all the series included in the analysis.

After verifying stationarity, we move to the second step of ARDL approach, performing several panel cointegration tests for the existence of a long-run cointegration relationship between the variables of interest. Most tests described in Pedroni (1999, 2004) and Kao (1999), as well as Johansen's (1991) Fisher test, have rejected the null hypothesis of no cointegration among the variables (tables A10 and A11). Therefore, we can confirm the existence of a long-run relationship between production and sales volumes of Greek tobacco, and its average market prices over the period 1953-64. The appropriate lag length for each of the underlying variables in the ARDL model has been selected based on Akaike Information Criteria (AIC).

TABLE 6
Long-run supply side responses (cross–varietal level), 1953-64

	log_production	log_sales
log_price(p-value)	+2.157 ***(0.000	+2.098 ***(0.000)

Source: authors' calculations based on data from National Tobacco Board (1967).

The long-run coefficient of the price elasticity on the produced quantity of different Greek tobacco varieties (*i.e.* cross-varietal level) has been found to be positive and statistically significant at a 1% level, indicating that a 1% increase in the average market price would lead to an increase of 2.15% in the quantity supplied in the long run (Table 6). Another significant positive long-term association is observed between price and sales volume: a 1% increase in average market price would lead to a 2.09% increase in sales in the long run. Similarly, at the cross-regional level of analysis, the long-run price elasticity of supply for Greek tobacco can be considered highly elastic (Table 7). These findings confirm our main argument that Greek farmers responded positively to market prices in terms of both production and sales volumes of tobacco. In the last step of our analysis, we performed a test for Granger causality in order to identify the direction of the relationship

between production and sales volumes of Greek tobacco and market prices. There is a one-way causal relationship running from market prices to both production and sales volumes (Table A12).

TABLE 7
Long-run supply side responses (cross-regional level), 1953-64

	log_production	log_sales
log_price(p-value)	+2.266 ***(0.000	+2.429 ***(0.000)

Note: the optimal lag length of each variable is selected on the basis of the Akaike information criteria for top 20 models (AIC).

Source: authors' calculations based on data from National Tobacco Board (1967).

7. CONCLUSIONS

In this article we have provided empirical evidence for the existence of a significant positive linkage between production and sales volumes of Greek tobacco on one hand, and its average market price on the other, over the period 1953-64. We found that Greek tobacco farmers responded positively to price changes at three different levels of analysis (cross-varietal, cross-regional, and two-dimensional). The price elasticities of supply for Greek tobacco remain highly significant and positive even after controlling for possible unobserved time-constant effects. We also found that farmers responded positively and significantly to the prices offered through publicly funded purchasing programs. However, such effects were generally found to be much lower compared to those caused due to changes in market prices. In other words, market prices rather than state support were the main driver of farmers' decision over the resources that they would allocate to the production of tobacco, a purely market-oriented crop. Last, it is worth noting that, despite the existence of unsold surpluses that the state would periodically buy from producers, increases in production volumes in response to market increases were generally accompanied by increases in sales as well. In other words, farmers would not just grow more tobacco whenever prices were up, but they would also sell more tobacco.

A long-run positive causal relationship between production and sales volumes of Greek tobacco on one hand, and its market prices on the other has also been identified. Our findings support the poor-but-efficient hypothesis in the specific context of our study. Peasants respond to higher prices by producing more, and to lower prices by producing less, at least as far as tobacco in postwar Greece is concerned. Quite significantly, their decision to increase production would lead, in the aggregate, to increased sales as well. To be sure, future empirical research will have to determine which non-price factors are also relevant to decisions of this kind. Life cost, input prices, opportunities for non-agricultural

employment, alternative crops, public investment in infrastructure, and the availability of new technologies come easily to mind as topics of further enquiry. However, the limited availability of detailed, consistent datasets might be a challenge for the purposes of their measurement. Be that as it may, we hope to have demonstrated that Greek tobacco producers were already in the 1950s and 1960s in a position to adapt, to a certain extent, their production plans to market trends, and that state purchasing programs did not disincentivize them from doing so. In fact, when compared to tobacco farmers elsewhere in roughly the same period, Greek farmers were more, not less, responsive to price incentives.

Whether our findings about how prices factored in the evolution of tobacco production can be extended to other crops grown in post-Secondo World War Greece should be the matter of further inquiry. We have demonstrated the Greek tobacco sector's dynamic character in the sense that the "variety mix" evolved over time in accordance to market trends. One should keep in mind, however, that the period under study was also one in which crops such as cotton and fresh produce were becoming increasingly relevant within Greece's primary sector. What drove the trajectories of such "new" crops is a question that must be answered empirically, as we have attempted to do with tobacco in this article. In the 1950s and 1960s, tobacco growers, much like the rest of Greek society, lived through a period of rapid socio-economic transformations in which new opportunities for more lucrative employment appeared elsewhere, whether in Greek cities or abroad. Within the broader picture of Greece's overall national economy, tobacco became less and less relevant. Relative to urban employment, tobacco production became less profitable generally speaking. Yet it can be said that those who continued growing tobacco remained, as Shultz would put it, poor but efficient.

ACKNOWLEDGEMENTS

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