University of Connecticut

Department of Economics Working Paper Series

Risk, Transaction Costs, and Tax Assignment: Government Finance in the Ottoman Empire

Metin M. Coşgel
University of Connecticut

Thomas J. Miceli
University of Connecticut

341 Mansfield Road, Unit 1063
Storrs, CT 06269–1063
Phone: (860) 486–3022
Fax: (860) 486–4463
http://www.econ.uconn.edu/

This working paper is indexed on RePEc, http://repec.org/

Abstract

Risk and transaction costs often provide competing explanations of institutional outcomes. In this paper we argue that they offer opposing predictions regarding the assignment of fixed and variable taxes in a multi-tiered governmental structure. While the central government can pool regional risks from variable taxes, local governments can measure variable tax bases more accurately. Evidence on tax assignment from the mid-sixteenth century Ottoman Empire supports the transaction cost explanation, suggesting that risk matters less because insurance can be obtained in a variety of ways.

RISK, TRANSACTION COSTS, AND TAX ASSIGNMENT:

GOVERNMENT FINANCE IN THE OTTOMAN EMPIRE

Economic historians have explained various organizational forms as different

institutional responses to the problems posed by risk and transaction costs. In a hypothetical

world without risks or transaction costs, the organization of production and exchange activities

would not affect the use of resources, but in reality, various interesting organizations and

institutional arrangements emerge to share risks optimally or to minimize transaction costs.

Historical examples include economic explanations of sharecropping, the Open Field system and

enclosures, the emergence of the firm, contractual structures observed in slavery, the manorial

system, and Southern agriculture.[1]

Risk and transaction cost explanations can also help to answer one of the fundamental

questions of public finance, known as the tax assignment problem. Specifically, in the context of

a multi-tiered governmental system, what activities should be taxed and by which level of

government (McLure, 1983)? If the risk associated with a certain tax base and the transaction

costs of measuring it vary significantly, and if possible recipients of the resulting revenue have

different capabilities of dealing with these problems, then the assignment of that tax will matter

for efficiency. Risk can affect a tax system if some tax revenues are subject to region-specific

shocks. Thus, in terms of optimal risk sharing, it may be efficient to assign these revenues to the

---

[1] See, for example, Alston and Higgs, "Contractual Mix"; Barzel, "Measurement Cost"; Cheung,

Theory of Share Tenancy; Coşgel, "Risk Sharing"; Fenoaltea, "Risk"; McCloskey, "English

Open Fields"; and Stiglitz, "Incentives."

central government rather than local governments, because the central government can better diversify risky revenues across regions. The opposite conclusion arises with regard to transaction costs since local governments will likely be in a better position to minimize the cost of measuring and collecting variable taxes, owing to their closer proximity to the tax base.

This paper will examine how these factors affected tax assignment in the Ottoman Empire during the sixteenth century. By the mid sixteenth century, the Ottomans had built a vast Empire that spanned the area from the Black Sea in the north to Egypt and the Arabian Peninsula in the south, and from the Persian Gulf in the east to central Europe and North Africa in the west. Combining elements from the customs and administrative practices of previously existing states and the basic principles of Islamic taxation, the Ottomans developed a system of government finance that assigned tax revenues to various recipients, including the central treasury, provincial and district governments, military personnel, and various non-governmental groups like tribes and pious foundations.

To determine how risk and transaction costs affected this assignment problem, we categorize taxes into two groups based on whether the tax base was fixed or variable during the taxation cycle. We then examine how risks and transaction costs differed between the two groups of taxes. We also examine the differential capabilities of the recipients of these taxes to bear the risks and transaction costs. In this context, we develop two competing hypotheses based on the above reasoning. According to the *risk hypothesis*, tax revenues with a fixed (safe) base are optimally allocated to local governments, while those with a variable (risky) base should go to the central government. In contrast, under the competing *transaction cost* hypothesis, tax revenues with a fixed (easy to measure) base should be assigned to the central government, while those with a variable (difficult to measure) base should go to local governments. Our tests of

these hypotheses using data from the Ottoman tax registers of the sixteenth century show that variable taxes tended to be assigned to local governments, providing evidence in favor of the transaction cost hypothesis.

THEORETICAL ANALYSIS OF TAX ASSIGNMENT

Risk and transaction costs are often the focus of competing explanations of historical phenomena. Consider the well known explanations of land scattering observed in the Open Field system. In a pioneering contribution that championed economic approaches to such phenomena, D. N. McCloskey (1976) argued that this peculiar pattern of land holding was simply a mechanism for peasants to insure against risk.[2] But in another pioneering contribution, Stefano Fenoaltea (1976) emphasized transaction costs, rather than risks. Noting that "considerations of risk and transaction costs have altogether different implications for the organization of medieval agriculture," he found the key to scattering in the transaction costs of purchasing or exchanging labor (Fenoaltea, 1976: 130).

As another well-known example, consider explanations of sharecropping, a practice that has been observed throughout history. Although there are several economic approaches to contracts, two of the dominant and competing approaches have been the principal-agent model and transaction cost theories.[3] Principal-agent models typically postulate different risk attitudes

---

[2] For a historical overview of various institutions designed for the management of agricultural risk, see Persson, "Agricultural Risk Management."

[3] For a historical overview of agricultural contracts, review of the pertinent literature, and quantitative analysis of some of the proposed hypothesis, see Allen, "Cropshare Contracts"; Alston, "Tenant Farming" and Alston and Higgs, "Contractual Mix."

between contracting parties and explain differing contractual forms as emerging from the tradeoff between risk and incentives (Cheung, 1969; Stiglitz, 1974). Transaction cost theories, on the other hand, avoid making assumptions about risk preferences (or assume universal risk neutrality) and instead focus on differences in the costs of negotiating, supervising, and enforcing contracts.[4]

Although theories of risk and transaction costs have generally been employed to explain private organizations and institutions, these ideas can also be used to study the public sector. Some of the recent studies of taxation and government expenditures have relied heavily on these concepts. Thomas Aronsson and Magnus Wikström (2003), for example, examine optimal taxation and risk sharing arrangements in an economic federation. Similarly, Eric Patashnik (1996) studies the implications of transaction cost theory for the design of budgeting institutions.[5] The effect of risk and transaction costs on the assignment of tax revenues in history, however, has not been systematically examined.

To analyze how risk and transaction costs can affect tax assignment, we consider a two-tiered governmental structure consisting of a *central government* and multiple *local governments*. Suppose that aggregate tax revenues will be allocated among these various governments in pre-set proportions. (That is, the spending side of the public budget has already

---

[4] See, for example, Allen and Lueck, Transaction Costs."

[5] For examples of other studies of public finance based on theories of risk and transaction costs, see the references cited in Aronsson and Wikström, "Optimal Taxation," pp. 104-06 and Patashnik, "Contractual Nature," p 190. See also contributions in Part III of Hoff, Braverman, and Stiglitz, *Economics of Rural Organization* for applications to agricultural taxation.

been determined.) To be concrete, assume that aggregate tax revenue, R, will be divided

between the central government and local governments (collectively) as follows:

$$R = R_C + R_L. \tag{1}$$

Tax revenue is generated from two sources, fixed taxes and variable taxes, which differ

both in their predictability and measurability.[6] Fixed taxes are those whose bases do not change

much during the taxation cycle. This will be the case, for example, if the tax base depends on a

fixed asset or a fixed input used in production. Examples include property taxes and taxes that

depend on inputs like the number of trees or the quantity of land, all of which have been

observed frequently throughout history. While the tax revenue from fixed taxes is easier to

predict and measure because the tax base is stable over time and relatively easy to observe,

revenue from variable taxes can change considerably during the taxation cycle. Typical

examples include taxes imposed on the revenue or profits from the production or sale of a good

or service, which can change over time and by region due to weather, varying fertility of land,

and other aspects of the production process. To capture this difference in the simplest manner,

we treat total revenue from fixed taxes, F, as determinate, and total revenue from variable taxes,

V, as random. In any given budgetary period, the total revenue is allocated completely between

the two levels of government, or

$$F + V = R_C + R_L. \tag{2}$$

The problem facing the central government is how to assign the revenues from the two

types of taxes between the central and local governments. In a world in which both levels of

government are risk-neutral and the transaction costs of raising revenue are zero, the allocation

---

[6] We do not address the question of which type of tax is optimal in terms of revenue generation,

assuming instead that some mix of the two taxes maximizes revenue.

does not matter, so long as (2) is satisfied in the aggregate. The two levels of government may differ, however, both in their aversion to risk and their ability to collect revenue. When this is true, there may exist an optimal allocation of fixed and variable taxes between them. We first consider differences in their attitudes toward risk.

The central government, because it receives revenue from all parts of the Empire, can diversify away most of the risk from variable taxes, whereas local governments cannot. To capture this, we assume that the central government is risk neutral, while the local government is risk averse. In this case, it is clearly optimal for the central government to fully insure the local government against revenue risk by collecting all of the tax revenue and then redistributing it to the local governments in the form of grants to cover their spending. Such a scheme, however, assumes that it is costless to redistribute revenue between governmental levels, given that all revenue is, in effect, raised locally. If such costs matter, then the above scheme can be approximately duplicated by financing as much local spending as possible out of fixed taxes.

Specifically, suppose $F \geq R_L$. In this case, all local spending can be financed by fixed taxes, and any remaining fixed tax revenue, plus all variable tax revenue, can be transferred to the central government to finance its spending, where it follows from (2) that

$$R_C = (F - R_L) + V. \tag{3}$$

Note that this scheme duplicates the first-best outcome, and the local government is fully insured against revenue risk. Alternatively, if $F < R_L$, then all fixed taxes plus some variable taxes must be used to finance local spending, while the remaining variable taxes are transferred to the central government. This represents a second-best outcome because the local government bears some residual revenue risk.

7

The preceding argument assumed that the local and central governments differed in their abilities to absorb risk, but they will also likely differ in their transaction costs of generating revenue from variable taxes. As we have noted, this cost arises from the need to measure the tax base to prevent tax evasion but also includes agency costs associated with bribery of, or theft by, tax collectors. We assume that these costs are lower for the local government because it is "closer" to the source of the taxation as compared to the central government.

To capture this, let $R_v(1-m_j)$ be the "effective revenue" that can be raised from a given variable tax,[7] where m_j is the proportion of the gross tax that is dissipated when the tax is collected by government level j, $j=L,C$. Our assumption that the central government has higher transaction costs implies that $m_C > m_L$. To isolate the transaction cost effect, we assume that both governments are risk neutral.

Given this specification, it is clearly optimal for all variable taxes to be collected by agents of the local government in order to minimize transaction costs. (It does not matter how fixed taxes are collected.) If redistribution of revenue is costless, then, given universal risk neutrality, the manner in which the tax revenue is allocated does not matter. However, if redistribution of revenue is costly, then the differential transaction costs of collection would suggest that local spending should be financed as much as possible out of locally raised variable taxes, while the central government should be financed primarily out of fixed taxes. Such a scheme jointly minimizes the transaction costs of raising revenue and of redistributing revenue between government levels.

---

[7] We assume for simplicity that only the variable taxes are subject to this transaction cost. This reflects the greater unpredictability of these taxes, which creates wider scope for evasion or confiscation.

The preceding analysis has generated opposing predictions regarding the allocation of revenue between the central and local governments. If risk-sharing is the primary consideration, then revenue from variable taxes should be allocated to the central government because of its superior ability to bear revenue risk. In contrast, if the transaction cost associated with revenue collection and distribution is the primary consideration, then variable tax revenue should be assigned to local governments because they are in a better position to minimize revenue dissipation. In the next section, we present evidence on these competing predictions.

OTTOMAN TAX CATEGORIES

To examine the risk and transaction cost hypotheses in the context of the Ottoman Empire, we use information from the Ottoman tax registers, which were assembled periodically by the government to obtain current information about taxable activities and resources.[8] These registers were used for a variety of purposes, including serving as official registers to establish legal claims to land, assessing the empire's expected tax revenues, and assigning these revenues to different levels of the government.

At the beginning of each district's register was its tax code, which laid down the basic tax regulations of the district and specified the rates for each type of tax. The tax codes and other information recorded in the registers can be used to classify Ottoman taxes into the general

---

[8] These registers were called *defter-i hākanī* [imperial register], commonly known as the *tahrir defterleri* (s. *defter*). For the contents and potential uses of these registers, see Coşgel, "Ottoman Tax Registers."

categories of fixed and variable taxes.[9] In the fixed category were the personal taxes, which were based on a taxpayer's marital and economic status (e.g., land ownership); input taxes, which were based on one of the inputs used in production (e.g., land, trees, animals); and lump-sum enterprise taxes, which were collected from some of the small, distant villages and from most of the service and manufacturing activities in towns. Variable taxes consisted of trade taxes, which were based on the sale of goods in market towns; and output taxes (primarily on grains, legumes, and fibers), which were assessed as a share of the total output (like the tithe).[10]

---

[9] Ottoman taxes have also been classified according to their historical origin, legal foundation, method of payment, and the recipient of the tax revenue. See, for example, İnalcık, "Osmanlılarda Raiyyet Rüsumu"; İnalcık and McGowan, *Economic and Social History*; Kazıcı, *Osmanlılarda Vergi Sistemi ;* and Darling, *Revenue-Raising*.

[10] For a detailed description and economic analysis of Ottoman tax categories, see Coşgel, "Efficiency and Continuity in Public Finance". The Ottoman central government also received revenues from other sources like tributes from vassal states and profits from government owned enterprises. Because of our focus on tax assignment, such revenues are excluded from this classification. Extraordinary levies to the state called *avarız-ı divaniyye* are also omitted because of their irregular nature during the classical age. For Ottoman state revenues, see İnalcık and McGowan, *Economic and Social History*, Vol. 1, pp. 55-76. See also Løkkegaard, *Islamic Taxation*; and Lambton, "Kharādj," for Islamic taxation in general.

Table 1 shows examples of tax types and rates in some districts of the Ottoman Empire.[11] Jerusalem (Kudüs) is in eastern Mediterranean, Budapest (Budin) is in Europe, Bursa (Hüdavendigār) is in western Anatolia, Erbil is in northern Iraq, and Antep (Ayintab) and Malatya are in eastern Anatolia. The examples of taxes and rates reflect commonalities as well as differences across regions, thus showing how local conditions affected the tax system. The table does not include examples of lump-sum enterprise taxes because the tax codes typically did not codify standardized rates for these activities, except for some rare occasions, as when they specified the tax rates for retail stores as being "per store".

The risky portion of the Ottoman tax revenues from the recipient's perspective consisted of trade and output taxes. Trade taxes were risky because the amounts of goods brought to the market would fluctuate based on market cycles and various local conditions. Output taxes were also risky because they were subject to various locality-specific shocks like the weather, climate, and other natural conditions.[12] The revenue from personal, input, and enterprise taxes, on the other hand, was more certain from the recipient's perspective. The amount that the taxpayers owed for these taxes did not (in principle) depend on business or weather conditions. For example, a married landholding peasant owed the yoke (*çift*) tax whether or not his crop failed in a given year. He similarly owed input taxes on his fruit trees even if the fruits were ruined by a

---

[11] For the complete tax codes of these and other districts, see Akgündüz, *Osmanlı Kanunnâmeleri;* and Barkan, *Kanunlar.*

[12] In some regions the output tax rates varied between villages. For an analysis of the determinants and consequences of variable rates in the Fertile Crescent, see Coşgel, "Taxes, Efficiency, and Redistribution."

storm. The recipient of taxes could thus expect its income from fixed taxes to be relatively steady.

The transaction costs of tax collection would also have differed for fixed and variable Ottoman taxes. In particular, the cost of administering and collecting taxes would have been significantly higher for trade and output taxes, as compared to personal, input, and enterprise taxes. In the case of trade and output taxes, the tax collector would have had to determine the quantity of taxable items brought to the market for sale during each market period because the quantities could not have been predetermined or easily estimated. In contrast, the costs of measuring personal, input, and enterprise taxes would have been relatively low because of their lesser variability.

In sum, the same factors that made variable taxes riskier in terms of the revenue yield would have made them costlier to measure. Thus, in terms of our competing hypotheses, the predictions regarding the optimal assignment of these taxes are exactly opposite.

TAX ASSIGNMENT IN THE OTTOMAN EMPIRE

The Ottoman government consisted of multiple hierarchical levels that divided the Empire into provinces, the provinces into districts, and the districts into fiefs. In short, it was a multi-tiered governmental system. Offices at each level received income from taxable sources assigned by the central government. Although a small number of taxes were sometimes assigned exclusively to certain levels of government, tax assignment was generally based, not on the type of taxes, but on the taxpayer. That is, the system did not assign output taxes exclusively to, say, the central government, and all other taxes to other recipients. Instead, revenues were distributed by taxpayer. Whereas everyone in one village paid taxes to the central government, their

neighbors in the next village paid to the provincial government, and those in other villages paid to the district government, a local fiefholder (cavalrymen or military commander), or a pious foundation.[13] Table 2 reports the distribution of tax revenue among the main groups of recipients.[14]

Although fixed and variable taxes were not exclusively assigned to recipients, this did not mean that the assignment of taxes did not reflect differences between fixed and variable taxes, because the proportions of these taxes could vary among taxpayers. To test the implications of the risk and transaction cost hypotheses for tax assignment in the Ottoman Empire, we thus need to examine not only how fixed and variable taxes were allocated to recipients, but also how their proportions affected the assignment. Consider first the risk hypothesis. Suppose the tax revenue

---

[13] The main revenue recipients were the central government (variously denoted in the registers of different regions as, for example, *hāss-ı şāhī* or *hāss-ı humāyūn*), provincial administrators such as the governors of provinces (*mīr mīrān, paşa, beylerbeyi*) or districts (*mīr liwā, sancakbeyi*), and holders of small and large fiefs *(tīmār and za'āma)*. There were also pious foundations (*vakıfs*), private landholders (*mülk*), and tribal leaders, who somehow possessed the right to collect tax revenues from some villages, based on rights recognized by the legal system or preserved after conquest for political reasons. For the organization and financing of the Ottoman government, see İnalcık, *Ottoman Empire*; Kunt, *Sultan's Servants*; and Darling, *Revenue-Raising*.

[14] For examples of the distribution of tax revenues in other districts, see Barkan and Meriçli, *Hüdavendigâr,* p. 5.

of a village consisted mostly, if not exclusively, of output taxes that were subject to location-specific shocks. Because the central government received revenue from all parts of the empire and thus had a well diversified budget portfolio, it would have mattered little to the risk level of the central treasury to add this highly risky income to its portfolio. The same was true for the tax revenues of a provincial government, though to a lesser degree because its revenues were typically restricted to the province and hence less diversified (Kunt, 1983). A fiefholder, on the other hand, typically received income from a single village or only a few villages. By receiving this village's tax revenue, the recipient would have been exposed to high risk with little ability to diversify. The risk hypothesis thus implies that this village's tax revenues should have been assigned to the provincial or central governments rather than a local fiefholder.

The transaction cost hypothesis leads to the opposite conclusion. The central government collected taxes through hired agents, who would have lacked sufficient knowledge of local production technologies and units of measurement to accurately calculate the variable tax bases (quantity and quality). Moreover, it was not in their interest to measure the tax bases accurately, because their income was independent of the tax revenue. At the other extreme were the fiefholders who collected taxes from their villages of residence and depended on the tax revenue for their livelihood (Kunt, 1983: 13). Unlike the agents of the central government, fiefholders had the knowledge, ability, and high incentives for accurate measurement of variable tax revenues. Between the central government and local fiefholders were intermediate levels of government, which would have had transaction costs that increased with their relative distances to the tax source.[15] The transaction cost hypothesis therefore implies that the tax revenue of a

---

[15] The argument also applies to pious foundations that received revenues to support charitable activities. The transaction cost was likely to be lower for pious foundations than provincial or

village with a high proportion of output taxes should have been assigned to a fiefholder, rather than to any higher level government.

A QUANTITATIVE ANALYSIS OF THE EFFECT OF RISK AND TRANSACTION COST ON TAX ASSIGNMENT

To conduct a quantitative analysis of the risk and transaction cost hypotheses of tax assignment, we use data from the tax registers of various regions of the Ottoman Empire. We formalize the two hypotheses by constructing a qualitative "distance" variable that represents the relationship between the source and recipient of the revenue from a given tax. We ranked recipients based on their distance to the taxable source in an ascending order, starting with private landholders, then fiefholders, pious foundations, the district government, the provincial government, and finally the central government. We then created an ordinal variable that took the value of the recipient's rank order: the value was 1 if a village's tax recipient was a private landholder, 2 if a small fiefholder, and so on.[16] The distance was therefore the greatest for the central government. This variable served as the dependent variable in an ordered probit model.

---

central governments because of their clear beneficiaries and local operations and management The beneficiaries of a foundation were likely to apply strong pressure for higher revenues, changing the nature of the agency problem. Although the manager(s) of a foundation may not have received all tax revenues directly as remunerations for service, they were ultimately responsible for the provision of these services and thus had high incentives to maximize tax revenues in order to fulfill professional obligations and improve service.

[16] Because of the hierarchical nature of the Ottoman system of government, the values for government offices also correspond to their order in the hierarchy. Although some of the

The explanatory variable of primary interest is the proportion of variable taxes in total taxes. The sign of this variable will show whether considerations of risk or transaction costs were paramount in the assignment of tax revenues. A positive and significant sign supports the risk hypothesis by indicating that, all else being the same, the riskier tax revenues were more likely to be allocated to distant recipients who could better deal with risks given their more diverse portfolio of revenues. However, if the sign turns out to be negative, it will support the transaction cost hypothesis, indicating that costlier revenues were more likely to be assigned to closer recipients who could better deal with measurement costs.

To isolate the effect of the proportion of output and trade taxes in the regression analysis, we included variables to control for other influences on the determination of tax assignment. One such variable is the size of the tax source. Provincial and central governments may have preferred large sources of revenue in order to benefit from economies of scale in tax collection

---

recipients, such as private landholders and pious foundations, were not part of the Ottoman government, they received revenues that could have been allocated to the government. We thus kept the information about the allocation of such revenues in the quantitative analysis. Whenever the records separated small and large fiefholders, large fiefholders were given a lower ranking based on the possibility that they may be receiving revenues from more than one villages and thus less able to attend each village closely. Sometimes the records did not further distinguish between two or more recipients, for example by lumping together fiefholders and pious foundations in one category, in which case we assigned them an equal ranking.

16

(for example by reducing the travel and set up costs of their agents).[17] To account for this

possibility, we included the number of taxpayers in a village as a proxy variable for its size.

The tax revenues of some villages were divided between two or more recipients.

Because the division of revenue required costly coordination, distant recipients may have been

reluctant to collect revenues from such villages. To determine whether this had any effect on

revenue allocation, we generated a dummy variable based on whether a village's tax revenue was

divided (=1 if divided between two or more revenue holders). The productivity of economic

activities could also be a factor in determining tax assignment. Because the number of taxpayers

was the only input item consistently recorded among provinces, we used information about

taxpayers and their taxes to estimate the revenue of economic activities per taxpayer in a village,

and then used it as a proxy for the village's productivity. Finally, when the data spanned a

geographically wide and diverse area, we used dummy variables to control for the effect of

various unobservable (such as political) differences across districts.

Table 3 shows the results of the ordered probit analysis of influences on tax assignment

in five representative regions of the Empire, some at different points in time. The effects of the

control variables are generally in the expected directions. The coefficient on the number of

taxpayers is generally positive and significant, showing that larger villages were more likely than

smaller ones to be assigned to distant recipients. This confirms the expectation about the

importance of economies of scale in tax collection. The generally negative (though not always

significant) coefficients on the "Revenue Divided" dummy variable are also consistent with the

expectations. That divided revenues were less likely to be assigned to distant recipients indicates

---

[17] For a discussion of the relationship between the size of a tax source and its allocation among

recipients, see Kunt, *Sultan's Servants,* p. 20.

that the central and provincial governments were less able than others to deal with the requisite costs of division. The coefficients on productivity are also generally positive (in all regions other than Malatya), indicating that more productive tax revenues were more likely to be allocated to central and provincial governments, as compared to pious foundations and fiefholders. (The effect, however, is not very significant in some regions.) Because of space constraints, we do not report the results of the dummy variables that account for unobservable differences among the districts.

Controlling for other influences makes it possible to isolate the individual effect of the focus variable: the proportion of output and trade taxes. The coefficient of the proportion is negative and significant at conventional levels in most regions, providing strong support for the transaction costs hypothesis. The risk hypothesis receives some support only in Antep, where the coefficient is positive and significant in 1536 and 1543. Unfortunately, the data do not include sufficient information about the peculiar circumstances of the region to permit an explanation for this contrary result. The consistently positive coefficient in this region suggests that the importance of the risk and transaction cost approaches may have varied by region, but the negative coefficients in all the other regions indicate that transaction costs were generally the dominant consideration in tax assignment.

The dominance of the transaction cost effect raises the question of why the risk effect was small. Risk considerations may have had an insignificant effect on the assignment of taxes because the recipients had various alternatives to insure against revenue fluctuations. One possibility was the storage of grain or cash income as a means of self insurance. Just as the central government could insure income by diversifying tax revenues across regions, a small fiefholder could diversify over time by storage. Another possibility was for tax recipients to

participate in formal or informal institutions of credit. [18] While these and similar mechanisms

allowed tax recipients to insure against revenue risk, there were no feasible alternatives to reduce

transaction costs. Various knowledge and incentive constraints as well as agency costs made it

infeasible to rely on alternatives like self-reporting to resolve the problem of accurate

measurement of the tax base. Other enforcement mechanisms like stiff penalties for

underreporting, and mutual or external monitoring, must have been similarly infeasible.

CONCLUSION

A quantitative analysis of the allocation of Ottoman tax revenues shows that the

assignment of tax revenue among alternative recipients was influenced more by transaction costs

than by risks.   The test made use of data from the sixteenth century tax registers of the Ottoman

Empire in five regions. We constructed an ordinal independent variable to represent a recipient's

relationship to the source of tax and used an ordered probit model to identify how the proportion

of variable (risky, high in transaction cost) taxes affected the outcome of the tax assignment

problem. In all but one region the results supported the transaction costs hypothesis. The

relative insignificance of risk considerations suggests that tax recipients generally had various

feasible alternatives for insuring against risky revenue but no such alternatives for dealing with

transaction costs. Consequently, they assigned taxes to those recipients who could bear those

costs most efficiently.

---

[18] For a similar line of reasoning used to criticize risk-based explanations of scattering on Open

Fields, see Fenoaltea, "Risk."

WORKS CITED

Akgündüz, Ahmed. *Osmanlı Kanunnâmeleri ve Hukukî Tahlilleri.* İstanbul: Osmanlı Araştırmaları Vakfı, 1990.

Allen, Douglas W. "Cropshare Contracts," in Peter Newman, ed. *The New Palgrave Dictionary of Economics and the Law.* New York: Stockton Press, 1998.

Allen, Douglas W. and Dean Lueck. "Transaction Costs and the Design of Cropshare Contracts," *RAND Journal of Economics* 24 (1993): 78-100.

Alston, Lee J. "Tenant Farming," in Joel Mokyr, editor in chief, *Oxford Encyclopedia of Economic History*, 5 (2003): 97-101.

Alston, Lee J. and Robert Higgs. "Contractual Mix in Southern Agriculture since the Civil War: Facts, Hypotheses, and Tests," This JOURNAL 42, no. 2 (1982): 327-53.

Aronsson, Thomas and Magnus Wikström. "Optimal Taxation and Risk-Sharing Arrangements in an Economic Federation," *Oxford Economic Papers* 55 (2003): 104-20.

Barkan, Ömer Lütfi and Enver Meriçli, 1988. *Hüdavendigâr Livası Tahrir Defterleri. I.* Ankara: Türk Tarih Kurumu.

Barkan, Ömer Lütfi. *XV ve XVI. Asırlarda Osmanlı İmparatorluğunda Zirai Ekonominin Hukuki ve Mali Esasları.* Cilt 1: *Kanunlar* Istanbul Üniversitesi yayınlarından. Edebiyat Fakültesi Türkiyat Enstitüsü Neşriyatı. Istanbul, Burhaneddin Matbaasi, 1943.

Barzel, Yoram. "Measurement Cost and the Organization of Markets," *The Journal of Law and Economics* 25, no. 1 (1982): 27-48.

Cheung, Steven N. S. *The Theory of Share Tenancy.* Chicago: The University of Chicago Press, 1969.

Coşgel, Metin M. "Risk Sharing in Medieval Agriculture," *Journal of European Economic History* 21, no. 1 (1992): 99-110.

_____. "Ottoman Tax Registers (*Tahrir Defterleri*)," *Historical Methods* 37 (2004): 87-100.

_____. "Efficiency and Continuity in Public Finance: The Ottoman System of Taxation," *International Journal of Middle East Studies* 37 (2005): forthcoming.

_____. "Taxes, Efficiency, and Redistribution: Discriminatory Taxation of Villages in Ottoman Palestine, Southern Syria, and Transjordan in the Sixteenth Century," *Explorations in Economic History*, (2005): forthcoming.

Darling, Linda. *Revenue-Raising and Legitimacy: Tax Collection and Finance Administration in the Ottoman Empire, 1560-1660.* NY: E.J. Brill, 1996.

Fenoaltea, Stefano. "Risk, Transaction Costs and the Organization of Medieval Agriculture," *Explorations in Economic History* (1976): 129-52.

Göyünç, Nejat and Wolf-Dieter Hütteroth. *Land an der Grenze.* Istanbul: Eren Yayıncılık, 1997.

Hütteroth, Wolf-Dieter and Kamal Abdalfattah. *Historical Geography of Palestine, Transjordan and Southern Syria in the Late 16th Century.* Erlanger Geographische Arbeiten, Vol. 5, Erlangen, 1977.

Hoff, Karla, Avishay Braverman, and Joseph E. Stiglitz, eds. *The Economics of Rural Organization: Theory, Practice, and Policy.* New York: Oxford University Press, 1993.

Hütteroth, Wolf Dieter and K. Abdalfattah. *Historical Geography of Palestine, Transjordan and Southern Syria in the Late 16th Century.* Erlangen: Erlanger Geographische Arbeiten, Vol. 5, 1977.

İnalcık, Halil. "Osmanlılarda Raiyyet Rüsumu," *Belleten* Cilt 23, Sayı 92 (1959): 575-610.

İnalcık, Halil. *The Ottoman Empire: The Classical Age, 1300-1600.* London: Phoenix Press, 1973.

İnalcık, Halil. [with Donald Quataert]. *An Economic and Social History of the Ottoman Empire, 1300-1914.* New York: Cambridge University Press, 1994.

Kazıcı, Ziya. *Osmanlılarda Vergi Sistemi.* İstanbul: Şamil Yayınevi, 1977.

Kunt, I. Metin. *The Sultan's Servants.* New York: Columbia University Press, 1983.

Løkkegaard, Frede. *Islamic Taxation in the Classic Period, with Special Reference to Circumstances in Iraq.* Copenhagen: Branner and Korch, 1950.

Lambton, A.K.S. "Kharādj," *Encyclopedia of Islam.* Second Edition. Leiden, 1962.

McCloskey, D. N. "English Open Fields as Behavior toward Risk," in P. Uselding, ed., *Research in Economic History,* 1 (1976): 124-170.

McLure, Charles E., Jr. ed. *Tax Assignment in Federal Countries.* Canberra: Australian National University, 1983.

Özdeğer, Hüseyin. *Onaltıncı Asırda Ayıntab Livası* İstanbul, 1988.

Patashnik, Eric M. "The Contractual Nature of Budgeting: A Transaction Cost Perspective n the Design of Budgeting Institutions," *Policy Sciences* 29 (1996): 189-212.

Persson, Karl Gunnar. "Agricultural Risk Management: Historical Overview," In Joel Mokyr, editor in chief, *Oxford Encyclopedia of Economic History*, 1 (2003): 49-53.

Stiglitz, Joseph E. "Incentives and Risk Sharing in Sharecropping," *Review of Economic Studies* 41 (1974): 219-56.

Turkey. Ottoman Tax Registers [*Tahrir Defterleri*] Collections in the Prime Ministry Archives, İstanbul and the Cadastral Office, Ankara.

Yinanç, Rafet and Mesut Elibüyük. *Kanuni Devri Malatya Tahrir Defteri (1560)* Ankara, 1983.

TABLE 1

EXAMPLES OF TAXES AND TAX RATES IN OTTOMAN DISTRICTS

| | Fixed Taxes | | | | | Variable Taxes | |
| | Personal Taxes | | | Input Taxes | | Trade Taxes | Output Taxes |
Region (Year)	Yoke Tax	Bachelor Tax	Gate Tax	Animal Products	Vineyards	Goods Brought to Market	Tax Rate
Antep (1574)	40	6	--	0.5 per animal	0.02 per vine	1 per camel-load of miscellaneous goods	1 / 8
Budapest (1562)	--	--	50	0.5 per animal	4 per *dönüm*	4 per wagon-load of pots and cups	1 / 10
Bursa (1521)	33	9 or 12	--	0.5 per animal	3, 5, or 10 per *dönüm*	--	1 / 10
Erbil (1542)	50	6	--	0.5 per animal	--	10 per load of butter and honey	--
Jerusalem (1562)	--	--	--	0.5 per animal	0.1 per vine	20 per camel-load of linen	variable
Malatya (1560)	50	6	--	0.5 per animal	0.03 per vine	--	1 / 5

Notes: All monetary values are in the Ottoman currency of *Akçe*. *Dönüm* is a measure of land. Some cells are blank either because the tax code (*kānūnnāme*) did not specify the rate for those items or because the description was too detailed and complex to be summarized in a single entry. Because of the customized nature of lumpsum enterprise taxes, their rates are not reported.

Sources: Ottoman provincial tax codes, published by Akgündüz, *Osmanlı Kanunnâmeleri*; and Barkan, *Kanunlar*.

TABLE 2

THE DISTRIBUTION OF TAX REVENUES

Region (Year)	Central Government	Provincial and District Governments	Fiefholders	Others
Antep (1536)	0.35	0.29	0.27	0.09
Antep (1543)	0.47	0.13	0.27	0.13
Antep (1574)	0.35	0.14	0.40	0.10
Bursa (1521)	0.40	0.04	0.18	0.39
Bursa (1573)	0.26	0.04	0.31	0.39
Malatya (1560)	0.37	0.17	0.18	0.28
Mardin (1564)	0.50	0.15	0.26	0.10
Palestine, Transjordan, Southern Syria (1596)	0.21	0.12	0.46	0.20

Notes: Recipients in the "Others" category include private landholders, pious foundations, and tribes.

Sources: Ottoman Tax Registers [*Tahrir Defterleri*] numbered 44, 111, 113, 161, 186, 373, 406, 453, and 1050 in the Prime Ministry Archives in Istanbul, Turkey; and 67, 68, 72, 75, 80, 97, 100, 112, 117, 142, 181, 185, 192, 570, 580, and 585 in the Cadastral Office in Ankara, Turkey. Contents of these registers have been published by Özdeğer, *Onaltıncı Asırda Ayıntab Livası*;

Barkan and Meriçli, *Hüdavendigâr*; Yinanç and Elibüyük, *Kanuni Devri*; Göyünç and Hütteroth, *Land*; and Hütteroth and Abdalfattah, *Historical Geography*.

TABLE 3

ORDERED PROBIT ESTIMATES OF INFLUENCES ON THE DISTRIBUTION OF TAX REVENUE

Region (Year)	Proportion of Variable Taxes	Number of Adult Males	Output per Adult Male	Multiple Recipients Share Tax Revenue	N	Log Likelihood
Antep (1536)	0.02	0.004	0.00009	0.14	102	-134.7
	(0.90)	(0.36)	(0.16)	(0.51)		
Antep (1543)	0.38	0.007	0.00008	-0.15	220	-314.1
	(0.04)	(0.02)	(0.08)	(0.15)		
Antep (1574)	0.50	0.03	0.0002	-0.04	212	-330.2
	(0.01)	(<0.001)	(<0.001)	(0.01)		
Bursa (1521)	-0.63	0.004	0.00005		329	-275.1
	(0.08)	(0.32)	(0.001)			
Bursa (1573)	-2.13	0.007	0.00008		933	-663.3
	(0.05)	(0.26)	(0.14)			
Malatya (1560)	-0.26	-0.001	-0.00002	-0.12	620	-893.9
	(0.008)	(0.45)	(0.05)	(0.25)		
Mardin (1564)	-0.35	0.004	0.00003	-0.44	1,670	-2,203.7
	(<0.001)	(0.002)	(0.46)	(<0.001)		
Palestine, Transjordan, Southern Syria (1596)	-0.93	0.004	0.0002	-0.02	1,352	-1,386.3
	(0.05)	(0.002)	(<0.001)	(0.93)		

Notes: Figures in parentheses are the p-values. The dependent variable is an ordinal variable that takes the value of a recipient's rank in the following (ascending) order, based on the recipients' relative "distance" to the tax source: private landholders, (small and large) fiefholders, pious foundations, district and provincial governments, and the central government. See the text for the descriptions of independent variables. Because of space constraints, the results of the dummy variables that account for unobservable differences among districts within a region are not reported.

Sources: See Table 2.