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Tax Collection in History

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Abstract

Methods of tax collection employed by modern governments seem dull when compared to the rich variety observed in history. Whereas most governments today typically use salaried agents to collect taxes, various other types of contractual relationships have been observed in history, including sharing arrangements which divide the tax revenue between the government and collectors at fixed proportions, negotiated payment schemes based on the tax base, and sale of the revenue to a collector in exchange for a lump-sum payment determined at auction. We propose an economic theory of tax collection that can coherently explain the temporal and spatial variation in contractual forms. We begin by offering a simple classification of tax collection schemes observed in history. We then develop a general economic model of tax collection that specifies the cost and benefits of alternative schemes and identifies the conditions under which a government would choose one contractual form over another in maximizing the net revenue. Finally, we use the conclusions of the model to explain some of the well-known patterns of tax collection observed in history and how choices varied over time and space.

Tax Collection in History

1. INTRODUCTION

Methods of tax collection employed by modern governments seem dull when compared to the rich variety observed in history. Whereas most governments today typically use salaried agents to collect taxes, various other types of contractual relationships have been observed in history, including sharing arrangements which divide the tax revenue between the government and collectors at fixed proportions, negotiated payment schemes based on the tax base, and sale of the revenue to a collector in exchange for a lump-sum payment determined at auction. Tax collectors were not always government officials. They were sometimes private individuals who collected taxes on behalf of the government under an agency relationship. Further, contractual forms could differ among tax types or change over time.

Previous studies of tax collection in history have typically taken a narrow approach to the problem, focusing on a limited aspect of the problem and adopting a restrictive theoretical framework. Their focus has been limited primarily to the problem of whether the governments used private agents or public officials for collection. Lumping together all varieties of private agents under a single category called tax-farming, researchers have identified the circumstances under which governments preferred tax-farmers over public officials.[1] The attention paid to the public-private distinction has led to various complications in the literature, causing researchers to overlook the economic significance of the contractual variations within the public and private categories and leading to various terminological confusions and analytical difficulties.[2]

The theoretical frameworks adopted to explain tax collection have also been restrictive, focusing on the analysis of market imperfections that were deemed responsible for an observed method of tax collection. Three types of market imperfection have been identified as being

responsible for why governments have turned to private collectors, with each type of explanation failing under closer theoretical and empirical scrutiny. The first category consists of imperfections in the capital market. Facing constraints in their ability to borrow funds from the private sector, government are said to sell some tax revenues to private collectors in exchange for an advance payment, treating the sale proceeds as loans against future income.[3] There is a significant logical gap in the argument, however, because the tax collectors who entered the rent contract with the government had to borrow from external sources themselves, quite possibly the same sources avoided by the government, to meet their contractual obligation for an advance payment. The argument also conflicts with known facts about public finance and tax collection. The collectors did not always pay the entire sum in a single advance payment, instead negotiating a payment scheme that consisted of several installments. Moreover, these loans were not always at significant amounts, and some governments used rent contracts while continuing to borrow at low rates from other sources. There were also governments that did not use rent contracts even though they had definite needs for cheap external funds.[4]

Explanations in the second category focus on imperfection in the insurance market and the government's desire to shift the risk of volatile tax revenues to collectors in exchange for a certain payment.[5] This type of argument basically depends on the questionable assumption that governments were more risk averse than tax collectors.[6] One could just as easily, perhaps even more convincingly, assume the opposite. Given that the government was most likely in a better position to pool the risk by diversifying across tax revenues of different variability (e.g., subject to different sectoral and regional risk), it could be better able and more willing than an individual collector to assume the risk of a particular source of revenue. Moreover, even though a risk-averse ruler may have preferred the expectation of a fixed income from the tax collector in a rent

contract over the riskier residual in a wage contract, rent contracts always included the more general and perhaps more important risk of default by the tax collector himself. It is also difficult to explain the temporal, spatial, and sectoral variation in contractual forms simply by the variations in risk or risk aversion, as can be seen from the evidence on tax collection patterns observed in France.[7]

Adopting a third type of approach to explaining contractual forms in tax collection, some recent studies have focused on imperfections in the labor market and applied the tools and concepts of agency theory. Viewing the ruler as the principal and the tax collector as the agent, Toma and Toma (1992) and Kiser (1994) have examined how the welfare losses associated with monitoring and changing control capacities of the rulers affected the choice between wage and rent contracts. More recently, White (2004) and Priks (2005) have similarly used agency theory to study tax collection practices in France and England. While insightful, these explanations are also problematic because of their almost exclusive focus on the choice between rent and wage contracts. Moreover, they have typically modeled the problem with a single margin, formulated in terms of the (cost of measuring) the agent's effort.[8]

We contribute to the literature by offering a theory of tax collection that provides a more comprehensive explanation of the temporal and spatial variation in contractual forms. We begin by offering a simple classification of tax collection schemes observed in history. We then develop a general economic model of tax collection that specifies the cost and benefits of alternative schemes and identifies the conditions under which a government would choose one contractual form over another in maximizing the net revenue. Finally, we use the conclusions of the model to explain some of the well-known patterns of tax collection observed in history and how choices varied over time and space.

2. VARIETIES OF TAX COLLECTION

To distinguish systematically between the varieties of contractual forms observed in tax collection, we group them according to the form of payment between the government and the collectors. Three general categories are possible depending on whether the contract is based on the collected revenue, the tax base, or the tax collector's labor. The first is the *share contract*, which specifies the proportion at which the government and the collector would share the actual revenue. Under this arrangement, the government typically assigned the right to collect taxes to an agent, conditional on dividing the tax revenue according to a ratio determined prior to collection. This type of a scheme was observed only occasionally in history, less frequently than wage or rent contracts. It has been considered anomalous, for example, that the Prussian government used share contracts in the collection of excise taxes (Kiser and Schneider 1994). The French government also used this type of contracts occasionally before the revolution (White 2004; Johnson 2006). Share contracts were also observed at other times and places, such as India, China, and Medieval Egypt (Copland and Godley 1993; Çızakça 1996). To enforce this type of a contractual form, the government would have to measure the actual tax collected and then divide that amount with the collector at the prespecified rate.

The second general category is the *fixed rent contract*, under which the collector would pay the government a fixed amount (based on the tax base) in exchange for the right to collect the taxes and keep the residual after the taxes are collected. This type of an arrangement has generally been called tax-farming, referring to the way the government would lease the right to collect taxes to private agents in exchange for a lump sum payment determined prior to collection.[9] Rent contracts can be further divided into two categories based on the method for

determining the amount of the fixed payment. One method was to determine the payment at an auction. Under such an arrangement, the government awarded the right to collect the specified set of taxes to the highest bidder in a competitive auction. The collector paid the bid amount to the government either as a single payment in advance of tax collection, or as an initial advance deposit followed by a series of installments according to a jointly agreed schedule that may have coincided with the period of tax collection. Rent contracts determined by auctions have been commonly observed in tax collection throughout history. For example, Republican Rome began to give out rent contracts for tax collection through auctions as early as the third century B.C. (Levi 1988, Ch. 4). This type of contract was also used by the Abbasid Empire, a precedent followed by other Islamic states (Løkkegaard 1950, Ch. 4), and by the Ottomans, who relied heavily on auction-determined rent contracts for tax collection in the early modern period.[10] France, England, and other European governments also used this type of contract during the same period.[11] More recently, rent contracts have been observed in modern day Tunisia for the collection of taxes from periodic (mostly weekly) markets (Azabou and Nugent 1988, 1989).

Another method for determining the amount of payment in a rent contract is direct bargaining between the government and tax collectors. This type of contract has also been observed frequently throughout history. In the eighteenth century, for example, the French government determined the annual rent through negotiations with a syndicate of tax collectors called the General Farms (White 2004). In a similar arrangement, the Ottoman and Mughal governments granted tax revenues to groups called *jāgīrdārs* and *sipāhīs* in exchange, not for a monetary payment, but for military and administrative service provided to the government.[12] Whereas in the auction-determined rent contracts the government would place trust in the auction process to generate a desirable payment amount, in the direct-negotiation mechanism it

had to gain knowledge of the value of the tax base (e.g., with a survey) in order to determine the payment accurately. This knowledge could also come from the outcome of previous auctions (e.g., in an unchanging environment), which we can infer from cases of auction-based contracts giving way to bilateral bargaining (Azabou and Nugent 1988, 686).

The third general category of contractual agreements in tax collection consists of *fixed wage contracts*. In this type of a contract, the tax collector would turn over all of the collected revenue to the government and receive a salary that would depend on his or her labor effort. As a distinct feature of wage contracts in tax collection, the governments would typically assign other supervisory agents to observe the effort of salaried collectors. Throughout history, governments have always employed salaried agents for tax collection, though at varying levels of importance. The Ottoman government, for example, used salaried commissioners to collect taxes from some enterprises in towns and from imperial domains in rural areas. The importance of wage contracts in tax collection has generally grown greatly since the seventeenth century. For example, the English government turned over the collection of customs and excise taxes to salaried agents in the late seventeenth century, a pattern also observed in Sweden, Russia, and other European countries in the eighteenth century (Bonney 1995, 443). The strong tendency observed since the mid eighteenth century towards using salaried agents has made wage contracts the dominant contractual form in today's systems of tax collection.

Beyond the three general categories of share, rent, and wage contracts, numerous possibilities have been observed within each category. The proportion of the revenue to be turned over to the government in share contracts, for example, could be determined in various ways, such as choosing the highest rate offered in an auction, determining the rate separately for each tax unit, or applying a single rate for all units as determined through bilateral bargaining

with a syndicate of collectors. In addition to the well-known subcategories of rent contracts described earlier (auction-determined and negotiated rent), other variations existed depending on whether the length of the contract was limited or lasted for the collector's lifetime. Wage contracts could also have numerous variations. The wage rate, for example, could depend on such things as whether the labor market was competitive and whether the government paid market or efficiency wages.

Finally, contractual arrangements could vary significantly over time and space. To be sure, there were some well-known general tendencies observed across countries, such as the rise of rent contracts in the early modern period and the increasing dominance of wage contracts after the eighteenth century. There were also similar general tendencies observed in the choice of contractual forms for the collection of different types of taxes. Rent contracts, for example, were more likely to be observed in the collection of trade taxes like customs duties than in collecting personal taxes.[13] However, there were also numerous exceptions to general tendencies and various regional and temporal variations among observed contractual forms, making it unsatisfactory to explain all cases from simple generalizations. Despite the general tendency toward the choice of wage contracts after the eighteenth century, for example, some countries were slower to change than others. Explanations of tax collection thus need to be sufficiently abstract to identify the basic factors affecting general tendencies, but also flexible enough to account for the rich diversity and the temporal and spatial variation in methods of tax collection. We develop such a model in the next section.

3. A MODEL OF TAX COLLECTION

Suppose the amount of tax revenue that can be collected over a set period of time is determined by the production function

$$R = f(e)B, \qquad (1)$$

where e is the effort of a risk-neutral tax collector (measured in dollars), B is the tax base, and $f'>0, f''<0$. We assume that B is unobservable both to the government and the collector, though both know its distribution, and e is unobservable to the government. The government can, however, learn the values of B, R, and e by investing in the appropriate measurement technology. Specifically, it can measure the tax base by incurring a fixed cost m before the tax is collected (i.e., before the collector chooses e); it can measure the actual tax by incurring a fixed cost k after the tax is collected; and it can observe (and hence dictate) the collector's effort by spending $s \cdot e$ on monitoring, where $s>0$.[14]

The government faces a standard principal-agent problem in that it must design an incentive scheme to elicit effort from the collector. The specific characteristics of the scheme will depend on which variables the government decides to measure, as this determines the information on which the parties can contract. (We assume that once the government measures a variable, it becomes public knowledge.) We consider three schemes depending on whether the government measures the actual tax collected (R), the tax base (B), or the collector's effort (e).[15] Each scheme must satisfy the both incentive compatibility constraint (that is, the collector chooses effort to maximize his expected return), and the participation constraint (that is, the collector must achieve a minimum expected return).

3.1. Measurement of R: Share Contract

We first consider the case where the government measures the actual tax collected, R, and then shares that amount with the collector according to a pre-arranged sharing rule, $T(R)$. Without loss of generality, we consider the linear sharing rule, $T(R)=\alpha R-\beta$. The collector's expected return under this rule, given risk-neutrality, is

$$U = E[\alpha f(e)B] - \beta - e, \tag{2}$$

where the expectation is over B. Incentive compatibility requires that the collector choose e to maximize this expression, yielding the first order condition

$$\alpha f'(e)E[B] - 1 = 0. \tag{3}$$

Let $\hat{e}(\alpha)$ define the resulting level of effort as a function of α. Note that $\hat{e}$ is increasing in α and is independent of both β and the realized value of B.

It is well-known that in this setting, the government's optimal contract involves $\alpha^*=1$ and

$$\beta^* = f(\hat{e})E[B] - \hat{e} - \overline{U}, \tag{4}$$

where $\overline{U}$ is the collector's reservation utility (Mas-Colell, Whinston, and Green 1995, 482-483).[16] Intuitively, setting $\alpha=1$ has the effect of inducing the efficient level of collector effort, given uncertainty about B, because the collector retains the full amount of the actual tax collected. As a result, the collector's choice of e solves

$$f'(e)E[B] - 1 = 0. \tag{5}$$

The fixed payment the collector owes to the government, β^*, is set so that his participation constraint is just satisfied. The resulting expected return for the government under the optimal share contract is

$$V_S = \beta^* - k = f(\hat{e})E[B] - \hat{e} - k - \overline{U}. \tag{6}$$

An important shortcoming of this contract is that it imposes all of the risk arising from variations in B on the collector. This is not a problem if the collector is risk-neutral, as we have

assumed, but if he is risk-averse, the optimal contract will no longer involve $\alpha^*=1$. Rather, α will be a number between zero and one so as to share the risk between the two parties while still providing the collector some incentive to exert effort. As a result, the outcome is second best, and the expected return for the government will be something less than the amount in (6) (Mas-Colell, Whinston, and Green 1995, 483-487).

3.2. Measurement of B: Rent Contract

We next consider the case where the government measures B up-front at cost m and then conveys that information to the collector. The sharing rule is therefore specified ex ante (i.e., before the tax is collected) as a function of the measured value of B. Specifically, the collector promises to pay the government $T(B)$, and retains the residual, $R–T(B)$. As noted earlier, this arrangement has been called tax farming in the literature.

Once the collector learns B, there is no further uncertainty, so his return,

$$U = f(e)B – e – T(B), \tag{7}$$

is non-stochastic. The collector's optimal effort, $\hat{e}(B)$, therefore solves

$$f'(e)B = 1, \tag{8}$$

which defines the efficient level of effort for all realizations of B. The fact that effort is state-specific in this case represents an important advantage of measuring B ex ante compared to measuring R ex post. The likely trade-off, however, is that it may be costlier to measure the tax base accurately compared to measuring the actual tax collected (i.e., we might expect m to be larger than k). Of course, this is ultimately an empirical question that will depend on such factors as the variability of the tax base from year to year, the availability of survey methods to estimate the tax base efficiently, the ability of tax payers to conceal the base, and the ability of tax collectors to conceal the amount of taxes collected.

The collector's participation constraint in this case implies that $T(B)$ solves

$$T(B) = f(\hat{e}(B))B - \hat{e}(B) - \overline{U} . \qquad (9)$$

Thus, the collector's reservation utility is satisfied in all states, given that T is determinate once B is observed. That is, there is no residual uncertainty to cause variations in the collector's income. This represents an advantage of the rent contract compared to the share contract when collectors are risk averse. The return to the government under this arrangement is given by $T(B)$–m, which, in expected terms, is

$$V_R = E[f(\hat{e}(B))B - \hat{e}(B)] - m - \overline{U} . \qquad (10)$$

An alternative interpretation of this case is that would-be collectors, rather than the government, measure the tax base and then bid for the sole right to collect taxes. If collectors are competitive, then the outcome will be identical to that just described because collectors will compete away any rents associated with their private information. In cases where collectors have an advantage in measuring B, owing, for example, to their local knowledge, this arrangement would dominate the one in which the government measures B. Offsetting this advantage, however, is the possibility that the collectors might be able to capture some rents if they are not sufficiently competitive.

This alternative interpretation shows the difference between the two sub-varieties of rent contracts discussed earlier. Historically, rent was typically determined either at an auction or by direct bargaining between the government and collectors. The difference corresponds to whether the contractors or the government would measure B. Whereas in the former case the contractors would measure B and use the information to determine their bids at the auction, in the latter the government would measure it and share the information with the collector(s). Of course, the

model can easily be extended to discuss various other possibilities depending on available methods of measuring the tax base and conveying the information reliably to other parties.

3.3. Measurement of e: Wage Contract

Finally, we consider the case where the government measures the collector's effort, e, and pays a wage contingent on that effort, $w(e)$. Since the government observes e, it can dictate the collector's effort, so the incentive compatibility constraint is irrelevant in this case. The government's problem is to choose e and $w(e)$ to solve the single-constraint problem

$$\max_{e, w(e)} f(e)E[B] - se - w(e)$$

$$\text{subject to: } w(e) - e \geq \overline{U}, \tag{11}$$

where, recall, se is the cost of monitoring. The first-order conditions imply that the optimal effort level, $\hat{e}(s)$, solves

$$f'(e)E[B] = 1+s. \tag{12}$$

Note that effort is neither state-contingent (since B is unknown) nor efficient (owing to the cost of monitoring). As for the optimal wage, it satisfies the participation constraint

$$w(\hat{e}(s)) = \hat{e}(s) + \overline{U}. \tag{13}$$

Thus, the wage is constant, which again ensures that the collector's income is independent of the state. The resulting expected return to the government under the wage contract is

$$V_W = f(\hat{e}(s))E[B] - \hat{e}(s)(1+s) - \overline{U}. \tag{14}$$

3.4. Comparison of the Various Tax Collection Contracts

We now compare the various tax collection contracts to determine which yields the highest expected return to the government. This involves choosing the largest of the expressions in (6), (10), and (14). Consider first the comparison between (6) and (14) (the share contract versus the wage contract). In neither case is effort state-contingent, so the comparison depends

only on the relevant measurement costs. The nature of the costs differs, however: under the

share contract it is fixed and hence non-distortionary, whereas under the wage contract it is

proportional to effort and therefore distortionary. In both cases, however, as the measurement

cost goes to zero, the expected return converges to the efficient level. Thus, for sufficiently high

k the wage contract dominates, while for sufficiently high s, the share contract dominates. This

is illustrated in Figure 1, where the positively sloped locus in (k,s) space demarcates the relevant

regions for the two contracts. Specifically, the wage contract dominates for points above the line

(high k), and the share contract dominates for points below the line (high s).[17]

[Figure 1 about here]

Now introduce the rent contract. As shown above, this arrangement has the inherent

advantage that effort is both state contingent and efficient. Thus, if the up-front cost of

measuring the tax base, m, is sufficiently low, the rent contract will dominate both of the other

arrangements. This is indicated in Figure 1 by the vertical and horizontal lines, which show that

the rent contract dominates for large enough values of s and k.

The figure also shows what happens when the variance or cost of measuring B changes.

The solid lines demarcate the relevant regions for a given value of m and holding the variance of

B fixed. However, an increase in the variance of B will increase the value of state-specific effort.

The dashed lines show what happens in this case. Since only the rent contract induces state-

contingent effort, an increase in the variance of the tax base will expand the region where it

dominates relative to wage and share contracts. In contrast, the region where the rent contract

dominates will contract as the cost of measuring B increases.[18]

4. TAXES AND THEIR COLLECTION

To see how the model helps to explain historical reality, consider first a hypothetical case of an invariant tax base (i.e., the variance of B is zero), where the government can also measure the tax base and tax revenue at no cost ($m = k = 0$) and can observe the collector's effort perfectly ($s = 0$). This is similar to the case of poll taxes (a fixed amount per person) from an unchanging small population known with certainty. In that case, the Coase theorem would imply that it would not matter which contractual form the government would choose to collect taxes. Any of the three available methods could be used, with identical outcomes for e and R. The division of the total tax revenue between the government and the tax collector would also be expected to be the same. The evidence on Ottoman methods of collecting poll taxes (such as the *cizye*, collected from religious minorities, and the *avarız*, originally an occasional levy that was regularized in the seventeenth century) confirms the expectation of equal substitutatibility among contracts. The Ottomans used the three methods almost interchangeably, with small variations in measurement cost presumably affecting the actual choice.

In reality the tax base would typically be variable for most taxes, and the cost of measuring the collector's effort, the tax base, and tax revenue would be positive. Depending on the properties of each source of taxation, the government would have to choose a collection method based on which option would bring the highest net revenue. To examine these factors in a concrete setting, consider the operation of the government bureau put in charge of overseeing the tax collection. This bureau would employ staff trained in monitoring the collector's effort and measuring the tax base and revenue. The government's problem would be to decide for which sources of tax revenue and under which circumstances the bureau would be better off monitoring the effort and for which other cases it would be better off measuring the tax base or

the tax revenue. A variety of factors, including geography, production technology, market structure, and institutional constraints, could affect how the variance of the tax base and the cost of measurement could vary from one context to another.[19]

4.1. Share Contracts

Consider first the incidence of share contracts. Recall that the model would predict the government to choose share contracts over others if the cost of measuring the tax revenue after collection was lower than the cost of measuring the tax base or the collector's effort, all else being the same. This type of a contract was typically not observed in the collection of production taxes in rural areas because the cost of measuring and dividing the tax revenue could be very high for agricultural products.[20] The bureau's staff would have had to incur significant cost in ascertaining the value of the tax revenue for agricultural products, especially for those collected in kind (possibly varying in shape, size, and ripeness), to determine the share of the government. Sometimes the local units used to measure the output of agricultural products also varied significantly among regions, further increasing the cost of measuring the tax revenue in standard units. The government could thus increase the net revenue by choosing wage or rent contracts over share contracts in the collection of agricultural taxes.

The cost of measuring the revenue could also be high for urban taxes if the collection process was somehow subject to corruption by the bureau staff. This could be true for services or manufacturing enterprises for which the tax revenue was difficult to observe or confirm independently. By underreporting the total tax revenue and dividing the reduction in government's share with a corrupt bureau staff, the collector could benefit himself at the expense of the government. Although the government could try to prevent this type of corruption by assigning additional bureau staff or supervisors to monitor those in charge of measuring the

revenue after collection, this would clearly increase the cost significantly. If it was cheaper for the bureau staff to measure the tax base ($k > m$), the government's net revenue would be greater under rent contracts than share contracts for the collection of taxes from these types of services and enterprises.

A well-known case of share contracts that has attracted considerable scholarly attention is the collection of excise taxes in Prussia. Starting from the 1680s the Prussian government collected excise taxes by state officials who were compensated by share contracts. This was unique because other contemporary European governments were using rent contracts for the collection of excise tax revenue. As another unique characteristic of the Prussian case, the excise tax was only collected in the cities. To explain why the Prussian rulers chose share contracts while others adopted rent contracts for the same type of tax, Kiser and Schneider (1994, 198) argue that "the main reason is that the monitoring of officials collecting indirect taxes was much better in Prussia." The problem with this argument is that it restricts explanation to a single dimension, namely, variation in the cost of monitoring officials' effort. They consider share contracts a "mixed solution" along this dimension, somewhere between the high cost wage contracts and zero cost rent contracts. By omitting the cost of measuring the tax base and the tax revenue, however, they provide an incomplete explanation that fails to account satisfactorily for why similarly semi-strong bureaucracies at other times and places did not adopt share contracts, why share contracts were not observed for the collection of other urban taxes in Prussia, and why they were at some point abolished for excise taxes as well.

In contrast, our model identifies the distinct costs and benefits of each of these contracts, thus allowing a complete explanation these phenomena. Share contracts were observed for the collection of excise taxes in Prussia not necessarily because the bureaucracy was better able to

monitor the tax collector's effort, but because it could measure the tax revenue cheaply. For reasons explained above, the measurement would have been costlier for excise taxes collected in the countryside or for other types of taxes. The Prussian case becomes less anomalous once we consider the cost not just of monitoring effort but also of measuring the tax base and tax revenue.

4.2. Rent Contracts

Consider next the incidence of rent contracts. According to our model, rent contracts were more likely to be chosen over wage or share contracts if the cost of measuring the tax base was low and the variance of the tax base and the cost of measuring effort and tax revenue were high. When it was prohibitively costly to measure the tax revenue, the government was left with a choice between wage and rent contracts in collecting taxes.

While agreeing with some of the previous explanations of rent contracts, we identify other parameters of the government's decision problem that have been overlooked in the literature. A common explanation of rent contracts offered in the literature is that they were preferred over wage contracts when the cost of measuring the collector's effort was too high. This type of explanation has been commonly given for the observed incidence of rent contracts in France, England, and Tunisia, among other places.[21] Although the high cost of measuring the collector's effort was a significant determinant of contractual form in some cases, other factors were also important.

One of these factors was the cost of measuring the tax base. Before a rent contract could be implemented, the government or the tax collector had to measure the tax base to be able to agree (or bid) on the amount of rent. Variations in the cost of measuring the tax base explain why, among the tax sources with a high cost of measuring effort, only some were collected by rent contracts and not others. For example, the cost could be lower for large enterprises, such as

customs and salt mines with established systems of accounting and record-keeping, than for small ones like blacksmiths and small shops which could require substantial cost to measure their tax base. Even though the cost of monitoring the collector would probably be the same (in proportion to total effort) in both types of enterprises, rent contracts were more likely to be observed in the former than the latter. The difference in the cost of measuring the tax base also explains why rent contracts were more likely in urban than rural sources of tax, all else being the same.

The variance of the tax base was also an important reason why rent contracts were chosen over others in some cases. For example, as noted earlier, rent contracts were more likely to be observed for the collection of customs revenues than excise taxes. The primary reason for this was that the variance of the tax base for customs revenues was likely to be higher in the more volatile environment of international trade than in regional markets because of greater fluctuations in prices, exchange rates, international supply and demand, and political and military stability. Governments preferred rent contracts over share contracts in the collection of customs dues because the collector's effort would be state contingent, giving it an advantage over other types of contracts.

Research on the allocation of tax revenues in the Ottoman Empire provides quantitative support for the importance of variance. For example, a recent study has found that in the sixteenth century the sources of revenue allocated to local government officials included a higher proportion of variable taxes than those allocated to the provincial and central treasury (Coşgel and Miceli 2005). Clearly, tax bases with a higher proportion of variable taxes would also have a higher variance. Given that wage contracts were observed primarily on provincial and central

treasury domains, the result indicates a positive correlation between the variance of the tax base and rent contracts, as predicted by the model.

Changes in the variance of the tax base also explain the rising incidence of rent contracts in the late sixteenth and seventeenth centuries in general. Historians have tried to explain this phenomenon by changes in the risk aversion, monitoring capacity, or the fiscal and military needs and priorities of governments.[22] Unless they make ad hoc assumptions about the changing preferences and capabilities of governments, however, such explanations leave it unclear why rent contracts rose significantly during this period and not others. Our approach recognizes that this was generally a period of significant rise in population, inflation, urbanization, and political turmoil around the world. The immediate impact of these changes on tax collection was most likely a significant rise in the variance of tax bases. Whereas governments may have previously preferred to collect some taxes by wage contracts, they now found it more advantageous to switch to rent contracts under the new, more volatile conditions. They did so not necessarily because they became more risk averse or less solvent, but because switching to rent contracts allowed them to maximize the net tax revenue by benefiting from the state–contingent effort associated with this type of contract.

4.3. Wage Contracts

The model predicts that governments would choose wage contracts over others when the cost of measuring the tax base or the actual revenue were high, and the variance of the tax base and the cost of measuring the collector's effort were low. We thus agree with the previous literature that the observed general correlation between strong bureaucracies and wage contracts was due to the lower cost of monitoring the tax collectors in those states (Kiser 1994). This is also consistent with the argument commonly made to explain the eventual dominance of wage

contracts around the world, a phenomenon attributed to the general rise in the ability of modern states to monitor government officials, which lowered the cost of measurement.[23]

In addition to the falling cost of measuring effort, however, there were other factors that favored the choice of wage contracts by making the alternatives less attractive. One of these factors was the rising costs of measuring the tax base and revenue. Together with urbanization and industrialization, production and exchange was becoming more sophisticated during this period, raising the cost of measuring the value of economic activities that were previously subject to taxes collected under rent contracts. At the same time, a variety of new activities were emerging that needed to be systematically incorporated into the tax system. Because the past was little guide to determining the value of these activities, and because the government, tax collectors, and taxpayers possessed asymmetric information about them, it was costly for the government and the collectors to measure the value of their tax base.

Another factor for some activities was the falling variance of the tax base. Improvements in agricultural technology reduced the risk of crop failure caused by natural disasters, lowering the variance of expected return from these products. Industrialization similarly reduced the effect of natural risks on production and exchange in general. Greater integration of markets reduced the effect of sector-specific influences on revenue, lowering the variance of the tax base. These factors together reduced the value of state-contingent effort that previously made rent contracts beneficial and allowed governments to increase net revenue by switching to wage contracts.

5. CONCLUSION

To study the rich variety of tax collection methods observed in history, we have grouped them according to the basis for payment between the government and the collectors. Three general categories have been observed: share contracts, specifying the proportion at which the two parties would share the tax revenue; rent contracts, where the collector would pay the government a fixed amount based on the value of the tax base; and wage contracts, specifying a fixed wage the government would pay the collector for his or her labor. In explaining the choice among contracts, we have identified the economic cost and benefits of alternative methods of collection rather than subscribing to misleading dichotomies between private and public agents, or making ad hoc assumptions about the risk preferences or behavioral motivations of governments and tax collectors. In the economic theory of tax collection we have developed, the cost and benefits of alternative schemes depend on which variables need to be measured— specifically, whether the scheme calls for the government to measure the actual tax collected, the tax base, or the collector's effort—and the value of state-specific collection effort.

Differences in these factors go a long way toward explaining the temporal and spatial variations in the contractual forms of tax collection observed in history. Share contracts were generally rare between governments and tax collectors because it was prohibitively costly for the governments to measure the tax revenue independently. These types of contracts were occasionally observed in cases when the cost would be expected to be low, for example in the collection of excise taxes in Prussian cities. Rent contracts became increasingly more common during the sixteenth and seventeenth centuries, notably throughout Europe and the Ottoman Empire, because various demographic and socio-economic changes increased the variance of the tax bases and thus the value of the state-contingent effort associated with this type of contracts. The trend after the seventeenth century was toward greater use of wage contracts in tax

collection. A combination of factors, including stronger bureaucracies and more sophisticated

production and exchange, increased the cost of measuring the tax base and revenue and lowered

the cost of measuring the collectors' effort and the variance of tax bases, making wage contracts

increasingly more common and eventually the dominant form of tax collection everywhere.

APPENDIX

This appendix derives the efficient share contract for the case of a risk-neutral collector. Recall that the government's problem is to choose the parameters of the sharing rule, α and β, to maximize its return subject to the collector's participation constraint, and his optimal effort level, $\hat{e}(\alpha)$, as defined by (3) (reflecting the incentive compatibility constraint). The Lagrangian for this problem is

$$L = (1-\alpha)f(\hat{e}(\alpha))E[B] + \beta - k + \lambda[\alpha f(\hat{e}(\alpha))E[B] - \beta - \hat{e}(\alpha) - \overline{U}], \qquad \text{(A1)}$$

where λ is the Lagrange multiplier on the participation constraint. The first-order conditions for α and β are

$$-f(\hat{e}(\alpha))E[B] + (1-\alpha)f'E[B]\left(\frac{\partial \hat{e}}{\partial \alpha}\right) + \lambda(f(\hat{e}(\alpha))E[B]) = 0 \qquad \text{(A2)}$$

$$1 - \lambda = 0, \qquad \text{(A3)}$$

where (A2) makes use of the Envelope Theorem. From (A3), $\lambda=1$. Substituting this into (A2) causes the first and third terms to cancel, leaving $(1-\alpha)f'E[B]\left(\dfrac{\partial \hat{e}}{\partial \alpha}\right)=0$, which can only hold if $\alpha=1$. Finally, substituting this value for α into the collector's participation constraint (which holds with equality given $\lambda>0$) and solving for β yields the expression in (4).

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1. For example, the vast literature devoted to contractual arrangements observed in England, France, and the Ottoman Empire has been concerned primarily with explaining who was appointed to collect taxes, rather than how the collectors were paid or which conditions bound their agreement with the government. See Ashton (1956), Çızakça (1996), Darling (1996), Johnson (2006), Johnson and Bella (2005), Kiser and Kane (2001), Ma (2003), Priks (2005), Toma and Toma (1992), and White (2004).

2. While some researchers have restricted the term tax-farming to rent contracts, others have used it to refer to all forms of agreements (including wage contracts) with private agents (Copland and Godley 1993). This has caused analytical difficulties because many tax-farmers were previous (or current) soldiers or bureaucrats who could not be classified as private agents. In the Ottoman Empire, palace servants and members of the military belonging to cavalry forces or standing regiments often entered and sometimes even dominated the auctions (Darling 1996, Ch. 5). There were also private tax collectors hired by the government on wage contracts, such as the collectors of the Ottoman *avarız* tax in the seventeenth century (Demirci 2002, 163).

3. The borrowing needs of the public sector has been at the core of some explanations of the rise of rent contracts in the Ottoman Empire after the late sixteenth century. See, for example, Darling (1996) and Çızakça (1996). This approach to tax-farming has been adopted in most recent narratives of the Ottoman Empire covering this period, such as those by Imber (2002), Johnson and Balla (2005), and Pamuk (2004). Similar arguments have also been offered to explain the changing contractual forms observed in other parts of the world during the same

period. For example, Ashton (1956) used it to explain the rising incidence of rent contracts in England under the Stuarts, and Webber and Wildavsky (1986) generalized the argument to Europe as a whole.

4. See Kiser (1994, 301) for details and further references. See also Bonney (1979, 21-23) for the differential applicability of the argument between England and France.

5. In one of the early studies of tax farming in France, for example, Matthews (1958) identified risk aversion as a significant reason for its existence. Parker (1974, 563) similarly argued that rent contracts "smoothed out the flow of money into the treasury" in early modern England. Arguing that the Ottoman Government became more risk averse during the same period, Çızakça (1996, 142) claimed that risk aversion took the form of "transferring to the risk-taking entrepreneurs, the tax-farmers, the potential profits in return for a firm commitment of annual payments".

6. For criticisms of problematic assumptions made in this type of arguments, see Johnson (2006) and Allen and Lueck (1995).

7. As Johnson (2006) has argued, contrary to the implication of the argument, French rulers rarely received only a fixed payment from the collectors. The risk-aversion argument also fails to explain how the contractual form changed in France in the course of the seventeenth century.

8. See Allen and Lueck (1995) for a similar criticism of principal-agent models of agricultural contracts as being based on a single margin. Although Priks (2005) considers "the inefficiencies of the auction mechanism," these inefficiencies are fixed in his formulation. Moreover, rent contracts in tax collection need not be given out at auctions.

9. For observed varieties of tax-farming and the difficulties with inconsistent uses of the term tax-farming, see Copland and Godley (1993). Rent contracts have also been observed on the

expenditure side of public finance, for example in the recent growth of public-private partnerships in the procurement of public services. See Maskin and Tirole (2008).

10. Akdağ (1959, 2: 231-47), Çizakça (1996, Ch. 5), Darling (1996, Ch. 4), Salzmann (1993).

11. For comparative studies of tax collection methods in the Ottoman Empire and other European states during the early modern period, see Copland and Godley (1993), Johnson and Balla (2005), Kiser (1994), Kiser and Kane (2001), Ma (2003), and Priks (2005).

12. For a detailed description of *jāgīrdārs* and *sipāhīs*, see Habib (1999, Ch. 7) and İnalcık (1973, Ch.13).   Despite their similarities with fixed rent type of contracts, these systems for granting tax collection rights clearly have various other interesting properties that deserve separate, systematic analysis.

13. See Coşgel (2005) for the Ottoman tax system and examples of personal, production, and trade taxes.

14. See Lueck (1995) for a similar specification of monitoring.

15. Note that measurement of R represents output monitoring, while measurement of both e and B represent input monitoring. For analyses of this choice in other contexts, see Wittman (1977), Eswaran and Kotwol (1985), Maskin and Riley (1985), and Khalil and Lawarree (1995).

16. See the Appendix for a formal proof.

17. If collectors are risk-averse, the range where the share contract dominates will shrink since, as noted above, the optimal contract in that case is second-best.

18. However, to the extent that an increase in the variability of B also increases measurement costs, the net effect of such a change on the desirability of rent contracts will be ambiguous.

19. The problem clearly involves other types of agency problems which we have omitted here. For example, it can make a great difference for the work incentives of the bureau's own staff

whether they operate under a wage, rent, or share contract in performing their duties. Although the government can attempt to solve the problem by monitoring the effort of the bureau staff, the problem can clearly end up in an infinite regress. In the agency literature this is the well-known problem of how to monitor the monitor. We are justified in ignoring this problem here, focusing instead on the principal-agent relationship between the collectors and the government at the first level, because these bureaus have typically employed salaried staff (the reasons for which would certainly be important to study elsewhere). The Ottoman government, for example, assigned salaried commissioners to monitor the activities of tax collectors, including those operating under rent contracts. Their choice of effort was thus independent of the government's tax revenue and identical across the three types of contracts implemented between the government and tax collectors. The independence between their income and the government's tax revenue suggests that their effort incentives did not affect the choice among wage, rent, or share contracts in tax collection.

20. For the influence of measurement cost on the selection of share contracts in agriculture, see Allen and Lueck (1993). The importance of assessment difficulties in tax collection have also been noted, for example, by Kiser (1994, 292-293) and Hoffman (1994).

21. See, for example, Azobou and Nugent (1988, 1989), Priks (2005), and White (2004).

22. See, for example, Çızakça (1996), Darling (1996), and Kiser (1994).

23. See, for example, Copland and Godley (1993), Kiser and Kane (2001), Priks (2005), and White (2004).

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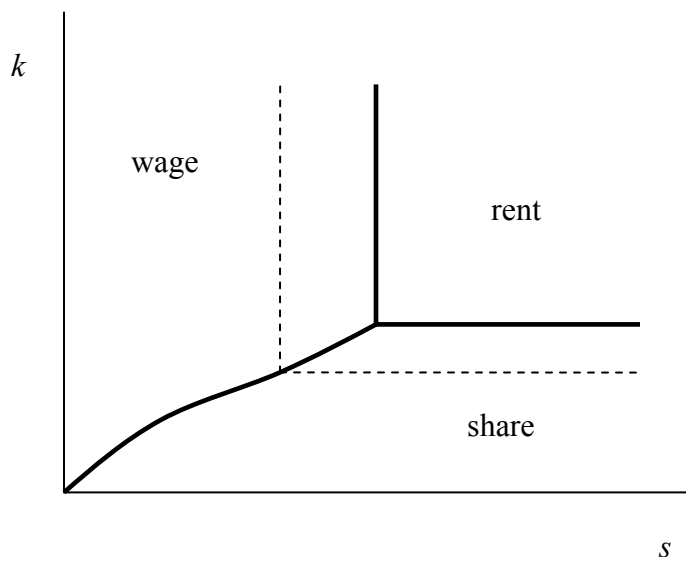
Figure 1: Regions where each of the tax collection arrangements dominates.