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Taxes, Efficiency, and Redistribution: Discriminatory Taxation of Villages in Ottoman Palestine, Southern Syria and Transjordan in the Sixteenth Century

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Abstract

Governments can tax productive activities with either uniform or discriminatory rates among taxpayers. Although discriminatory rates can cause productive inefficiency and require high cost of administration, they can be preferred because of their advantage in distributional flexibility. This paper studies the discriminatory taxation of production in the Fertile Crescent. Using information from the Ottoman tax registers, it examines the basis, distortionary effects, and distributional consequences of discriminatory rates quantitatively. The results challenge widely held beliefs about the basis for discriminatory rates in this region and the Ottoman government's motivation in adapting systems of taxation in newly conquered lands.

Keywords: taxes, efficiency, redistribution, discriminatory rates, Ottoman Empire, Palestine, Syria, Transjordan

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ABSTRACT: Governments can tax productive activities with either uniform or discriminatory rates among taxpayers. Although discriminatory rates can cause productive inefficiency and require high cost of administration, they can be preferred because of their advantage in distributional flexibility. This paper studies the discriminatory taxation of production in the Fertile Crescent. Using information from the Ottoman tax registers, it examines the basis, distortionary effects, and distributional consequences of discriminatory rates quantitatively. The results challenge widely held beliefs about the basis for discriminatory rates in this region and the Ottoman government's motivation in adapting systems of taxation in newly conquered lands.

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A fundamental question governments face in taxing productive activities is whether the rates should be uniform or discriminatory among taxpayers. Whereas under a uniform rate structure the same rate would apply to all taxpayers, discriminatory rates would vary among taxpayers based on their abilities, socio-economic status, what they do, or how much they earn. Although uniform rates are simpler and cheaper to administer, discriminatory rates may also be observed in a variety of contexts, primarily because of their advantage in distributional flexibility. By varying rates among taxpayers, governments are able to redistribute income between the sectors and regions of the economy or between political, demographic, or income groups. Discriminatory rates induce inefficiencies, however, because they cause the after-tax cost of production or input provision to be greater for some taxpayers than others. In deciding

whether the rates should be uniform or discriminatory, governments have to balance the loss in efficiency against the social value of redistributing income through the system of taxation.

The cost of administering a system with discriminatory rates can be very high when the characteristics of taxpayers do not differ systematically or when these differences cannot be easily observed. It is generally easier to identify differences between the sectors of the economy than within each sector, making it harder to implement discriminatory rates within a sector. Although rates have historically varied between the agricultural and manufacturing or between the market and non-market sectors, they have been more uniform among producers within each of these sectors. In most medieval and early modern systems of taxation, for example, although manufacturing and trade activities may have been taxed at different rates than agricultural activities, all agricultural producers typically paid taxes at the same rate, usually as tithes.

The system of discriminatory taxation observed in parts of the Fertile Crescent stands out as a novel phenomenon in the history of taxation. One of the methods of agricultural taxation observed in the region was to levy taxes directly on output, known in Islamic taxation theory as the *muqāsama* (sharing) method.[2] Evidence indicates that this method existed long before the Islamic period and that an integral part of it was a discriminatory rate structure. Persian rulers of the Sassanid dynasty, for example, employed the method in taxing agricultural production, rates ranging between one third and one sixth of output.

Despite the attempts of Persian ruler Kawadh (488-501) to discontinue the *muqāsama* method (as one of his reformist policies), proportional taxation with discriminatory rates appear to have continued in some parts of the Fertile Crescent, being reintroduced officially during the Islamic period by the Abbasid caliph al-Mahdi (775-85) (Løkkegaard, 1950, pp. 109-15). Muslim jurists generally agreed that the rates of taxation could vary among producers, and

secondary sources indicate that some rulers collected taxes on grains like wheat and barley at rates that varied among villages between one-twentieth to one-half of total output. The lack of detailed and reliable data, however, does not allow us to determine with certainty what exactly were the rates in each village, how widespread was the system of discriminatory taxation in various Islamic empires, and how the system changed over time until the Ottoman rule.

When the Ottomans conquered this region in the early sixteenth century, the discriminatory rates they inherited from the Mamluk state stood in sharp contrast to the system of agricultural taxation that prevailed in other parts of the Empire. Whereas in other provinces taxes on grains were typically levied at uniform rates among villages, the rates in some districts of the newly conquered lands of the Fertile Crescent were discriminatory. Despite the contrast between the two systems, the Ottomans preserved the prevailing system of taxation and simply reassigned the tax revenues to themselves. They also recorded detailed information about the tax rates and taxable resources of these lands, making it possible for us to study the system in great detail.

This paper seeks to understand the nature and consequences of discriminatory taxation in this region, examining it quantitatively within the relevant theoretical and historical context. Three objectives guide the inquiry. The first is to examine the basis for discriminatory rates. Although historians have generally argued that the rates depended on local factors like the fertility of the soil and the availability of irrigation facilities, no satisfactory quantitative evidence has been found for support. I use the Ottoman tax registers as primary sources of data, which include information about over 1,300 villages in seven Ottoman districts corresponding to Palestine, southern Syria, and Transjordan in 1595-96 (Hütteroth and Abdulfattah, 1977). I also use maps of the region to construct measures of some of the physical characteristics, such as the

availability of irrigation water, of each village. Although a regression analyses shows various variables that affected the tax rates significantly, the effects of some of the variables were not in expected directions. Framing previous arguments into a coherent whole, I discuss their relative merits.

The second objective is to determine the distortionary effects of discriminatory taxation. Whereas the tax rates varied among villages for some products like grains, they were uniform for other products like fruits and vegetables. By determining the relationship between the tax rates and the outputs of these two types of products, we can determine the distortion caused by discriminatory taxation. Economic theory of taxation has shown how taxes raise the after-tax cost of a product and cause producers to inefficiently shift resources toward other products. All else being the same, the magnitude of this distortion would rise with the rate of taxation. The implication for a discriminatory rate structure is that, assuming substitutability between products to be the same among villages, a village with a higher rate of taxation than another would be expected to substitute a greater amount of the uniformly taxed products for the discriminatorily taxed products. Taxation theory would thus lead us to expect a negative relationship between the tax rates and the output of a discriminatorily taxed product and a positive relationship with the outputs of other products. Using data from the tax registers, I find that the results confirm the expectation.

The final objective is to examine the effect of discriminatory rates on income distribution. To compare income distribution under discriminatory and uniform rates, I first determine the existing distribution of income among villages at different points of the distribution and calculate the income shares of the villages in each group. I then use the regression results of the relationship between the tax rates and output to simulate what the incomes would have been

under a uniform rate structure. Comparing the distribution of income under the two rate structures, I examine whether discriminatory rates improved or worsened income distribution. The results challenge widely held beliefs about the Ottoman government's motivation in adapting systems of taxation in newly conquered lands.

DISCRIMINATORY RATES IN THEORETICAL AND HISTORICAL CONTEXT

The basic elements of a tax system are the tax base and the rate structure. Governments have various choices in levying taxes on a productive activity, such as to impose a lump-sum payment on the firm or to make taxes based on the revenue or profits earned from the activity or on the returns to one or more of the inputs used in production. Corresponding to each tax base, there is also the choice of whether the rates should be uniform or discriminatory among taxpayers. The rates in discriminatory taxation may vary according to various criteria, including geographic location (rural versus urban, developed versus backward), product category (farming versus industrial, consumer versus capital goods), or personal characteristics (age, marital status). Because tax collection is coercive, the choice of tax base and rate structure can have important implications for various political and economic outcomes in a society, including the allocation of resources and the distribution of income.

Uniform and discriminatory rates have significant implications for equity and efficiency in taxation.[3] By altering the relative costs of economic activities, all (non-lump-sum) taxes affect behavior and cause inefficiencies as taxpayers naturally adjust to taxes by substituting other activities for taxed ones. Although both uniform and discriminatory rates thus cause distortions, economic inefficiencies are likely to be greater with discriminatory rates than with uniform rates. Some inefficiencies are distinct outcomes of discriminatory taxation. For example, discriminatory rates create opportunities for rent-seeking (as each group seeks to reduce its own

rate) and raise the cost of administration and compliance (given the asymmetric information about taxpayers and their incentives to avoid taxation).[4]

Moreover, discriminatory rates among taxpayers cause aggregate production inefficiency.[5] One of the requirements of production efficiency is for the marginal rate of transformation between any two outputs to be the same in all producers, which can be achieved when all producers face the same prices for outputs. Although a uniform tax rate across producers would not affect this condition, discriminatory rates would cause producers to face different prices and cause the economy to be productively inefficient.

To compare the distortionary effects of uniform and discriminatory taxation in a simple example, consider an economy with two groups of producers producing two goods, A and B. Suppose that this economy is initially producing efficient quantities of A and B and that the government decides to raise revenue by taxing A. Notice that in order for the tax revenue to be the same under the two rate regimes the discriminatory rate has to be higher than the uniform rate for one of the groups and lower than the uniform rate for the other group. Because the tax rates are now different between the two groups, they face different costs and produce the two goods at different marginal rates of transformation. The economy is no longer productively efficient. Assuming supply elasticities to be the same between the two groups, the high rate group would be producing too little A and the low rate group too little B, compared to levels required for aggregate production efficiency. Aggregate output can be increased by diverting resources from B to A in one group and from A to B in the other until the marginal rates of transformation are equalized.

Are the inefficiencies of discriminatory taxation justified? Governments engage in discriminatory taxation primarily for income redistribution.[6] A variety of factors can affect the

choice of a rate structure, including the magnitude of inefficiencies, the nature of pre-tax inequalities, and the balance of power between various social and political groups. These, in turn, would be determined by such things as production technology, natural resources and their allocation in the population, the availability of skilled staff to administer taxes, and a society's history of taxation.

Although it is well known that discriminatory taxation existed in the fiscal history of the Fertile Crescent, not much is known about the details of the system before the Ottoman period. Thanks to the rich information recorded and preserved by the Ottomans, it is possible to analyze the details of discriminatory taxation in this region during their reign. Upon conquering new lands, they typically conducted a cadastral survey and recorded information about tax-paying subjects and taxable resources in tax registers, updated periodically as circumstances changed over time, in order to have current information on the empire's sources of revenue.[7] At the beginning of each tax register was the tax code of a region, which laid down the basic tax regulations and specified the rates corresponding to different circumstances.[8]

The tax codes of some of the districts in the Fertile Crescent make it clear that the Ottomans inherited a discriminatory rate structure from previous rulers and that this differed from the system of taxation in other regions. The tax code of the district of Jerusalem (Quds), for example, begins: "In this district, because the tax rate of each village is different, the rate is recorded separately."[9] The tax registers of this and several neighboring districts thus recorded the tax rate for each village separately, in addition to the detailed information about the taxpayers and the expected revenues from a variety of productive activities in each village.

By studying the tax codes of various Ottoman districts, we can determine the general structure of their fiscal system. There were three general categories of Ottoman taxes: personal

taxes that were based on a taxpayer's characteristics like land ownership and marital status, trade taxes based on the market exchange of goods and services, and production taxes that applied to various farming and manufacturing activities.[10] Production taxes consisted of three subcategories depending on the tax base: output taxes that were based on the total output of an activity, input taxes that were based on one of the inputs used in production, and enterprise taxes based on the activity as a whole. Output taxes applied primarily to grains, legumes, and fibers, and they were assessed as a share of the total output. Input taxes typically depended on the quantities of the land, trees, animals, or other inputs used in production, rather than on total output. For example, taxes on fruits, nuts, and dates typically depended on the number (sometimes also the age, height, and type) of trees. Taxes on vineyards similarly depended on the number of vines, taxes on vegetables depended on the amount of land allocated to them, and taxes on animal products depended on the numbers of beehives or animals. Enterprise taxes depended not on the amounts of the total output or one of the inputs used in production but on the activity as a whole. They applied primarily to retail stores and manufacturing enterprises like dye-houses, tanneries, juice-makers, slaughterhouses, and soap-makers in towns.[11] Tax assessments were presumably determined by some estimate of the profitability of the enterprise.

Table 1 shows examples of tax instruments and rates in representative districts of the Ottoman Empire during the sixteenth century.[12] Differences among districts in tax rates and bases reflect regional economic conditions and also the way pre-Ottoman customs were adapted into the Ottomans system of taxation. Because personal taxes often had origins in well-established feudal obligations that prevailed in areas conquered by the Ottomans, the names and rates of these taxes could vary among regions.[13] Whereas a married peasant in Anatolia who held farm land workable by a pair of oxen paid the yoke (*çift*) tax and a bachelor male paid the

lower bachelor tax, similar taxes in the European districts, such as the "gate-tax" observed in Budapest, were typically levied on the household as a whole. Personal taxes (other than the poll taxes imposed on non-Muslims) did not even exist in the Jerusalem district (and surrounding districts as well). Trade and input taxes, on the other hand, were remarkably similar across districts, reflecting the way the Ottomans were able to standardize the system as much as possible.

A comparison of the output tax rates across districts shows the distinct nature of discriminatory taxation in Jerusalem and surrounding regions. In other parts of the Ottoman Empire the output tax rates were uniform across villages in a district. Although the uniform rate itself could vary from one district to another, such as between the rate of 1/10 in Bursa and 1/5 in Malatya, it was the same rate that nevertheless applied uniformly to all villages within a district. The rates in Jerusalem and neighboring districts, however, varied significantly among villages.[14]

The absence of personal taxes in Jerusalem provides a partial explanation for why output tax rates were generally higher in this district than in others. It may seem to be an unfair burden for villages to be taxed here at rates as high as forty percent while in other regions the rates were only ten percent. The higher rates did not necessarily mean, however, that the total tax burden in Jerusalem was significantly higher, because there were other types of taxes to consider. Table 2 reports the relative shares of different tax categories in representative districts (in inhabited villages and towns). Although the higher output tax rates in Jerusalem might have caused the proportion of output taxes to be higher there than in other districts, the absence of personal taxes (other than the poll taxes imposed on non-Muslims) could have compensated for this. The sum of output and personal taxes in Budapest, for example, constitute about the same proportion of total taxes. Moreover, the level and composition of both taxes and incomes from productive

activities were influenced by a variety of other regional production and market conditions, rendering comparisons of tax burden based solely on output tax rates misleading.

Rate differences between and within districts continued until the nineteenth century, when the Ottomans finally fixed these rates uniformly at one-tenth throughout the Empire. The standardization of the rate was part of the European-inspired reform movement known as the *Tanzīmāt*.[15] The reforms included the centralization and universalization of the tax system in the same way that contemporary European states had recently sought to accomplish. Not everyone has agreed, however, with the reformers' contention that discriminatory rates were dysfunctional and needed to be changed. Ömer Lütfi Barkan, one of the leading economic historians of the Empire in the twentieth century, criticized *Tanzīmāt* reformers for failing to understand the redistributive benefits of discriminatory taxation (Barkan, 1964). Barkan and reformers could both be right, of course, if discriminatory rates once had good basis that ceased to exist by the nineteenth century. In any case, the question remains whether Barkan and others were right in asserting that discriminatory rates served useful functions during the sixteenth century.

THE BASIS FOR DISCRIMINATORY TAX RATES

Unfortunately, the tax registers did not specify the basis for the tax rates of villages, and other contemporary sources did not provide direct testimony for what exactly caused the rates to vary among villages. Writers in the secondary literature have typically presumed the rates to be determined by factors that could cause the cost or revenue of productive activities to differ systematically. Combined with information about farming conditions in the Fertile Crescent, this presumption has led them to argue that the rates depended primarily on differences in

productivity and irrigation possibilities. Lewis (1979, p. 119), for example, argues that rates were "determined by the quality and situation of the land, the availability of irrigation, and of course the existing usage." Løkkegaard (1950, pp. 109-10) similarly states that in determining the rates, "due regard [was] being paid to the facilities for irrigation and the cultivation of the soil."[16]

It is well-known that the availability of irrigation water has had great importance for agricultural production in this region because of its Mediterranean-type semi-arid climate, with a regular pattern of some winter rains and an absolute summer drought.[17] Differences in irrigation possibilities could clearly affect the cost of farming, as villages with poorer access to irrigation water were likely to spend more effort and incur higher cost than other villages in producing the same amount of output. Similarly, differences in the productivity of land could affect the revenue from farming, allowing farmers on more productive lands to generate higher incomes. A redistributive system of taxation could in turn be based on these differences by assigning higher rates to villages with more productive resources and/or easier access to irrigation water.

Although historians have generally shared the view of discriminatory rates as an instrument of redistribution, they have not been able to confirm any of the presumed relationships by quantitative analysis. For example, finding the argument about the relationship between tax rates and productivity reasonable, Hütteroth and Abdulfattah (1977, pp. 64-65) checked it "very carefully in hundreds of cases," but they found the results disappointing: "there is no definite correlation between the [tax rate] and the agricultural productivity of the respective village lands." Similarly, based on a quantitative analyses of tax rates in Jerusalem, Makovsky (1984, p. 102) argues: "Despite the likely general accuracy of the … hypotheses concerning the

progressive nature of [discriminatory] taxation, there seems to be no absolute standard by which we can predict the taxation rate of a given village."

These studies may have failed to find the determinants of tax rates not because of a nonexistent relationship between tax rates and other variables but because of insufficient data or inadequate methods of investigation. Although they do not state it explicitly, Hütteroth and Abdulfattah (1977) seem to have reached their conclusion from a merely visual inspection of hundreds of cases rather than systematic quantitative analyses. Because a variety of factors, in addition to the productivity of land, were likely to influence tax rates at the same time, it is impossible to control for all these factors and isolate the effect of productivity by mere visual inspection. Despite being more detailed and quantitatively more sophisticated, Makovsky's (1984) analysis of the relationship between tax rates and population is also likely to fail for the same reason. Because the effect of population, if any, on the tax rates is likely to be mixed with many other factors, tabulating the population and tax rates of villages is unlikely to show their relationship in isolation.

For a quantitative analysis of the determinants of tax rates, this paper uses data from the tax registers of the Ottoman districts of Quds (Jerusalem), Nāblūs, Ġazza, Lajjūn, 'Ajlūn, Ṣafad, and Hawran for the year 1595-96 (1005 H.).[18] To construct a complete and reliable data set for the study of the determinants of tax rates, I omitted fiscal units that made a single lump-sum payment for taxes (rather than itemized taxes) and those with missing information on inhabitants or taxes.[19] Of the 1559 fiscal units (excluding uninhabited fields called *mazra'as*) reported by Hütteroth and Abdulfattah (1977), 211 observations were thus dropped, and the remaining 1348 villages constitute the observations in the data set.

Table 3 shows the distribution of the inhabitants of these villages and their taxes by tax rates. About half of all villages in the area were taxed at the rate of one-fourth, the majority of the rest being taxed at one-third of total output. Only 5 villages were taxed at rates below 20 percent. Taxed at the rate of one-seventh was the village of Sukrīr in Ġazza. Those taxed at the rate of one-sixth were the villages of Dayr Shayh and Bayt Sāhūr an-Naṣārā in Quds and the villages of Majdal Ūrkamās and Tall Kisān in the subdistrict (*nāḥiya*) of Akkā in the district of Ṣafad. Nuwayrī, a writer of the Mamluk period, emphasized security concerns, such as being located on the seacoast or near the enemy border, as the primary reason for why the Mamluks assigned such low rates of taxation.[20] Although one of these villages, Sukrīr, was located near the coast in the northwestern part of Ġazza, the other four villages did not have similar locations, and there were many other villages along the coast with higher rates of taxation.[21] There must have been something distinct about these five villages, such as being in charge of the protection of (or catering to) the pilgrims during the annual pilgrimage to Mecca or the maintenance of an important road or bridge, which caused their tax rates to be exceptionally low.

For a regression analysis of the determinants of tax rates, I generated various independent variables from the tax data. I also used available maps of this region to construct other variables that represent physical characteristics of a village. The variables of primary interest are those that have been identified in the literature as the most significant influences on the cost and revenue of farming operations: irrigation possibilities and agricultural incomes. It is impossible to find a direct measure of the availability of irrigation facilities in each village in the late sixteenth century, simply because we have no localized information on irrigation methods (e.g., canals or underground water sources) from that period. Rather than a direct measure of irrigation

possibilities, proxy variables have to be used to represent the availability of irrigation water in a village. One possibility is to use recent maps of the region to approximate a village's access to surface sources of water (rivers, streams, lakes), assuming them to be unlikely to have changed significantly.[22] I thus identified each village's location relative to surface sources of water and generated a dummy variable for whether a village was within close proximity of water.[23] There are some obvious potential problems of using such a measure, such as omitting other sources of water that were available to villages in the sixteenth century and including sources that were not available. Given the current state of our knowledge of irrigation facilities in each of these villages in the sixteenth century, however, this is the best that we can do.

On the revenue side, the relationship between the tax rates and agricultural incomes could exist at two different levels: total for the whole village or average per household. Even though the registers listed the heads of households separately and the tax system made them responsible for taxes individually, the taxes were recorded as a single sum for the whole village, rather than broken down or averaged out by households. Although the government could presumably use this information to calculate simple averages, there is no evidence that this was done. One might argue that, because the government did not have information about average incomes of households, tax rates were determined by the total revenue of the whole village, all else being the same. Discriminatory tax rates applied only to output taxes, so I included as an independent variable the sum of the incomes from products subject to output taxes by multiplying the taxes listed in the registers for these products by the taxation factor (inverse of the tax rate). To calculate monetary values, I used the prices recorded in the registers.[24]

The relationship between income and tax rates could also exist at the level of average incomes per household. That the government did not calculate taxes or incomes per household

may not necessarily imply that income differences among villages were not well-known or that these differences did not influence the determination of tax rates. There may have been well-known differences in soil productivity among villages, which may have caused incomes per household to differ systematically. The tax system could have used these differences as the basis for discriminatory rates, for example by assigning higher rates to villages with higher incomes per household. To consider this possibility, I calculated each village's average income per household from products subject to the output tax.

I included various other variables into the regression analysis to be able to control for their effects on the tax rates. The religious composition of a village's inhabitants could be a factor if, for example, the relative power of the tax recipients over the villagers in influencing the tax rates depended on the proportion of Muslims in the village. Although the religious minorities (Jews and Christians) paid a poll tax called *jizya* in addition to regular agricultural taxes, they could be paying even higher taxes through higher rates of taxation on their grain production as well. To consider this possibility, I calculated the proportion of Muslims in a village's population (adult males) as another variable.

A village's distance to the nearest market town could affect its tax rate. This could be the case if being farther from market towns meant for a village to have a lower tax rate because of fewer opportunities for alternative employment, higher cost of marketing products, or costlier access to other urban benefits. To approximate these considerations, I measured the direct distance between a village and the nearest market town as a variable. Although the relevant distance could vary considerably from this measure because of such factors as the terrain or the presence and conditions of the roads and waterways, we do not have information about these factors in the sixteenth century.

The recipient(s) of a village's tax revenue could also affect its rate of taxation. The distribution of tax revenue could affect the rates if, for example, the recipients differed systematically in their incentives to maximize the revenue.[25] To consider this possibility, I grouped the recipients into three categories based on the way they collected and spent taxes.[26] The first is the central government, which collected taxes through its agents. Because the money entered the treasury before being spent and thus those who collected the money were different from those who spent it, the incentives to maximize the tax revenue were different. The government's tax collectors, who had the expertise and local knowledge, did not have full incentives to try to maximize the tax revenue. The second category consists of all members of the governing and military class in the provinces. There are some obvious differences among the members of this group, for example between the cavalrymen who typically lived on the same land as he collected taxes and other members of the governing and military class who lived farther and thus used agents to collect taxes. More relevant, however, was that all recipients in this group had the same type of high incentives to maximize the tax revenue, both to increase their personal living standards and to improve their professional positions.[27] In the third category are the pious foundations (and various other negligible recipients whose combined revenue was less than two percent of total taxes). Although there were pious foundations of various types and sizes, as a whole they had the same type of incentives to maximize tax revenues, which was also distinct from the incentives of those in the two previous categories. As was the case with the central government, they needed agents to collect tax revenues, and different people thus collected the taxes and spent the revenue. But because pious foundations often had a clear focus and local operations and management, they were less likely to suffer from the same problem of incentives facing the central government.[28] By being local and thus clear

and present, the beneficiaries of a foundation were likely to apply strong pressure to increase the tax revenues. Similarly, although the manager(s) of a foundation did not receive all tax revenues directly as remunerations for service, they nevertheless had high incentives to maximize tax revenues in order to fulfill professional obligations and improve service, if not to increase personal standards of living.

To consider the effect of the distribution of tax revenue, I generated three dummy variables corresponding to the three categories of recipients.[29] In the regression equation, I omitted the dummy variable for the central government to avoid multicollinearity, so the coefficients of the remaining two dummy variables show the different effect of having a pious foundation or one of the members of the provincial governing and military class, rather than the central government, as the primary recipient of the tax revenue.

The distribution of tax revenue could affect the rates differently if there were multiple recipients of the revenue. For example, one might expect the upward pressure on the tax rate to be greater in villages where two or more recipients share the tax revenue than in villages with a single recipient. To account for this possibility, I generated a dummy variable based on whether a village's tax revenue was divided (1 if divided between two or more revenue holders).

Finally, I included a set of dummy variables to determine and control for the influences of possible but unobservable differences among the seven districts comprising the data set. A variety of unobservable regional factors, such as systematic differences among districts in climate, topography, and political factors, could have influenced the tax rates. I thus generated dummy variables corresponding to each of the districts (1 if village is in the stated district). The dummy variable for Quds is dropped, so the remaining six dummy variables show the way

unobservable factors caused the tax rates of other districts to differ systematically from the tax rates in Quds.

Table 4 shows the results of the regression estimation of influences on the tax rate.[30] The effects of control variables are interesting in their own right. The results show that religious composition of a village and its distance to the nearest market town did not affect its tax rate significantly. The distribution of tax revenue and local factors, on the other hand, affected tax rates significantly and generally in expected directions. The rates were likely to be higher in villages where multiple parties shared tax revenues. Villages paying taxes to pious foundations and provincial officials were also likely to pay at higher rates than those paying to the central government, confirming the expectation about the effect of differential incentives to maximize the tax revenue. The coefficients of regional dummies are also significant, showing that villages in other districts except Nāblūs were likely to have lower rates of taxation than those in Quds.

The magnitudes of these influences are also interesting. Because the dependent variable is in logarithmic form, the coefficients of explanatory variables have a percentage interpretation. The coefficients of some of the district dummies are considerably high, explaining as much as 32 percent of the difference in tax rates between districts (as can be seen from the difference between the coefficients of Ṣafad and Nāblūs). For example, given that the dummy variable for Quds was dropped, the coefficient for Ṣafad indicates that the grain output of a village was likely to be taxed at a rate about 26 percent lower in Ṣafad than in Quds, holding all other variables constant. The variables representing the distribution of the tax revenue, on the other hand, had smaller influences, varying around 3 percent, on the tax rate.

Controlling for other factors makes it possible to identify the individual effects of incomes and irrigation possibilities. To the extent that a village's current proximity to sources of fresh surface water represents the possibilities for irrigation in the sixteenth century, the positive coefficient of this variable indicates that access to irrigation water did indeed affect the tax rate, confirming the expectation that the tax rates were likely to be higher in villages with better access to water than in others.

The coefficients of "Village Income (from Output-taxed Products)" and "Income per Household" are both significant but with different signs, providing two alternative hypotheses about the relationship between incomes and tax rates.[31] Whereas the significance of the coefficient of village income supports the view that the whole village's income served as the tax base in determining the rates, the significance of the coefficient of income per household suggests that the tax base was the average income per household. Whereas the positive coefficient of the former variable indicates a progressive rate-base relationship, the negative coefficient of the latter indicates that the rate structure was regressive. Unfortunately, we do not have sufficient information to determine whether it was the total or average incomes that actually served as the tax base when the rates were first assigned. Further research based on other sources is required to decide which of these possibilities was the more likely scenario.

Despite being small in magnitude (a one percent increase in average income lowered the tax rate by about 0.04 percent), the latter result contradicts the argument commonly made in the literature about the relationship between tax rates and productivity (assuming that higher incomes were generated by higher productivity). One possible explanation for this surprising result is that the negative relationship between tax rates and average incomes could simply be an unintended consequence. If, for example, people overcrowded villages with easy access to

irrigation water and the tax rates were based primarily on irrigation possibilities, then (Ricardian) diminishing returns in agriculture would have caused marginal product and average incomes in these villages to fall, resulting in a negative relationship between tax rates and average incomes. If villagers and Ottoman officials were unable to systematically compare average incomes and tax rates across villages, this unintended outcome may have gone unnoticed. As another possibility, the rates may have been intentionally assigned to achieve a negative relationship between tax rates and average incomes. If, for example, the fiscal authorities were concerned solely with minimizing the distortionary effects of taxation (rather than redistribution) and per-household incomes and supply elasticities of output-taxed products were positively correlated, then (similar to Ramsey taxes in commodity taxation) optimal taxation would require to assign high rates to villages with low incomes (inelastic supply). Once again, lack of sufficient evidence forces us to leave it to further researchers to determine which of these possibilities was the more likely explanation.

DISCRIMINATORY RATES AND OUTPUT DISTORTION

Taxes are mandatory, but taxpayers are free to adjust their behavior in order to avoid being taxed as much as possible. The Ottoman taxpayers too had opportunities to shelter some of their income from taxation by allocating their resources among productive activities. One opportunity was to shift resources toward non-taxed activities. But this must have been a limited alternative, restricted solely to domestic production or other non-market activities that could not be efficiently observed by tax collectors. All observable productive activities were typically subject to taxation.

Another opportunity to reduce taxes was created by the difference between the rate structures of output and input taxes.[32] Whenever the rates differed among producers for output-

taxed activities but were uniform for input-taxed ones, taxpayers could adjust to their own rates by changing the composition of output between these two types of activities. For example, a village could adjusted to a high output tax rate by shifting resources from items subject to the output tax to those that are subject to the input tax, such as by converting a grain field to vegetable garden. Although regulations may have prevented producers from altering their product mix significantly in any one year, they could have nevertheless achieved desired changes in the long run as cumulative outcomes of small yearly adjustments. We would thus expect taxpayers with higher output tax rates than others to produce less of the output-taxed products, all else being the same. As a corollary, the amounts of input-taxed products would be expected to be higher for high-rate producers than others.

These expectations about the distortionary effects of discriminatory taxation can be tested by a regression analysis of how tax rates affected output-taxed and input-taxed products in two separate equations. The dependent variable of the first equation is the revenue from output-taxed products, which we can easily calculate (as we have already done for the previous regression analysis) by simply multiplying the taxes listed in the registers for these products by the taxation factor (inverse of the tax rate). It is much harder to calculate the dependent variable of the second equation: the revenue from input-taxed products. Although the tax codes stated the tax rates for inputs clearly, we have no direct information on how to relate these rates to the output or revenue of these products.[33] We can nevertheless estimate input-output rates indirectly by combining the tax data with more recent information about the productivities and production processes of some of the items listed in the registers. Information about olives and grapes is particularly useful because they could be taxed either as raw products or as finished products like olive oil and grape syrup, and the registers listed these taxes either individually or as combined

with other taxes, and as based on either inputs or outputs. The registers thus provide information about the quantities of inputs and the prices of outputs, which we can combine with external sources on current yields of olive trees and grape vines, the oil or juice contents of olives and grapes, and the conversion rates of weights and measures between the two time periods to estimate revenue from taxes. Based on the assumption that yields did not change significantly since the late sixteenth century, I calculated the ratio of revenue to taxes to be remarkable similar between these products: 8.1 for grapes and 8.2 for olives.[34] Assuming yields to be similar within the region and tax arbitrage to be possible among input-taxed products, I used the rate of one-eights for all input-taxed products to convert taxes to revenue in all villages.

I used the same set of independent variables in both equations because the same set of factors could have potentially, if differently, affected output-taxed and input-taxed products. The independent variable of primary interest is the tax rate. Among the other variables that could have also affected production, perhaps the most important were the inputs used in production. Although the tax registers did not directly record the quantities of inputs, they did record the numbers of adult males in each village, which we can use to generate a general proxy for all inputs. Assuming the number of adult males to be proportional to the agricultural labor force and input proportions to be similar among villages, this measure would represent the units of the input bundle used in production.

Among the variables created earlier for examining influences on the tax rate, the availability of irrigation water in a village, its distance to the nearest town, and the recipients of its tax revenue could have also affected production. So I included these variables in this regression analysis. I used the information from tax registers to create three new dummy variables that represent other economic activities in a village. To consider the effects of

commercial activities, I created a dummy variable based on whether the village hosted the periodic regional market or pursued any urban activities (1 if the village paid *bāj bāzār* or other urban taxes). I created two other dummy variables to consider the effects of making investments in manufacturing activities. One is whether the village had a water mill (1 if village paid taxes for *ṭāḥūn*), whose presence would indicate a lower cost of converting grain to final products and could thus have had a complementary, positive effect on grain production. The other dummy variable is whether the village had a press for grape syrup or olive oil (1 if village paid taxes on *ma'sara*), which would similarly indicate a lower cost in the processing of fruits and olives into final products.[35]

Just as unobservable differences among districts were found to affect the tax rates significantly, *more localized* differences among subdistricts could have affected the productions of output-taxed and input-taxed products. To control for unobservable differences among subdistricts in, for example, rainfall, climate, prices, and soil quality, I generated dummy variables, similar to the district dummies of the first equation, for the forty-two subdistricts represented in the data set.

Table 5 reports the OLS estimates of influences on the revenues of output-taxed and input-taxed products separately. One might argue that a method of simultaneous estimation should have been used to estimate these equations. Recall that the revenue from output-taxed products was one of the independent variables in the regression analysis of the determinants of tax rates reported in Table 4. That the tax rate is now an independent variable in Table 5 thus indicates an interdependent relationship between the tax rate and output-taxed products. Testing for the endogeneity of the value of output in the equation in Table 4 and of the tax rate in the first equation in Table 5 weakly confirms that these two variables were indeed jointly determined.[36] I

therefore used the two stage least squares (2SLS) method to estimate the two equations simultaneously. The signs and significance of the coefficients, however, were generally consistent between the OLS and 2SLS estimates. The coefficients were also surprisingly close.[37] Table 5 thus reports only the OLS results in order to avoid redundancy and to maintain consistency between the two equations.

The results show interesting relationships between the control variables and the revenues from output-taxed and input-taxed products. The number of adult males affected the quantities of the two types of products positively, as one would expect. Being close to irrigation water had an insignificant effect on these products, probably because it affected more the cost of production than its revenue. Villages with a water mill produced more of both types of products than other villages. Although the positive effect of mills on output-taxed products confirms expectations about their complementarity, it is difficult to explain why the same type of positive relationship existed between mills and input-taxed products. Consistent with grape syrup and olive oil being output-taxed products, having a press for grape syrup or olive oil affected the production of output-taxed products (but not input-taxed products) positively. The presence of urban and commercial activities in a village, on the other hand, affected the input-taxed products (but not output-taxed products) positively, indicating a complementary relationship between them. Although the distribution of tax revenue also affected production in interesting ways, it is beyond the scope of this paper to examine them in detail.[38]

The coefficients of the tax rate in the two equations show how taxes distorted output. The negative coefficient of the tax rate in the first equation confirms the expectation that, all else being the same, taxpayers adjusted to higher rates by producing less of the output-taxed products (and substituting by others). The positive coefficient of the tax rate in the second equation shows

the other side of the substitution effect: taxpayers substituted output-taxed products with input-taxed ones as those with higher rates produced more of the latter. The magnitudes of these effects are also interesting. Because both variables are in logs, the coefficients of the tax rate reflect tax elasticities of the two types of products. Tax elasticity of supply is low in both cases, possibly caused by the immobility of resources and restrictions on changing the composition of products.

DISTRIBUTIONAL CONSEQUENCES

One of the features of the Ottoman government frequently emphasized in the literature is their concern about fairness in taxation. The rulers appear to have taken various measures to prevent inequitable practices in collecting taxes. They announced great pride in changing some of the taxes in the newly conquered lands, such as by commuting labor services in the European provinces, in attempts to introduce fair and just taxation. They similarly established clear regulations about how and when taxes should be collected and how tax collectors should not abuse their power. When one type of tax was replaced by another, for example, the tax codes often explicitly prohibited tax collectors from taking advantage of the situation by collecting both types of taxes. Observing these measures against unjust taxation, leading historians of the Empire have typically portrayed the Ottoman legal and financial system as fundamentally fair. İnalcık (1973, pp. 73-4), for example, writes that the Ottoman laws "introduced a system of taxation which was in general simpler and less liable to abuse than the earlier systems of feudal services. [Various] regulations aimed to prevent the military class oppressing the peasantry and, therefore, assessment according to means and collection according to law were the governing principles of the tax system."

The question then becomes whether preserving discriminatory rates in the Fertile Crescent was consistent with the Ottoman concern for fairness. One of the standards of fairness is vertical equity, which suggests that individuals who are in a position to pay higher taxes than others should do so. If there were significant, systematic differences among villages in their ability to generate income, vertical equity thus requires a discriminatory rate structure to assign higher rates to those who are in a position to pay more than others.

Although the negative relationship between the tax rates and the per-household revenue from output-taxed products (Table 4) suggests a regressive system of taxation, this does not by itself mean that the tax system worsened the distribution of incomes as a whole. As the results in Table 5 show, the taxpayers were able to adjust their total net incomes by responding to higher rates by decreasing the production of output-taxed products and increasing input-taxed products. To determine how tax rates affected incomes, we thus need to consider not just the revenue from output-taxed products but the net incomes from all activities.

I used the tax data and previous regression results to calculate and compare the total after-tax incomes under discriminatory and uniform rate structures. I used the same procedure outlined above to estimate a village's income from output-taxed and input-taxed products with discriminatory rates. Subtracting the amount of total taxes paid by the village and dividing the result by the number of households gives the net per-household incomes in a village. To simulate what the incomes would have been under a uniform rate structure, I used the regression results reported in Table 5. Simple calculations show that the uniform tax rate that would be required to generate the same amount of tax revenue (as with discriminatory rates) is 29.25 percent. Substituting this for the tax rate in the data and using the regression equations to calculate the predicted value of the dependent variable for each village gives the simulated

revenue from output-taxed and input-taxed products corresponding to this tax rate, all else being the same. Similarly recalculating the taxes corresponding to this rate and subtracting them from revenues, I estimated the net incomes under a uniform rate structure.

Table 6 shows the distribution of income under the two types of rate structures at different points of the distribution. The distribution is shown separately for villages that were near and distant from sources of irrigation water to determine whether any redistribution took place between them. Contrary to expectations raised by the literature, the distribution is less equitable under discriminatory rates than under uniform rates. Discriminatory rates decrease the shares of total income received by the poorest 80 percent of the households, while increasing the share of the richest 20 percent. It is also interesting that redistribution was more pronounced among villages distant from sources of irrigation. Even though the magnitude of redistribution was small, the direction of redistribution nevertheless shows that the discriminatory rate structure was regressive.

This does not mean, of course, that the system of discriminatory taxation was originally intended to be regressive or that the Ottomans intended to use the tax system to redistribute income from high-income to low-income villages. Such interpretations of the results have to wait until more direct evidence can be found about the origins of the system or about the Ottoman's intentions in preserving it.

The results nevertheless suggest an alternative to the standard reason offered in the literature for why the Ottomans preserved some types of taxes after conquest and changed others. It may have been simple pragmatism and concern with political stability, rather than an overriding concern for justice and equity, that determined Ottoman policy. They may have thus chosen to preserve the discriminatory rate structure in the Fertile Crescent not because they knew

about and agreed with its redistributive consequences but because they found it politically more feasible to preserve than abolish a system that had been in existence for centuries. Unlike the commutation of labor services in the European provinces that was typically welcomed by all peasants, the switch from discriminatory to uniform rates would have faced significant resistance because the Ottomans would have had to lower the rates for some villages but raise them for others in order to preserve the same tax revenue.

CONCLUSION

Combining information from the tax registers of the Ottoman Empire with other information about the physical characteristics of villages, this paper has examined the determinants and consequences of discriminatory taxation in the Palestine, southern Syria, and Transjordan region in the late sixteenth century. The results support the widespread belief that the availability of irrigation water was one of the determinants of discriminatory rates in this region. The widespread belief about the positive relationship between the tax rates and productivity, however, receives no support.

As an adverse consequence, discriminatory rates caused distortion in output. Consistent with behavior expected from rational decision-makers, the producers in this region responded to taxes by reallocating their output between discriminatorily taxed and other products. All else being the same, villages with higher tax rates produced less of the discriminatorily taxed products and more of other products, and vice versa. By altering the cost of production among producers and causing them to alter the product mix, discriminatory rates thus caused inefficiencies in production.

Whereas inefficiencies in taxation can sometimes be justified by more equitable distribution of income, discriminatory taxation in this region actually made the distribution even

less equitable. Contrary to arguments raised in the literature, a comparison of the distribution of income under uniform and discriminatory rate structures shows that discriminatory rates worsened the distribution of income by redistributing it from all other villages to those in the richest 20 percent group. By preserving, if not initiating, such a regressive system of taxation, the Ottoman administration must have, if unintentionally, contributed to the persistence of income inequalities in this region.

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TABLE 1

EXAMPLES OF TAX RATES IN OTTOMAN DISTRICTS

	PERSONAL TAXES			TRADE TAXES	PRODUCTION TAXES		
					Input taxes		Output taxes
Region (Year)	Yoke Tax (*Akçe*)	Bachelor Tax (*Akçe*)	Gate Tax (*Akçe*)	Taxes on Goods Brought to Market (*Akçe*)	Taxes on Animal Products (*Akçe*)	Taxes on Vineyards (*Akçe*)	Tax Rate (%)
Antep (1574)	40	6	--	1 per camel-load of miscellaneous goods	0.5 per animal	0.02 per vine	12.5 (uniform)
Budapest (1562)	--	--	50	4 per wagon-load of pots and cups	0.5 per animal	4 per *dönüm* of land	10 (uniform)
Jerusalem (1562)	--	--	--	20 per camel-load of linen	0.5 per animal	0.1 per vine	discriminatory between 14.2 and 40
Malatya (1560)	50	6	--	--	0.5 per animal	0.03 per vine	20 (Uniform)

Notes: *Akçe* is the Ottoman currency. *Dönüm* is a measure of land. Because of their customized nature, the rates for enterprise taxes are not reported.
Sources: Ottoman provincial *kānūnnāmes*. Akgündüz (1990), Barkan (1943).

TABLE 2

THE SHARES OF OTTOMAN TAX CATEGORIES

DISTRICT	YEAR	PERSONAL TAXES	TRADE TAXES	PRODUCTION TAXES		
				Output	Input	Enterprise
Antep	1574	0.10	0.03	0.47	0.33	0.06
Budapest	1562	0.23	0.18	0.42	0.09	0.09
Malatya	1560	0.17	0.05	0.53	0.17	0.07
Jerusalem	1595	0.00	0.02	0.69	0.23	0.06

Sources: Ottoman *Tapu Tahrir Defterleri* (numbered 142, 161, 186, 345, 373, 388, 406, 410, and 449 in the Prime Ministry Archives in Istanbul and 69, 72, 97, 100, 112, 117, 181, 185, and 192 in the Cadastral Office in Ankara); contents published by Özdeğer (1988), Kaldy-Nagy (1971), İlhan (1994-95), Yinanç and Elibüyük (1983), Göyünç and Hütteroth (1997), and Hütteroth and Abdalfattah (1977).

TABLE 3

DISTRIBUTION OF HOUSEHOLDS AND TAXES, BY TAX RATES

	All Villages	Distribution by Tax Rate 1/7	1/6	1/5	1/4	1/3	2/5
Number of Villages	1348	1	4	38	704	451	150
Households per Village	31.7	10	21.0	23.6	28.7	37.6	30.9
	(38.2)		(10.1)	(23.4)	(36.2)	(42.0)	(33.5)
Proportion Muslim	0.98	1	0.91	0.99	0.98	0.98	0.98
	(0.10)		(0.19)	(0.05)	(0.08)	(0.12)	(0.10)
Output Taxes per Village (in *akçes*)	5039.2	885	2977.5	3986.6	4410.2	5290.2	7586.2
	(5728.1)		(884.2)	(3524.2)	(5376.2)	(4597.4)	(9176.7)
Total Taxes per Village (in *akçes*)	6874.8	2000	3522.7	5112.9	6194.5	7240.6	9535.9
	(7190.1)		(730.2)	(4236.3)	(6891.5)	(6435.1)	(10138.1)

Note: Figures in parentheses are the standard deviations.
Source: Ottoman *Tahrir Defterleri* numbered 72, 100, 112, 181, 185, and 192 in the Cadastral Office in Ankara. Hütteroth and Abdulfattah (1977).

TABLE 4

INFLUENCES ON THE TAX RATE

	Coefficient	P-value
Village Income	0.018	0.001
Income per Household	-0.045	< 0.001
Village is Near Irrigation Water	0.042	< 0.001
Distance to Nearest Market Town	-0.001	0.62
Proportion of Muslims in Village	0.059	0.16
Multiple Recipients Share Tax Revenue	0.028	0.003
Recipient of Tax Revenue is a Provincial Soldier, Commander, or Governor	0.031	0.006
Recipient of Tax Revenue is a Pious Foundation	0.035	0.01
Village is in ’Ajlūn	-0.223	< 0.001
Village is in Ġazza	-0.097	< 0.001
Village is in Lajjūn	-0.176	< 0.001
Village is in Nāblūs	0.058	< 0.001
Village is in Hawran	-0.043	0.002
Village is in Ṣafad	-0.261	< 0.001
Constant	3.463	< 0.001
N		1348
F		62.9
R^2		0.39

Notes: The dependent variable is the natural logarithm of the assigned tax rate (as percent) for a village. Total and per-household income are (natural logarithms of) the revenue from output-taxed products (grains, rice, legumes, and fibers). The omitted variables are “Recipient of Tax Revenue is the Central Government” and “Village is in Quds (Jerusalem)”.

Source: Ottoman *Tahrir Defterleri* numbered 72, 100, 112, 181, 185, and 192 in the Cadastral Office in Ankara. Hütteroth and Abdulfattah (1977).

TABLE 5

DISTORTIONARY EFFECTS OF DISCRIMINATORY TAXATION

	Effect on Output-Taxed Products	Effect on Input-Taxed Products
Tax Rate	-0.52	0.38
	(< .0001)	(0.063)
Labor (Number of Adult Males)	0.57	0.65
	(< .0001)	(< .0001)
Village is Near Irrigation Water	-0.009	0.008
	(0.823)	(0.888)
Village Has a Mill	0.25	0.43
	(0.004)	(< .0001)
Village Has Press for Oil or Juice	0.17	0.03
	(0.005)	(0.732)
Distance to Nearest Market Town	-0.002	-0.014
	(0.854)	(0.444)
Village Pays Urban/Market Taxes	0.11	1.17
	(0.552)	(< .0001)
Multiple Recipients Share Tax Revenue	0.18	0.24
	(< .0001)	(< .0001)
Recipient of Tax Revenue is a Provincial Soldier, Commander, or Governor	-0.11	-0.37
	(0.042)	(< .0001)
Recipient of Tax Revenue is a Pious Foundation	0.08	-0.13
	(0.256)	(0.167)
Constant	9.04	4.96
	(< .0001)	(< .0001)
N	1348	1348
F	22.9	22.1
R^2	0.48	0.47

Notes: Figures in parentheses are the p-values. The dependent variables are the natural logarithms of the revenue from output-taxed products (Equation 1) and input-taxed products (Equation 2). "Tax Rate" and "Labor" are also in natural logarithms. The omitted variable is "Recipient of Tax Revenue is the Central Government." Because of space constraints, the results of the dummy variables that account for unobservable differences among the 42 subdistricts are not reported.

Source: Ottoman *Tahrir Defterleri* numbered 72, 100, 112, 181, 185, and 192 in the Cadastral Office in Ankara. Hütteroth and Abdulfattah (1977).

TABLE 6

DISTRIBUTION OF INCOME UNDER UNIFORM AND DISCRIMINATORY RATES

	PERCENTAGE OF TOTAL INCOME					
	All Villages		Villages Close to Irrigation Water		Villages Distant from Irrigation Water	
CUMULATIVE PERCENTAGE OF HOUSEHOLDS	Uniform Rates	Discrim. Rates	Uniform Rates	Discrim. Rates	Uniform Rates	Discrim. Rates
20	0.08	0.06	0.03	0.03	0.05	0.03
40	0.13	0.11	0.06	0.05	0.07	0.06
60	0.17	0.15	0.07	0.06	0.10	0.09
80	0.23	0.22	0.10	0.10	0.13	0.12
100	0.39	0.46	0.14	0.15	0.25	0.31

Note: Figures in parentheses are the standard deviations.
Source: Ottoman *Tahrir Defterleri* numbered 72, 100, 112, 181, 185, and 192 in the Cadastral Office in Ankara. Hütteroth and Abdulfattah (1977).

NOTES

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[2] For Islamic taxation methods, see Løkkegaard (1950). See also Johansen (1988) for Islamic law on land taxes. For the historical background to agricultural taxation in the region, see also Lambton (1962), Lewis (1979, pp. 112-14), and Poliak (1977, pp. 65-66). Venzke (1997) studies tax rates and agricultural productivity in Aleppo.

[3] For the classical article on the efficiency of differential commodity taxes, see Ramsey (1927). Despite some parallels, however, the problem is quite different with rates that differ among commodities than with those that differ among taxpayers. For general reviews of efficiency and equity in taxation, see Slemrod (1990) and Stiglitz (1999).

[4] For a general analysis of public choice issues in taxation, see Holcombe (1998).

[5] Diamond and Mirrlees (1971) analyze conditions for production efficiency in taxation in a general framework.

[6] If taxpayers' supply elasticities differ systematically among producers, discriminatory taxation can also help to maximize tax revenue by assigning higher rates to producers with lower elasticity. See Ramsey (1927) for a parallel argument in differential taxation of commodities. Because of my focus on income redistribution and the difficulty of determining supply elasticities, I ignore the way discriminatory rates may also have affected state's tax revenue.

[7] These registers were called *defter-i hākanī* [imperial register], commonly known as the *tahrir defterleri* (s. *defter*). For details, see Coşgel (2004b), İnalcık (1954), and İnalcık (1994, Chapter 5). For the registers of the Arab lands, see Lewis (1951) and Hütteroth and Abdulfattah (1977, pp. 1-11). See also Kark (1997) for a history of cadastral surveys of Palestine and Singer (1990a; 1990b) for research possibilities based on the Ottoman registers of this region.

[8] The tax code of each province or district was called *kānūnnāme*. See İnalcık (1960) for the history and types of *kānūnnāmes*. For collections of Ottoman *kānūnnāmes*, see Barkan (1943) and Akgündüz (1990). For similarities

and differences between the tax systems of the Ottomans and other contemporary Islamic states, see Floor (1998) and Moosvi (1987).

[9] See Singer (1994, pp. 48-49) for an English translation of the Jerusalem tax code.

[10] Although the Ottoman budgets included other sources of revenue, such as the tributes from vassal states, profits from government owned enterprises, and revenues from various fees and fines like the marriage fees and criminal fines, these revenues are excluded from discussion because of our focus on the discriminatory taxation of productive activities. Extraordinary levies to the state called *avarız-ı divaniyye* are also omitted because of their irregular nature during the sixteenth century. For Ottoman state revenues, see İnalcık (1994, Vol. 1, pp. 55-76).

[11] This method was also used in the taxation of agricultural production in uninhabited lands called *mezra'as* and in some small or remote villages.

[12] These districts represent the geographical diversity of the Ottoman Empire. Jerusalem is in eastern Mediterranean, Budapest is in eastern Europe, and Antep and Malatya are in eastern Anatolia. Items of taxation were similarly chosen to represent regional similarities and differences in rates. See Akgündüz (1990) and Barkan (1943) for the complete tax codes of these and other districts.

[13] For a detailed account and historical origins of personal taxes, see İnalcık (1959). For an economic analysis of the general structure of Ottoman taxes, see Coşgel (2004a).

[14] Despite the spatial variation, the rates remained remarkably stable over time. See Makovsky (1984, p. 104) for the infrequent cases of changing tax rates in the Jerusalem district.

[15] For attempts at making the rates uniform, see Lambton (1962, p. 1037). See also Barkan (1964) for the history of *muqāsama* taxes (*Öşür*) in the Ottoman Empire and the variation of these rates among districts.

[16] For similar arguments about the relationship between tax rates and productivity, see Ashtor (1976, p. 40), Bakhit (1982, p. 148), Barkan (1964), and Sūdī (1996, p. 40). For a detailed discussion of the effect of irrigation possibilities on tax rates, see Løkkegaard (1950, pp. 120-22.).

[17] For the climate and water resources of the region, see Beaumont, Blake, and Wagstaff (1976, Chapter 2) and FAO (1997). See also Arnon (1992) for agriculture in dry lands.

[18] The registers are numbered TK 72, 100, 112, 181, 185, and 192 in the Cadastral Office archives in Ankara. In addition to reporting the results of their pioneering study of the historical geography of this region, Hütteroth and Abdulfattah's (1977) transcribed, categorized, and made available the data contained in these registers for other researchers. Social, economic, and demographic studies of the region in the sixteenth century have relied heavily on these registers as the primary sources of information. See, for example, Makovsky (1984), Rhode (1979), and Singer (1994). For the registers of the Arab lands, see Lewis (1951) and Hütteroth and Abdulfattah (1977, pp. 1-11). See also Kark (1997) for a history of cadastral surveys of Palestine. Bakhit and Hmoud (1989) also published a series of registers of the region corresponding to today's Jordan.

[19] In a few number of cases, I filled in the tax rates of surrounding villages for the missing rate of a village to be able to retain available information on other variables.

[20] Makovsky (1984, p. 102) also discusses the case of Qūfin in the Jerusalem district as being taxed at the rate of one-tenth. Hütteroth and Abdulfattah (1977) list the same village as being taxed at one-third in their register. An error may have been made in deciphering, recording, or printing this record.

[21] Nuwayrī (1923-42) also mentioned the possibility of low rates for those villagers leasing deserted lands. Although their status as being no longer inhabited in the late mandatory period appears to suggest harsh climatic conditions for three of these villages, the same was true for over 200 other villages whose past locations were also identified (about 750 villages were still inhabited in the late mandatory period, and no definite determination could be made for the status of the remaining 500 or so villages recorded in the tax registers).

[22] The assumption is consistent with the evidence on climatic changes and the evolution of land use in the region. See Butzer(1961) and Whyte (1961) for details.

[23] For the location of villages, I relied on the maps produced by Hütteroth and Abdulfattah (1977). I also relied on their estimation of where a village could be located in cases when the location could not be identified with certainty in current maps. In locating available sources of water, I did not include underground sources because no reliable and detailed maps exist for their location and depth. Similarly, I omitted artificial canals because most canals that are currently used for irrigation in this region have been built recently.

[24] For accounting purposes, the registers recorded the average price of each of the products subject to output taxes in a district and used these prices to calculate the monetary value of the tax revenue. These prices varied across districts, reflecting differences in both market conditions and units of measurement. Although actual prices must have varied even more at the local level, information about local prices is not available.

[25] The causality between the rates and recipients of taxes could also have gone in the other direction, such as if recipients were determined based on the tax rates, which would be a case of an endogenous relationship. Despite being an interesting possibility, this interdependence is beyond the scope of this paper and is not investigated in detail.

[26] Under the Classical Ottoman system of government finance, tax revenues were either retained by the central treasury, awarded to various military, judicial, and administrative personnel as remuneration for their services, or distributed to other groups or organizations as their rights recognized by the system of land tenure. The revenue recipients recorded in the tax registers of this region were the *pādīşāh* (the ruler, central government), *mīr liwā* (provincial governor and commander of troops), holders of *tīmār and za'āma* (small and large fiefs), *waqfs* (pious, charitable foundations), and the holders of such rights as *mülk* (private) land and *haq 'arab* (share of the Bedouins). In *Qaḍā* Ḥawrân, some of the revenues were also awarded to the *mīr mīrān* (governor of the *wilāyat*) of *Shām* (Damascus). The tax revenues of some villages were divided between two or more recipients, in which case the registers recorded the respective portions (as a fraction of 24) of all recipients. In such cases, I calculated the amount of tax revenue to add to each recipient's grand total by simply multiplying these portions by the tax revenue of the village. See Coşgel and Miceli (2004) for how risk and transaction costs affected the allocation of tax revenue among these recipients.

[27] There is also a more practical reason for grouping them in the same category. Although these recipients were clearly identified and separated in other regions, they were not distinguished in the registers of the *qaḍā* of Hawran.

[28] Although some foundations received tax revenues from distant villages, the argument about differential incentives still applies.

[29] In cases of divided revenue, I coded the holder of the highest share as the primary recipient of tax revenues.

[30] The (mean, standard variable) of the non-dummy variables included in the regression equations are as follows: natural logarithm of tax rate (3.4, 0.19), natural logarithm of the revenue from output-taxed products (9.4, 0.9), natural logarithm of per-household income from output-taxed products (6.3, 0.86), percentage of Muslims (0.98, 0.097), distance to nearest market town (3.0, 2.2).

[31] The simple correlation coefficient between the total income and income per household is 0.44, suggesting the possibility of a multicollinearity problem between them. The sign and significance of their coefficients, however, do not change when one of these variables is dropped. Both variables are thus kept in the reported regression to provide more complete information about their effects.

[32] Because discriminatory rates applied to agricultural production, I ignore the possibility of shifting resources to urban activities subject to trade and enterprise taxes.

[33] Faced with the same problem, Hütteroth and Abdulfattah (1977, pp. 79-85) assumed that the taxes collected from these products were proportional to their output according to the local taxation factor, so they calculated the revenue from the production of fruits, vegetables, animal products and various other products by multiplying the tax amount by the taxation factor of the respective villages.

[34] For estimates of current average yields, I relied on the Isaac, et al's (1994) team study of dryland farming in parts of this region. For conversion rates, see Makovsky (1984, pp. 109-110). To determine whether the results are sensitive to these calculations, I ran the same regressions with different rates, as low as one-third (proportion of tax to revenue). The results did not change significantly.

[35] Some types of olive trees called *zaytūn Rūmānī* were subject to the output tax, but the registers did not always record the distinction carefully. Sometimes, taxes from olive trees were lumped together with other items, such as fruit trees, that were subject to the input tax.

[36] See Wooldridge (2000, p. 483) for a description of the test performed.

[37] The only coefficient that changed significantly was that of the tax rate, possibly because the rates in the original data were discrete values that ranged between 1/7 and 2/5 whereas the values in the instrumental variable used in the 2SLS estimation could be continuous beyond this range. The results of the 2SLS estimation are available upon request.

[38] Because of space limitations, the results of the dummy variables that control for the differences among the forty-two subdistricts are not reported in the Table. A majority of these variables affected output significantly, confirming the importance of local factors in production decisions.