Tax administration and compliance: evidence from medieval Paris

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Abstract

We use tax and historical records to analyze the Parisian *taille*- an institution that resolved the tax compliance problem. The *taille's* essential features were; an agreement between the king and city government to collect a fixed amount of revenue and a sequential collection process that included public revelation of individual tax assessments prior to their collection. Modelling the *taille* tax game shows both features are necessary for a unique equilibrium of efficient tax compliance. A social norm that allocated this tax mainly to the elites provided for its peaceful collection. Data from 14th century Paris show the desired revenues were efficiently collected with high levels of compliance, despite minimal bureaucratic machinery.

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Introduction

The problem of tax compliance is as old as is the levying of taxes. Inducing compliance from taxpayers is important to governments for many reasons. Non-compliance obviously reduces the revenue raised from any tax system, but in addition, non-compliance can undermine the legitimacy of the government, and non-compliance that is unevenly distributed across social classes, professions or income levels can lead to social unrest if not violence. Consequently, governments expend considerable resources on reducing tax evasion, and innovations in tax administration that induce high compliance rates at reasonable cost are extremely important. In this paper we construct a tax-game model and explore data to analyze the *taille*, a tax-collection mechanism that was used in medieval Paris, primarily to finance wars fought by the French king. The *taille's* essential features were an agreement between the crown and city government to collect a fixed amount of revenue and a sequential collection process including public revelation of individual tax assessments prior to their collection. Using this mechanism, compliance was achieved by turning the social cost of tax evasion into a private one. It was supported by a social norm that allocated this tax mainly to the elites. The information we uncover from historical tax records indicates that this taxation mechanism allowed the government to collect the revenues desired at a low cost and with high levels of compliance, despite minimal bureaucratic machinery.

The primary difficulty in collecting taxes has remained constant throughout history. Citizens have superior information about the base on which most taxes are collected, particularly their own income and wealth. In medieval times and for long afterward, this led governments to rely on taxes levied on easily observed transactions. In the case of medieval Paris, this implied taxing goods that entered and left the city walls. However, such indirect taxes have many undesirable features: they are in particular generally regressive, which can be a trigger for social unrest. While direct taxes on personal income and wealth can avoid these difficulties, they are harder to collect because of the

asymmetric information problem mentioned. Medieval kings had relatively modest administrative capabilities, and there were, of course, none of the third-party record-keeping and reporting mechanisms in place that modern governments use. Moreover, attempts by the crown to send royal tax collectors (and sometimes troops) into cities to collect taxes ran the risk of igniting riots.

One method used by many governments in medieval and early modern Europe to collect taxes was to delegate tax assessment and collection to 'private' tax collectors (tax farmers) and local governments. The variation of this in which we are interested arose in France at the end of the 12th century. Under that scheme a given tax liability earmarked for a specific royal initiative was agreed to by the crown and a local government, and it was left to local authorities to partition that liability among its taxpayers and collect the agreed total payments. Variations of this de-centralized tax collection system were used in a variety of times and places in Europe. However, analogous to the 'Legal Origins' literature (Glaeser and Schleifer, 2002), initial differences in economic and political conditions led to different outcomes in terms of the success of this taxation mechanism. The *taille* that worked so well in the self-governing commune of Paris in the 1300s, later became, in royal hands, one of the most hated symbols of the *ancien regime*. In England, in 1381, the implementation of a similar taxation scheme resulted in a bloody uprising (Oman, 1905). Therefore, we focus on the Parisian *taille* and seek to determine the ingredients that made it so successful.

We model the *taille* tax collection mechanism as a sequential game and draw on actual tax rolls from Paris drawn up for the *tailles*, as well as information on other, similar, *tailles* of the era to determine its structure. Our model shows that two key aspects of the Parisian *tailles* were critical to its success: First, it embodied a principle referred to by Wolfe (1972) as an "impot de repartition" – a repartition tax whereby a fixed sum is agreed on to be collected, and is then divided amongst taxpayers; this repartition system implies that the cost of tax evasion by some taxpayers is borne directly by their fellow taxpayers. Second, it relied on information that citizens had about one another's economic circumstances, coupled with public revelation of individual tax liabilities to deter tax evasion at low cost. We model the tax collection game as a sequential game whereby in the first stage

taxpayers report their wealth to tax assessors. The reports are then revealed to the public who may challenge them. Only then is the tax levied and collected. We show that this sequential mechanism generates a unique equilibrium of truthful compliance at a very low cost. An additional key ingredient, that we do not model here, was the social norm that 'the rich should carry the poor' (Wolfe, 1972). In line with recent research (Sheffrin, 2013, Besley, Jenson and Persson, 2015) we suggest that fairness could have further lowered the costs of compliance. These factors enabled the city to collect, on a number of occasions, an income and wealth tax in a city that numbered some 200,000 inhabitants, without civil unrest.

Data from the tax rolls together with additional sources allow us demonstrate that the institution of the *taille* functioned extremely well: the required revenues were always raised, the elites paid most of the tax, and the absence of litigation suggests that compliance was very high. Further, the cost of collection was very low and the *tailles* did not ignite riots. One potential difficulty with the *tailles* is shown to be the possibility of tax avoidance by moving between parishes. We therefore statistically test whether wealthy taxpayers strategically relocated themselves to reduce their tax liabilities, and conclude that there is no evidence of this.

As is often the case in researching historical phenomena, our data is unique to Paris. Therefore, we cannot statistically test the predictions of our model using a panel of data from other cities or countries. Nevertheless, our findings from Paris are qualitatively in stark contrast to many other tax regimes of the period, including the famous Florentine *Catasto* of 1427 that did not yield the expected return and was politically short-lived, and an attempt in 1381 in England to collect a progressive poll tax based on the similar principle that the rich carry the poor, that resulted in massive evasion and ultimately ended in bloody riots. The medieval lay subsidies in England were also considered to be subject to tax evasion and corruption. In 1334 they were converted to an institution similar to the *taille*[3].

[3]Glasscock (1975) and Nightingale (2004).

Direct tax collection in modern developed economies typically does not exhibit the features of the *taille*. Most individuals are taxed at the source by their employers who provide the state with information on earnings. Individual and corporate income tax returns are typically held to be confidential, and the total revenue collected via any particular tax in any given period is typically a random variable. Nonetheless we can learn a few things from the Parisian *taille.* First, compliance was achieved by turning the social cost of tax evasion into a private one, as the tax re-partition scheme caused taxpayers to fully internalize the cost of tax evasion by fellow taxpayers. Second, the information provided by revealing the individual tax assessments enabled taxpayers to efficiently deter evasion. Lenter, Shackelford and Slemrod (2003) document the fact that at least some information from individual and corporate income tax filings has been made publicly available in various countries at different times. They review the arguments for and against this sort of revelation, noting in particular that improved compliance is one of its claimed virtues. Our analysis of the *tailles* shows that revelation might not improve compliance on its own. This is in part because we find that the re-partition feature of the *tailles* was critical to its being so effective.

An additional aspect of the Parisian *taille*s, that we do not model here, is that predetermining the amount of tax to be raised at first the city then the parish level essentially turns a direct tax into a lump sum tax. This eliminates another classic cost of taxation, the creation of deadweight loss that results from altering behavior in response to a tax (Feldstein (1999),Slemrod and Yitzhaki, (2002)).[4] We also note here, but do not analyze, the possibility that the principle in the *tailles* that the 'rich carry the poor' may have generated a belief in its 'fairness' that reinforced compliance at a low enforcement cost (Sheffrin 2013, Besley, Jenson and Persson, 2015). If so, this might also relate more broadly to 'tax morale' measures that reduce tax evasion without increasing enforcement (Lutmmer and Singhal, 2014). These issues merit further research.

Modern tax systems have come to rely heavily on third-party reporting to raise the cost of tax evasion and improve compliance. Nevertheless, in some situations, typically when a

[4] The smuggling that would have resulted if the King had imposed a tax on goods entering or leaving the City is an example of what we are referring to here.

relatively small number of wealthy taxpayers have a substantial informational advantage over the government, a *tailles*-like mechanism can yet be useful in some modern-day tax-collection systems, and we provide one notable recent instance of its use in our Conclusions section.

The paper is organized as follows. Section II places our work in the large literature on tax compliance and reviews other work that has used tax rolls from the same period. Section III lays out in detail what is known about the actual implementation of the *tailles* in medieval Paris as well as in other places and times. Using this information as a guide, Section IV then develops a theoretical model of the *tailles* mechanism, derives the model's unique equilibrium and shows how the theoretical predictions change if any of the key aspects of the model are altered. Section V discusses further issues that arise from the theoretical results and employs our data to test for strategic tax evasion. Section VI concludes.

II. Related Literature

There is a considerable literature devoted to tax compliance issues. The seminal paper on the deterrence of false reporting of an individual's tax base is Allingham and Sandmo (1972), which analyzes the behavior of a single taxpayer with private information about their own income, who makes a report of that income to the tax authority. The tax authority's role is to set a fixed probability of detecting an under-report by the taxpayer, and to set the penalty incurred if an under-report is detected. The tax authority is non-strategic, and the emphasis is on determining the values of these parameters which will deter under-reporting. An advance on this approach was made in a series of papers [see, for example, Reinganum and Wilde (1985), (1986), Chander and Wilde (1998)] which adopted a principal-agent approach to tax compliance by having the tax authority (the principal) as well as the taxpayer act strategically, and derived the equilibrium behavior by both parties. The environment in this literature remains one of a tax authority dealing with a single taxpayer with private information regarding his true income, and the equilibrium strategies inevitably involve randomization.

A recent survey of the literature on tax evasion by Slemrod (2007) cites no research that analyses the use of information held by fellow-taxpayers to aid a tax authority in deterring under-reporting, even though taxation authorities in many countries do make attempts to encourage citizens to report tax evasion by others.[5] Myles and Naylor (1996) develop a multi-taxpayer model of tax evasion, but the mechanisms for improving compliance that are analyzed there are social norms and group conformity, rather than taxpayers' information about one another.

There is, however, a large general literature on the use of 'mutual monitoring' in multiple-agent environments in which the agents have superior information to the principle regarding the behavior of other agents. Knez (2001) analyzes an incentive system adopted by Continental Airlines that relied on mutual monitoring and sanctioning by employees, and Fehr and Simon (2000) show that adding the possibility of mutual punishment by individuals in a public goods game can increase the amount contributed. Besley and Coate (1995) among others analyze the working of micro-financing systems like the Grameen Bank in which groups of lenders are mutually responsible for their loans. However, in the Continental and public-good environments it is the agents themselves who are required to punish/sanction sub-optimal behavior by their colleagues, rather than inducing a separate authority to do so, and in the group-lending context the only recourse available to a single lender is to repay the loan of another lender who would otherwise default. Thus, the central concept analyzed here of giving informed taxpayers appropriate incentives to trigger audits of one another by an uninformed authority, is missing.

A paper whose environment bears some resemblance to that in our formal model of the *tailles* is Bandyopadhyay and Chatterjee (2010). They develop a model of criminal activity in which citizens have better information than the police about whether their fellow citizens have committed a crime. The action available to citizens is to report others' criminal activity to the police. The key question analyzed in their paper is how such citizen reporting affects criminal activity in observably distinguishable groups.

[5] See, for example, http://www.endfraud.co.uk/Tax%20Fraud.html.

The theoretical literature on implementing social choice correspondences (Ma (1988) and Moore and Repullo (1988) are classic references) demonstrates that under quite general conditions one can construct an extensive-form game which will induce a set of agents with superior information to adopt any profile of actions that a principal wishes, as a (unique) subgame perfect equilibrium of that game. Our point here, however, is not to demonstrate that the Parisian authorities of medieval France *could* find a mechanism to collect taxes in such an informational environment, but to show how the incentives inherent in the mechanism they actually used allowed them to solve the problem they faced at minimal administrative cost.

A small number of previous recent studies have made use of the Parisian tax rolls. The tax rolls analyzed in this paper have been studied by Bourlet (1992) mainly for the purpose of an anthro- toponymic study. Herlihy (1995) analyzed the 1292 and 1313 tax rolls and briefly addressed issues related to migration, occupations and gender differences. Bove (2004) also used the tax rolls in his study of the Parisian elites. Desicmon (1989) analyzed the Parisian tax roll of 1571. Rigaudière (1982, 1989, 2002), studied the *tailles* imposed in southern France and more specifically attempted to answer the question of how income and wealth information was verified by tax collectors. The institutional detail we use in the model is derived mainly from his research.

III. The Parisian *Tailles* of Philip the Fair

1. Sources

Our data is extracted from the tax rolls of the *taille* imposed by Philip the Fair on Paris beginning in 1292. There are seven existing rolls: 1292, 1296-1300 and 1313. The first six correspond to the same imposition totaling 100,000 *livres parisis* to be paid in installments.[6] The last tax roll, of 1313, was earmarked to pay for the knighting of the prince, the future king Louis X. In addition we have qualitative information on the collection of two additional *tailles* of 10,000 *livres* in 1302 (for a war against Bruges) and

[6] There is some doubt as to whether the tax roll of 1292 was actually a roll of collected taxes rather than an initial survey of taxpayers.

in 1308 (for the marriage of Isabel, the king's daughter).[7] This tax was levied on the citizens of Paris and excluded the privileged tax exempt classes of the nobility, clergy, students and professors. It included the Italian merchants (*lombards*) and Jews who were not citizens of the city.[8] Who exactly in Paris was classified a citizen – a 'burgher' - is open to debate. According to Duby (1980), only those that enjoyed the privileges of citizens that were related to residency requirements paid these taxes. A court case in the *Parloir* (the city's court) from 1308 defines a citizen (*bourgeois*) as someone living in the city and paying the *taille* and other charges imposed by the city.[9]

The tax rolls differ in coverage. Table 1 shows the first - 1292 - being the largest, including all segments of the taxable population: The rich (*gros*) the poor (*menus*), the Jews (who were expelled by the king in 1306) and the *Lombards* (Italians). Separate lists were drawn for each of these groups, but the tax roll of 1296 is missing the list of the poor. All subsequent tax rolls exclude some of the neighborhoods outside the city walls. All of the rolls include the names of citizens who have died during the year. The tax roll of 1313, which records the fewest tax payers, has fewer parishes included in it than the previous ones. While the coverage of taxpayers in surviving manuscripts is sometimes incomplete, the totals collected show that the annual tax quota of 10,000 *livres* was indeed always collected and sometimes substantially exceeded. The Parisian *taille* was therefore a tax system that actually worked.

(Table 1 about here)

The tax rolls consist of a list of taxpayers recorded according to residency (i.e., street address). In addition to the taxpayer's name we often find information about his or her occupation and place of origin. According to the rolls, the city was divided into geographic tax units associated with a parish church. Larger parishes were further divided into wards. Taxpayers were grouped according to streets or street sections they lived in. Although we have no written record detailing the division of the tax burden by parishes, the division of

[7] Le Roux and Victor (1846).
[8] The privilege to tax the Italian aliens was given to the city by Philip le Hardi in 1282, The royal decree is cited in Le Roux and Victor (1846) Vol. II p. 261.
[9] Le Roux and Victor (1846) Vol. II p. 171.

the rolls into those geographical units suggests that the tax burden was divided among these tax units.

In addition to the tax rolls themselves we used the registers of the merchant court of Paris (the *livre de parloir*) that was transcribed by Le Roux and Victor (1846).[10] The registers provide supporting evidence on the institutional details of the administration of the tax.

2. The main features of the *tailles*

In this sub-section we will use what is known about the Parisian *tailles* as well as other similar tax systems to establish the key features of its implementation during this period.

Motivation for adopting the tailles

According to the history of the *tailles* studied here, it was the city of Paris that chose to substitute the *taille* for a sales tax (*aide*) (Bourlet, 1992). The main reason was in order to preserve the (fiscal) independence of the city.[11] The city negotiated with the crown on the amount to be delivered and the crown left it to the city's government to assess and collect it. It appears that this taxation mechanism was mutually advantageous for the bourgeoisie and the crown. The crown benefitted from this arrangement as it was assured a given tax revenue, thereby reducing fiscal uncertainty. In Burgundy, in contrast, the princely city of Dijon was subject to a wealth tax which was administered by the Duke of Burgundy's men and was calculated at a fixed rate of 2% of the assessed wealth. Tax revenues, therefore, fluctuated from one tax assessment to the next (Dubois, 1984). The king also benefited from the *taille* because administration costs for any direct tax are typically high. The small scale of the king's bureaucracy and his limited political and military powers resulted in a preference for farming out tax collection – the *taille* was no exception. Indeed, a later attempt in 1382 by the king's agents to collect taxes from the city of Paris directly resulted in violent riots (Cohn 2006).

[10] Le Roux and Victor (1846) call attention to the fragmentary nature of the documents, but argue that they are most complete for the period 1290-1315 which conveniently corresponds to the tax tolls studied. Nevertheless, Bove (2004) suggests that their transcription should be used cautiously as there are errors, particularly in dating some of the documents.

[11] One related potential benefit to the city was that it could use its fiscal independence to issue low interest debt in the form of rents – Luchaire (1911).

Adoption of the *tailles* in Paris likely appealed to both parties as a way to minimize the likelihood of civil unrest. This can be inferred from the adoption of a similar scheme in the Midi – the region around Toulouse. Wolff (1956) argues that the Count of Toulouse introduced in 1270 the Northern version of the *taille* to the consulates of the South.[12] According to the documents studied by Wolff, the reason behind exchanging indirect taxes for direct ones was to attenuate civil tensions that were widespread in the Southern consulates. The conflicts were a result of the regressive nature of indirect taxation and resentment of the city oligarchies by the lower classes.

Institutional setup

While the tax rolls in our possession provide a great deal of information about the collection of the Parisian *tailles*, we lack the details of the institutional setup. There is reason to believe that this is by design, since the main feature of the medieval *taille* was that the crown did not get involved in the process and therefore, unlike the lay subsidies and poll taxes in England, we do not have royal documents or parliamentary records regulating it. According to Descimon (1989), who analyzed a similar Parisian tax roll of 1571, the Parisian city government kept these tax rolls secret from the crown and carefully guarded the detailed information about taxpayers. Descimon suggests that tax rolls were burnt after the taxes were delivered, indicating the importance of fiscal independence to the City's leaders. Therefore, many of the institutional details must be inferred from evidence from the tax rolls themselves and from similar systems used in other times and places. The following account is based on the summary provided by Wolfe (1972) in appendix G to his book

The recourse to a taille was infrequent

The recourse to direct taxation by the crown in medieval Europe, and France was no exception, was infrequent. Generally, the king of France had to finance his expenditures from revenues raised from his feudal domain. On special occasions the king levied extraordinary taxes – the *aide* – usually in the form of a sales tax. These taxes could be

[12] The consulates were a governing body of a city that included landed aristocracy.

levied automatically, according to feudal custom, in the case of a marriage of the king's daughters and the naming of his heir. The tax could also be used to finance wars that had to be approved by the parliament. We will argue below that the infrequent and irregular nature of these taxes, along with other features particular to the Parisian case, imply that each instance of the *tailles* should be considered a one shot tax game.

The fixed sum (repartition)

The *tailles* in France were divided into two types – the *taille reele* and the *taille personelle*. The former was a property tax often called *'fougae'* - hearth tax - and was levied mainly in the *midi* and the south of France. The latter was a tax on personal wealth that included also moveable wealth and income, and was levied in the north of France. The Paris *tailles* were therefore a tax on all wealth and income from labor and capital.

We argue that a critical feature of this *taille personelle* was what Wolfe terms an "impot de repartition" – a repartition tax whereby a given amount to be collected is divided amongst taxpayers. [13] Recall that the city negotiated a lump sum tax to be delivered to the king – it therefore turned the tax allocation and collection process into a constant-sum game, whereby a taxpayer who evaded taxation by either falsely declaring his taxable wealth and/or income, or by not paying his assessed tax, imposed a burden on fellow taxpayers. This was different from other medieval taxation schemes such as the Lay Subsidies in England that were a fixed tax rate on movables or the Poll Tax (1377-1381), with a fixed amount of tax per head.[14] It is also different from modern taxes in which the government sets tax rates and tax revenue is determined by (variable) economic activity and the level of compliance. With the *taille*, the French medieval monarchy made sure that taxpayers internalized the costs of tax evasion and possibly mitigated tax avoidance.

Information collection and verification

[13] This mode of repartition – the division of a lump sum tax between tax payers - was common in small rural communities.. This became the norm in Burgundy after 1376 (Leguai 1970)
[14] The levying of lay subsidies in England began in the late 11th century and continued until the 16th century.

The successful implementation of the *tailles personelles* to collect the sum agreed to with the crown depended on the city government's ability to a) extract the necessary wealth information from each taxpayer and b) to enforce the collection of the resulting individual tax liabilities. Clearly, it wished to do this at minimal cost.

After negotiating with the King on the total amount the city should deliver to the crown, the city leaders had to determine how to distribute the tax burden across its citizens. This in turn required a general assessment of the city's wealth and then the allocation of tax quotas to the various parishes, which were the local tax units (with some exceptions, as detailed later).

Little is recorded about the first stage and the information historians have is derived from a few rare examples which survived – none from Paris. However, similar *tailles* were usually levied according to the following principle: the very poor paid a poll tax, the very wealthy, above a certain (variable) cutoff paid a proportional wealth tax that normally ranged from one to ten percent. Most taxpayers paid a proportional income tax.[15]

The critical issue was the extraction of accurate wealth and income information and enforcement of collection. This was achieved, in Paris and other large cities, by dividing the city into parishes with some parishes further divided into wards. To ensure that the principles that operated at the city level would also carry through at lower levels, the lump sum levied on the city was divided into quotas for each parish.[16] The actual assessment and collection of the tax was supervised by the city government but carried out by a varying number (between 13 and 24) of unpaid 'worthy' assessors (*Prud'hommes)* elected by the city government. A measure of the low cost of this taxation mechanism, on which we elaborate later, can be deduced from the fact that the process of assessing a city of 200,000 residents was carried out by such a small number of unpaid collectors.[17]

How much confidence could the city leaders have that the assessors had obtained truthful wealth and income statements from taxpayers? We know little about how the process was

[15] Boutaric (1861) p. 261. Desportes (1977)
[16] Descimon (1989) documents this further sub-division of the tax in 16th century usage.
[17] See discussions in Farr (1989) and Desportes(1977) for Dijon and Reims respectively. The collection costs were augmented by paid clerks that wrote up the tax lists and city police that guarded the money collected.

carried out in Paris for the *tailles* we analyze, but from other sources we can infer a good deal about the process.

The fact the rolls are constructed according to residence – by the taxpayer's address - alludes to the way the assessment was conducted: through a house to house canvas. The information collected by the assessors during the canvas might, nonetheless, be false. Rigaudiere (1989) has attempted to determine how reports were verified for the *tailles* levied in France more generally. The common features of the verification mechanisms he describes relate to the use of neighbors to verify wealth and income declarations. They included measures such as the assessors revisiting the neighbors when they had suspicions about a tax statement, and to call on neighbors to testify before a committee in cases of suspect statements. In Dijon, assessed taxpayers were required to provide the assessors with names of neighbors that can confirm their declaration. Other methods relied on making public the assessments and allowing neighbors to challenge them. Rigaudiere (1982) describes the process of collecting the *taille* in Saint Flour and shows that assessed taxpayers could challenge their assessments and neighbors were involved in the process. Decsimon (1989) alludes to the presentation of the tax rolls before the general assembly of Paris in 1571.[18] Evidence from small communities in the 17th century suggests that the tax rolls were read to the community during mass in the parish church.[19] While most of the documented evidence comes from periods after 1300, it is likely that the evidence drawn from rural communities that retained age old customs in the area around Paris, together with evidence from Paris from the 16th century can be used to infer the customs prevailing in Paris at the time.

One shot game

We noted above that other instances of the *tailles* often involved the collection of taxes for infrequent and unpredictable purposes. However, the first six tax rolls we have are known to have been for the purpose of collecting a pre-determined sum in installments.

[18] Descimon (1989, p. 76).
[19] Challet for Saint Vert, Lemarchand (2008), Follain and Larguier (2000,2005).

Nonetheless, we argue that the task of collecting information from taxpayers and collecting the resulting taxes in each of these years is best treated as a one-shot game.

An important fact in this regard is that medieval cities' populations were very dynamic. During the 13th century the population of Paris more than doubled. Migration was the most important source of population growth as death rates were high. Indeed, our data show that each tax roll contains numerous variations in taxpayers' vital and economic circumstances. First, the overlap between taxpayers within the years for which we have data is not high: the proportion of taxpayers that appeared in the roll of 1292 that appear in **any** subsequent year is about 40%. Only 50% of those appearing in the tax roll of 1300, which covered fewer citizens, were also listed in earlier rolls. The tax assessed on individuals also varied even over consecutive years. Moreover, over the years, our tax rolls document taxpayers that got married, became widowed, and died. Children reached adulthood and apprentices became masters. Some taxpayers changed residences and sometimes even their occupations. In short, from the data extracted from the rolls it is evident that substantial new information had to be collected every year, suggesting that the *tailles* was not a repeated game.

Equally significant is the fact that each tax collection game was played by a different set of tax assessors. Out of the 13 assessors of 1292, 10 were themselves assessed by different assessors in subsequent years. Of the 24 assessors in 1298/1300 14 were assessed by others.[20] All of this suggests that each tax collection can be thought of as a one shot game, as both the taxpayer population and the assessors they dealt with changed substantially from assessment to assessment.

Universality

As mentioned, only the nobility, the clergy, faculty and students were exempt from paying the *tailles*. The coverage of the *tailles* was otherwise universal. In medieval cities there was a distinction between residents (that included clergy, nobility and aliens) and citizens. The

[20] The list of assessors for the years 1293-1297 is missing, so we cannot calculate exactly how many times the assessors switched roles with those being assessed.

direct taxes were levied on all citizens, including the city elites, the poor and the dead. The records of the Paris *taille* show that in 1292 – 1313 poor taxpayers paid less than five percent of the total tax. The wealthier citizens would hardly have noticed if the poor had been excluded from paying (and it may be that in 1296 they were), but it appears to have been important for all citizens to be included. The inclusion on the lists of dead taxpayers is also significant. Since the planning of the tax assessment was based on living taxpayers, a taxpayer that died during the tax year could not be readily absolved. If the dead taxpayers were to be dropped from the list, their burden would have to have been picked up by surviving ones. Since death rates were not low in medieval Europe, a provision for collecting taxes from the survivors of deceased taxpayers was important, since one way to evade a direct tax is to avoid being assessed at all. For the *tailles,* even (a perhaps fraudulent claim of) death was not a successful way to avoid taxation.

Further, the assessors and the city leaders were neither exempt from the tax nor given preferential treatment. We found that all the Parisian political elite (the mayor - *prevot de marchands,* his lieutenants – *the echevins,* and members of the city parliament - *the elus*) are accounted for in the tax rolls – they did not exempt themselves or their families. Indeed, Bove (2004) in his study of the wealthy elites in Paris, compared the tax assessments of the wealthy individuals and families before and after assumption of political power and shows that privilege did not favor them: their assessments did not decline with their taking office.

Informed assessors

We noted above that the *taille* was overseen on the city leaders' behalf by a relatively small number of assessors. We also know a good deal about those assessors. From the *livre de parloir* transcribed by Le Roux and Victor (1846) we have the names of tax assessors for 5 of the years that the tax was collected [1292, 1298/1300, 1302, 1308, 1313]. Below we present evidence that clearly shows that the assessors were well informed citizens: they were men of standing drawn from the major professional guilds who had lived in the city for many years. Their names and occupations were noted in Le Roux and Victor (1846)

and we used the tax rolls to learn about their economic standing (tax payments) and residences.

Assessors were identified by their profession, suggesting that professional affiliation was a key selection criterion. Assessors coming from the professions would be familiar with business conditions generally and particularly those affecting their own profession. This mattered, especially in a medieval world populated with professional guilds that kept secret many of their business practices. Table 2 shows a list of professions ranked by their economic standing (average tax assessment). This ranking is contrasted with the distribution of the assessors' professions. It can be readily seen that the assessors were drawn largely from the wealthier professions. The assessors' relative economic standing in the profession was high. For the 66 tax assessors whose names we are able to determine, Table 3 displays the number of them who appeared as taxpayers in various groupings of the rolls that we have. Assuming these individuals were in Paris and economically active in the years between those in which their names appear as taxpayers, Table 3 implies that 47 of the 66 assessors (those in the first four year groupings) lived and worked in Paris for at least 7 years between 1292 and 1313. Finally, the assessors were amongst the most affluent citizens of Paris. Table 4 shows their rank in the tax distribution. More than half of the assessors belonged to the top 5% of the distribution of tax payments and all but one of these whose assessment we could determine belonged to the top two deciles.

(Table 2 about here)

(Table 3 about here)

(Table 4 about here)

Moreover, evidence from the tax roll of 1296 suggests that there existed another tier of tax assessors or collectors at the tax unit level. The opening paragraph of the tax roll of 1296 lists 5 names of people responsible for the tax of the first ward of the first parish. Unlike the list of the citywide assessors, they were not listed by their profession. The criteria for

their appointment appears to have been residential, as they all resided in that tax unit. Their tax assessments are lower than that of the citywide assessors; they belonged to the third decile of the income distribution, a rank below the *prud'hommes*. This suggests that the tax administration consisted of two tiers. The upper tier first assessed the citywide tax base and distributed quotas among tax units. The lower tier consisted of residents of each tax unit who were responsible for the assessment and collection within their own units.

IV. A formal model of the *taille* mechanism in Paris

We now construct a simple formal model of the *tailles* mechanism described above. Our purpose in doing so is to demonstrate how remarkably well-suited this particular tax-collection mechanism was for dealing with the issue of tax compliance. The model encompasses the key properties laid out in the previous section; we use it to generate predictions about how the results would have been altered if these key properties had been absent.

All of the analysis will be done in an environment in which the following assumptions are maintained:

A. There exist citizens who have information about other citizens' wealth that is superior to that of the authorities.

B. Tax liabilities are in the first instance based on self-reported wealth.

C. Citizens have the option to claim to the tax authorities that a fellow parishioner has mis-reported their wealth; only such a challenge will trigger a costly audit of the citizen about whom the claim was made.

A captures the informational situation in medieval Paris. In fact, it captures the situation in a modern economy, except that there it is a citizen's bank or employer who has superior information, and is required by law to report it to the authorities. Elements B and C are adopted to reflect the fact that in the medieval context, sending agents of the Crown or City out en masse to collect taxes was costly and possibly dangerous. We do not analyze the discussion among city leaders to determine parish assessments, nor the prior bargaining

with the Crown over the city's total tax assessment. Thus, the task at hand is to collect some amount of tax from a particular set of citizens.

Within this environment, the key elements of the *tailles* mechanism on which we focus are:

1. A fixed sum is to be collected from a given set of citizens.
2. The tax liability of each citizen (or equivalently, the wealth report on which it is based) is revealed before taxes are finally assessed.

In what follows then we will demonstrate that in an environment with the features A through C a *tailles mechanism* embodying 1 and 2 will collect the taxes desired with minimal cost (including costly audits) and that when either of these features is abandoned, the tax collection mechanism fails to do so.

Let the set of taxpayers then be denoted as $N=\{1,2,\ldots,n\}$, each of whom has a value of wealth, w_i.[21] The set N contains no individuals exempted from the tax, such as the nobility and clergy. We refer to individual taxpayers as 'parishioners', and will speak of the tax collected from 'the parish', however, nothing is altered if instead N is interpreted as the entire set of Parisian taxpayers[22].

Assume parishioner i's w_i is drawn from a continuous distribution f_i, with support $[a_i,b_i]$. The information (f_i, $[a_i,b_i]$) for each i is common knowledge among parishioners (which includes the tax assessors), and we assume that each $a_i > 0$. We formalize feature A with the assumption that the actual realization of each w_i is observed by a subset N_i of parishioners that includes i. Importantly, we assume that the set $N_i\backslash\{i\}$ is non-empty for each i, so there is at least one parishioner other than i who knows the realization of w_i. The tax assessor(s) for the parish are members of the parish who volunteer for this role, and are subject to taxation themselves. Thus, they may or may not be members of N_i for any particular i, but they know each $[a_i,b_i]$, f_i.

[21] While we term this 'wealth', it can be taken to be whatever value(s) the tax is assessed on.
[22] The tax-collection districts to which quotas were assigned did not always coincide with parish boundaries, as noted above, and they changed over time, but we use the term 'parish' here for brevity.

Consistent with B, each parishioner *i* makes a *report*, denoted as r_i, of their wealth, w_i, which we assume is an element of $[a_i,b_i]$. Thus, parishioner *i*'s *reporting strategy* is a function $\rho_i(r_i|w_i)$, which is a probability distribution over $[a_i,b_i]$, for each realization of w_i. Consistent with C, each citizen *i* also has a *challenge strategy*, the realization of which we write as $c^i = (c_1^i,c_2^i,\ldots,c_n^i)$ with $c_j^i=1$ meaning *i* is challenging *j*'s report, whereas $c_j^i=0$ implies *i* is not doing so. This can be generalized to allow randomization by interpreting c_j^i as the *probability* that *i* challenges *j*, and letting each $c^i \varepsilon [0,1]^n$. Analogously, we will let $c_i =(c_i^1,c_i^2,\ldots,c_i^n)$ be the list of *n* probabilities that parishioner *i* is challenged by each parishioner.

Finally, we assume that if an accusation is made, it triggers an audit which is costly to the authorities, but which does in fact reveal to them the actual value of w_i of the citizen audited. We are therefore giving the only strategic role for auditing to citizens: the authorities always conduct an audit if an accusation is made, but because of their cost, the authorities always prefer to make fewer audits. Their incentive is therefore to design a mechanism in which audits occur only if they will reveal under-reporting.

The Tailles Mechanism

To capture the two key features of the taille mechanism we define the tax liability of citizen *i* as:

$$T_i = \frac{s_i(w_i,r_i,c_i)P}{\sum_j s_j(w_j,r_j,c_j)}, \text{ where:}$$

$$s_i(w_i,r_i,c_i) = \eta^i(c_i)\max\{w_i,r_i\} + (1-\eta^i(c_i))r_i,$$

$$\eta^i(c_i) = max_j\{c_i^j\}, \text{ and}$$

P is the fixed amount of tax to be collected.

The function s_i embodies the fact that a parishioner's tax liability is based on his *report* r_i, unless he is audited, in which case it is based on the greater of his report and his true

wealth. The function η^i takes on the value 1 if and only if at least one of *i*'s fellow citizens accuses him and triggers an audit, and is 0 otherwise. Note that *i*'s tax liability here turns out to be proportional, in that $T_i = (P/\sum s_j)s_i$; every parishioner pays the same proportion $(P/\sum s_j)$ of their s_i in taxes. We show at the end of this section that the tailles mechanism can be adapted to levy a progressive tax, but use this proportional version here to minimize notational complexity. In any case, it is clear that $\sum T_i = P$ with this definition of tax liabilities – the repartition property holds.

To fully capture Feature 2, we assume that the game played among the parishioners occurs in two stages. In Stage I each citizen makes a (possibly random) simultaneous report of their wealth. The (realizations of) these reporting strategies are observed by all parishioners, and then at Stage II each citizen *i* chooses a c^i. This means that in fact the stage II strategy of parishioner *i* should be written as $\gamma^i(r)$, where $r = (r_1,r_2,\ldots,r_n)$ are the realized reports from Stage I of all parishioners[23], and $\gamma_j^i(r)$ is the probability *i* challenges *j* after observing *r*. This two-stage structure then captures the fact that the parishioners would know what their fellow citizens were reporting to the tax authorities.

This then suggests that the payoff function of parishioner *i* should be simply:

$$V_i(w_i,r,c,P) = w_i - T_i(w_i,r,c,P),$$

with T_i defined as above.

Note, that V_i implies that under-reporting goes unpunished and that there is no penalty for false accusation of fellow parishioners. We prove below that these omissions are important. We therefore define a more realistic, augmented payoff function by first defining the following two indicator functions:

$$h(x) = \begin{cases} 0, if\ x \leq 0 \\ 1, if\ x > 0 \end{cases}$$

and

[23] In fact strategies at Stage II depend on all that *i* observed, but we suppress w_i, others w_j, etc.

$$f(x) = \begin{cases} 0, if\ x > 0 \\ 1, if\ x\ \leq 0 \end{cases}.$$

The payoff function for parishioner *i* in the two-stage game above is now:

$$U_i(w_i, r, c, P, e, d) = w_i - T_i(w_i, r, c, P) - eh(w_i - r_i)\eta^i(c_i) - d\sum_j c_j^i f(w_j - r_j)$$

where *e,d > 0.*

The third term in the above payoff function imposes a penalty *e > 0* on *i* if and only if he under-reports his wealth *and* at least one fellow citizen challenges him. The fourth term imposes a penalty of *d > 0* on *i* for every parishioner she challenges who has *not* under-reported.

We are interested in the set of *Perfect Bayesian Equilibria* (PBE) of the game in which each player *i* observes their own w_i and that of any *j* whose N_j they belong to, and simultaneously with all other parishioners chooses a reporting strategy $\rho_i(r_i|w_i)$ and an accusation strategy $\gamma^i(r)$, and has the payoff $U_i(\cdot,d,e)$ defined above. The reason we work with this augmented payoff function will be seen from the following Proposition and Observation[24].

Proposition 1: *For any d,e > 0, any Perfect Bayesion Equilibrium of the two-stage tailles game has a strategy profile* $\langle[\rho(r|w)], [\gamma(r)]\rangle$ *which satisfies the following:*

a) in Stage 2, for any r, and any pair i,j, we have that:

if $i \in N_j$, $r_j < w_j$ *and the probability j is challenged by another parishioner is less than 1, then i challenges* r_j *for certain*

if $i \in N_j$, $r_j < w_j$ *and the probability j is challenged by another parishioner is 1,then i can challenger* r_j *with any probability, and*

otherwise, $\gamma_j^i(r) = 0$.

[24] Proofs of all Propositions are provided in Appendix A.2.

b) in Stage 1, for all i and all realizations of w_i, $r_i = w_i$ *with probability 1.*

Beliefs that support this equilibrium are that any i not in N_j *believes that* w_j *is equal to* r_j *with probability 1.*

The first important implication of this result is that it implies that in any PBE, all parishioners report honestly, and plan to accuse only those fellow parishioners who they *know* in Stage II are under-reporting. As a consequence, there is no under-reporting and no costly audits. Note second that this is 'essentially' a unique PBE. The only non-uniqueness arises because a) of the Proposition allows a parishioner who *knows* another parishioner is under-reporting to adopt any accusation probability if another parishioner is accusing for certain. Thus, if some N_j has two (or more) members, and *j* under-reports, one member of N_j will set $c_j^i = 1$ in the equilibrium continuation, while the other members may choose any value.

The reason we characterized this essentially unique PBE for the game with U_i rather than V_i stems from the following:

Observation 1: In the tailles game above with $e = d = 0$, there is an infinite set of PBE, including those with the same equilibrium strategies and outcomes as the PBE in Proposition 1, as well as PBE in which the equilibrium outcome is that all parishioners under-report with positive probability and all reports – including honest ones – are challenged with positive probability. These PBE are constructed in A.2. However, it is also shown there that in *all* the PBE of the game with $e=d=0$, it remains true that $s_i = w_i$ for every *i*; no one gets away with under-reporting.

Thus, as *d* and *e* go to zero, the tailles mechanism works as well as the authorities could hope: no under-reports and no challenge-induced audits. With *d,e* equal to zero, however, the PBE set includes equilibria in which everyone lies some of the time and the honest are challenged. The implication of this is that only an infinitesimal personal cost to being revealed as an under-reporter or false-accuser is required for the tailles mechanism to function well, and even when these costs are zero the PBE in which the mechanism

functions well remains focal. We now ask what happens if either of the two major features we highlighted above disappear.

Removing Feature 1

Altering the fact that the tax-collection mechanism collects some fixed amount *P* could mean many things. We consider an alternative that is common in present-day developed economies and was also widely used in the past: the application of a fixed tax rate to an imperfectly known tax base. In the present context the tax-base in question can be taken to be $W = \sum w_i$, which by our maintained informational assumptions is unknown to the tax authorities. We will assume, for consistency with the analysis just done, that the tax rate is a constant τ between 0 and 1. We refer to this as the *tau mechanism*, and in it the tax liability for parishioner *i* is:

$$T^{\tau}(w_i,r_i,c_i) = \tau s_i(w_i,r_i,c_i),$$

and *i*'s payoff function is

$$V_i^{\tau}(w_i,r_i,c_i) = w_i - \tau s_i(w_i,r_i,c_i)$$

Note that *i*'s payoff depends still on the challenge strategies of fellow-citizens, $c_i = (c_i^1,c_i^2,\ldots,c_i^n)$. To make a direct comparison with the tailles mechanism, we in fact consider the same two-stage game as we did there, with the payoff functions defined by:

$$U_i^{\tau}(w_i, r, c, d, e) = w_i - \tau s_i(w_i, r_i, c_i) - eh(w_i - r_i)\eta^i(c_i) - d\sum_j c_j^i f(w_j - r_j)$$

Our second result then follows.

Proposition 2: *If in the previous tailles game we replace the payoff functions U_i with the functions U_i^{τ} above, then for all $d,e \geq 0$ the following strategies form a PBE of the resulting 'tau game':*

$$\textit{In Stage 1 }, \rho_i(r_i|w_i) = \begin{cases} 1, for\ r_i = a_i \\ 0, else \end{cases}$$

$$\textit{In Stage 2, } \gamma_j^i(r) = 0 \textit{ for all r and for all i, j}$$

Stage 2 beliefs in the zero-probability event that some $r_j > a_j$ can be anything.

This is an equilibrium in which everyone lies and claims the minimum possible w_i and no one challenges. The key here is that the tau mechanism gives individuals no incentive to challenge a fellow parishioner's report, even if they know it to be false. The authorities can of course attempt to provide such incentives outside the tax collection system, as some contemporary tax authorities do, but the *tailles* mechanism, by virtue of being designed to always collect a certain fixed sum, has those incentives built in.

It is reasonable to ask if adding in a small psychological benefit to challenging an under-reporting parishioner might not make the tau mechanism operate as well as the tailles. In fact, it can be shown that if the tau game payoff function is altered by adding the term

$$k \sum_j c_j^i h(w_j - r_j)$$

for each *i*, then the tau game has the same essentially unique PBE as the tailles game. However, while it may be argued that a feeling of opprobrium towards a fellow parishioner who falsely challenges another ($d > 0$) or who attempts to evade taxation ($e > 0$) is a natural human instinct, it is rather less clear that one who correctly challenges a fellow parishioner will naturally receive approval from fellow citizens. If that is true, the authorities must somehow create a personal return (k) to making a legitimate challenge. Tax authorities could (and do) provide financial incentives for turning in tax cheats, but this then requires an added level of complexity to the system. The genius of the *tailles* mechanism is that this incentive is built into the way in which tax liabilities are calculated[25].

[25] There is a large literature in law journals about the effectiveness of snitching or whistle blowing. For example, Feldman and Lobel (2009) claim that monetary incentives may be counterproductive.

Removing feature 2

Here we are concerned with removing any possibility for parishioners to observe their neighbors' reports before taxes are assessed. We will not alter the informational environment, so it will remain true that the set $N\backslash\{i\}$ is non-empty, and we also retain the ability of parishioners to challenge. What we alter in this sub-section is the sequential nature of the tailles game, by considering a one-shot game in which each parishioner i simultaneously chooses a strategy pair $\{\rho_i(r_i|w_i), c^i\}$. The payoff functions remain the $U_i(\cdot,d,e)$ defined above, with $d,e > 0$, but we now are interested in the Bayes-Nash equilibria of this simultaneous-move game in which parishioners can still challenge their fellow parishioners' reports (and doing so results in a perfectly revealing audit), but they do so as best-responses to the equilibrium reporting strategies of their fellows. We refer to this as the simultaneous *tailles* game.

Proposition 3: *The simultaneous tailles game has no Bayes-Nash Equilibrium in pure strategies. In particular, in any BNE, all parishioners under-report with positive probability, while honest reports are challenged with positive probability and under-reports are challenged with probability less than one.*

These types of equilibria are familiar from the literature on single-individual tax evasion and compliance as a principal-agent problem.[26] The implication of Proposition 3 is that there will, with positive probability, be audits (some of which reveal under-reporting, and some of which necessarily - and wastefully - do not). It also implies that there will be unchallenged under-reporting with positive probability. Although the equilibrium outcome here does again imply that P is collected, the authorities would have to incur the costs of these audits. Further, it seems likely that the system would be seen as less legitimate, as some parishioners would be known by those in their N_i, ex-post, to have gotten away with under-reporting their wealth, while some others who had reported truthfully would find themselves nonetheless challenged and audited.

[26] See, for example Reinganum and Wilde (1985, 1986)

Before moving on to consider other implications of the analysis done so far, we return to the fact that our formulation of the *tailles* mechanism results in all parishioners paying a proportional wealth tax, with rate *P/W*. This is not essential for the mechanism to work. One could, for example, have the mechanism instead generate tax liabilities like those mentioned in the previous section: the poor paying a poll tax, middle income parishioner paying one rate on their w_i, and the rich paying a higher rate on their w_i. This more progressive system would have the poll taxes collected from the poor subtracted from *P*, and the non-poor parishioners' tax liabilities would be calculated as:

$$T_i = \frac{\theta(s_i)s_i()P^0}{\sum_{j\in N^0}\theta(s_j)s_j()},$$

where $\theta(s_i) = \beta \leq 1$ if $s_i < \bar{s}$ and $\theta(s_i) = b > 1$ if $s_i > \bar{s}$. Here, $\bar{s}$ is any chosen cutoff value, and the functions s_i remain defined as previously. P^0 is what remains once the poll taxes paid by the poor have been subtracted from *P*, and N^0 is the set of non-poor taxpayers.

This formulation removes the poor from the challenge/audit aspect of the game, and so requires that the assessors are able to determine on their own whether a taxpayer who reports a r_i low enough to be classed as 'poor' is lying

V. Further Considerations

We have argued that the *tailles* taxation mechanism used in Paris from 1292 to 1313 had distinct advantages for both the crown and the city. It eliminated uncertainty in tax revenues for the crown, and avoided arousing civil unrest, which would surely have been desirable for both the crown and the city leaders. Administrative and enforcement costs for the crown were clearly negligible, due to the devolution of these tasks to the city, and the theoretical results of the previous section indicate that its built-in incentives allowed the city to minimize its costs, also. In this section we discuss additional issues raised by the preceding analyses.

Civil unrest and fairness

We noted above the claim that the *tailles* system was adopted partly to avoid the civil unrest that was sometimes sparked by other means of taxation in medieval and early modern Europe, and that the regressivity of other, indirect taxes was a trigger for such unrest. The mechanism analyzed in detail in Section IV results in proportional taxation, but we also described a variation of it which would work the same and result in a progressive 'tax bracket' structure. So were the actual *tailles* progressive, or at least, not regressive?

Wolfe (1972) highlights the principle that in taxes based on repartition, such as the *tailles,* "Le fort portant le faible." – the strong should carry the weak. The information provided in the tax rolls allows us to compute the distribution of tax payments by taxpayer. We define the economic elite of Paris in 1292 by the top decile of tax payers and show in Table 5 their contribution to the tax paid by the city that year. It is clear that the principle was not an empty one: the economic elite of Paris provided more than 60 percent of the tax collected in 1292. The top one percent of taxpayers (not shown) provided 22 percent of the tax revenue that year. Without precise information on wealth and income for the entire population, we cannot say how progressive this is. These figures are striking in their similarity to those in the United States: In 2010, the top decile provided 53 percent of total Federal taxes and the top percentile 24 percent.[27] The OECD writes "Taxation is most progressively distributed in the United States ….. Australia and the United States collect the most tax from people in the top decile relative to the share of market income that they earn."[28]

(Table 5 about here)

These findings can also be contrasted with those from the English poll tax of 1381. The English Parliament agreed to pay the poll tax to finance the English war effort against France in The Hundred Years' War. The tax rate was set at one Shilling per head. The English Parliament also proclaimed that it followed the principle that the rich should carry the poor. In practice, the contribution of the very wealthy was capped at 10 times the poll

[27] CBO (2013), "The Distribution of household income and Federal taxes 2010" Table 3, p. 13. http://www.cbo.gov/publication/44604
[28] OECD. (2008), Growing Unequal: Income Distribution and Poverty in OECD Countries, pp. 104-106.

tax and that of the very poor bounded from below at half of the poll tax.[29] This meant that the ratio of the tax paid by the very rich to the poor was 20:1. In contrast, this maxim was interpreted more progressively in Paris where there was no cap and the ratio of highest tax paid to the lower tax paid was 2290:1. The 1381 Poll tax ended in a bloody tax revolt.

Intimidation and collusion

The result in Proposition 1 comes from a model in which parishioners are assumed to behave non-cooperatively, and the only strategies available are reporting and challenging. In particular, there is no consideration of the possibility that there are `bullies' – parishioners who can intimidate their fellow parishioners into not challenging their reports. We have to acknowledge that we cannot rule out that this might have occurred, but the rules of the *tailles* greatly limited the potential for such behavior. The nobility and the clergy – the two groups whose members would surely find it easiest to intimidate potential challengers – were exempt from paying the *tailles*. As to tax assessors and collectors under-reporting themselves and employing intimidation to deter challenges, recall that the lower tier of assessors/collectors were residents of the parishes in which they worked, making both lying and intimidation difficult. The upper tier of assessors came from the most highly-taxed groups. Within the city government, the mayor (the *prevot de marchands*) was aided by only 4 officials – the *echevins* – who were also drawn from the city's economic elite.[30] Information from the tax rolls shows that the *echevins* and their families paid taxes that place them in the top 5% of the tax payment distribution.

Recall that any taxpayer *j*'s tax liability T_i in the full *tailles* system is decreasing in the assessment (i.e., the s_i) of any other taxpayer. Also, however, the size of the impact on j's tax liability of a change in s_i is increasing in s_j. That is, the negative derivative $\partial T_j/\partial s_i$ becomes more negative as s_j increases. Thus, the paradigm that the 'rich carry the poor' had an additional benefit: being among the highest taxed, the governors and high-level assessors had the greatest stake in the functioning of the mechanism and in particular, the pursuit of wealthy tax evaders. Further, the city governors served short terms and rotated

[29] Oman (1905), pp. 20-25.
[30] Bove (2004) pp. 55-70.

frequently, and we have cited data from Bove (2004) that indicates their assessments didn't fall once they took office.

The general principle that the 'rich carry the poor' in itself would imply that the rich not collude to pass their tax burden onto the poor, but this doesn't rule out the possibility of a collusive arrangement among a group of the highest-taxed citizens designed to lower their payments and so pass some of their burden (mostly) onto other highly-taxed citizens. That is, the model doesn't encompass the possibility of a group of wealthy citizens (or any other group) agreeing to mutually under-report and to not challenge one another. Notice, however, that this can work only if the group that undertakes it is 'informationally self-contained'; the group must be sure that there is no one outside the group that has sufficient information about one of them to make a challenge. Such an outsider challenge of even one group member's false report could bring down the entire group, as the challenged member would then lose his incentive to stick to the no-challenge agreement.

Because the very rich were responsible for providing most of the tax revenue and thus had the greatest incentives to cheat, the city assigned most of the assessors to the Parishes where the rich lived. Table 5 shows the distribution of assessors by Parish for the years for which we have data. This clearly shows that indeed, the parishes with largest populations but also with the highest number of rich taxpayers were assigned more assessors.

Administrative costs

One argument that the *tailles* collected the agreed-upon revenues at low cost has so far been based on the model's result that the threat of challenges and audits was enough to eliminate the need to act on those threats. The information provided above regarding the small number of individuals employed in the collection of the *tailles* indicates this theoretical prediction is correct. However, we have additional data suggesting administrative costs were quite low. For the *taille* of 1313 we have a detailed list of the direct costs of collecting the *taille*. The person in charge of the collection was Jehan de Montreuil, one of the assessors elected by the city government, who received 10 *livres* for

his efforts[31]. Other expenses included supplies, such as paper, parchment, binding of the books etc., totaling 33 *livres*. Salaries of clerks and sergeants totaled 120 *livres*. Most clerks and sergeants were employed for 170 to 177 days. Interestingly, 40 *livres* were deducted against an expenditure associated with sending the *prevot* and other *prud'hommes* to the *Parlement* at *Pontoise* to bargain with the king. The total expenditure was about 200 *livres* which represented about 1.5% of the amount collected. As a comparison, the US IRS estimates administrative costs on all the taxes it administers at 0.6% of taxes collected, in an environment in which there is substantial legally mandated information reporting by taxpayers and third parties.[32] Moreover, according to a report done by the OECD (2004), administrative costs as a percentage of net revenues collected for OECD countries in 2002 ranged from a low of 0.42% for Sweden to a high of 1.76% for the Netherlands. This makes the achievement by the Parisian authorities look rather impressive.

Tax evasion

That recorded direct administrative costs were low does not imply that there were no challenges and re-assessments. In fact, we found an almost complete absence of any disputes in the historical record, which cannot prove definitively that none occurred, but we do have some direct evidence that the city government did not deal with many cases that required (costly) legal procedures.

The city government had legal jurisdiction over matters related to the city governance. The municipal court – the *parloir* – was convened to settle legal disputes related to the privileges of the city. Le Roux and Victor (1846) transcribed the *livre de parloir*, which includes legal disputes and testimonies before the municipal court. While historians agree that the full document did not survive the ages (Bove, 2004), the coverage for the years 1285 to 1320 seems to be more complete than for other periods. We searched the court records for any dispute related to the collection of the *taille*, and could find only one case,

[31] It is clear that the task of assessment was not considered a full time job, as the compensation for the assessor (10 *livres*) was lower than that of the sergeants or clerks that worked full time during the collection of the tax and received between 15 to 17 *livres*. Other than the head assessor, other assessors were not paid.
[32] Slemrod (1996) estimated the cost of compliance incurred by taxpayers in the US to be 10% of taxes paid.

related to the *taille* of 1308 raised to pay the traditional tribute to the king on the occasion of the marriage of his daughter Isabel. This suggests that legal disputes involving recourse to the legal system that arose from the administration of the *taille* were rare.

The lone court case involved a *lombard* (Italian banker or moneylender) by the name of Raimbaut (Romband) who apparently refused to pay his assessment for 1308. Italian moneylenders enjoyed a royal privilege of money lending (practicing usury). In 1282 the French king declared that the *lombards* contribute to the city taxes without enjoying the privileges of citizenship. They appear in separate lists in the tax rolls of 1292 to 1300, but these special lists no longer existed in the tax roll from 1313 that we analyzed. Apparently, sometime after 1300 the king revoked the royal decree of 1282 and the Italians were taxed directly by the crown rather than by the city. Our friend Raimbaut was one of a relatively small number of Italians that were citizens and were included in the regular tax units.[33] It appears that when the king decided to change the tax status of the Italian aliens and they were no longer taxed by the city, Raimbaut thought it advantageous to try and change his tax status from a citizen to an alien and thus evade taxation. The court ruled that since he enjoyed the privileges of a burgher in the past he should pay the tax assessed on him.

Note however, that the single court case we found pertained to an attempt to evade taxation based on tax status rather than a dispute on a challenged income report.[34] At the same time it is worthwhile to note that Raimbaut's tax assessment put him in the top 5% of tax payers – exactly the sort of wealthy taxpayer that our analysis predicts the city government did not want to lose.[35]

Strategic behavior by taxpayers

[33] In 1300 there were only 25 Italians recorded as regular citizens versus 127 as Aliens.

[34] The text reads: pronunciatum fuit contra ipsum quod ipse talliam a civibus parisiensibus sibi impositam a tempore quo fuit adeptus privilegium burgensium parisiensium solvet tanquam burgense parisiense. Et nichilominus solvet terminis assignatis financiam quam fecit antequam factus fuisset burgensem cum gentibus nostris, quia contra prohibitionem domini regis mutuaverat sub usuris sub regno. Le Roux and Victor (1846) p. 171.

[35] From the tax rolls we found that he paid 75 soldi in each of the tax years 1298, 9 and 1300 and lived in the second ward of St Huitace.

One possible method to lower tax payments was to strategically relocate one's residence. As noted above, the city leaders re-partitioned the payment across the various parishes in the City. It is reasonable to assume that in the allocation of tax quotas for the various parishes the city government aimed at levying the same ex-ante tax *rate* on residents in the various parishes. Once the tax quotas are determined then migration between parishes may alter the ex-post tax rate for individuals in the parish. Suppose that there are 2 parishes in the city, A and B, and that after the determination of the quota, a wealthy taxpayer moved from parish A to B. If the mover displaces a previous B parish resident with lower wealth, this will reduce the ex-post parish tax rate needed in parish B to collect the original quota. The size of the reduction will be larger the larger is the difference in the wealth of the mover and the replaced parishioner, so the incentive for such a move will lie primarily with the wealthiest taxpayers. Further, the effect will be larger the *smaller* is the tax base in the parish moved to – poorer or smaller parishes. When the next *taille* is collected, the quotas of the parishes would be reassigned to reflect moves by taxpayers that alter the income distribution in the city, but since the *taille* was not collected very frequently such opportunistic behavior might pay off.

Though it could not affect the total tax collected, the city government could be concerned with such strategic behavior, as it might undermine the legitimacy of this institution, and our data shows that taxpayers moved between parishes. For the years 1292, 1296 and 1297 we are able to account for 1001 moves between parishes (out of a total of 9200 taxpayers which we could link between rolls). Moreover, 16% of these taxpayers belonged to the top tax decile. The relatively large numbers of moves supports our earlier claim that each instance of the *taille* could be considered as a one shot tax game. To investigate whether wealthy taxpayers moved strategically to lower their tax liability we focus on those that belonged to the top decile of tax payers – the **'rich'** who paid more than 60% of all tax collected (table 5). The patterns of movement are analyzed and presented in table 6. We group the data into two categories. The first is the destination of the move: to a parish where the average tax was higher than the original or to one where it was lower. The second category tells us whether the taxpayer paid higher, identical, or lower taxes after the move.

Citizens move for many reasons, most of them unrelated to any economic activity. However, if one does move for reasons related to earning a living, then we would expect that those whose wealth/income increases would move to wealthier neighborhoods, and those who see a decline in their economic prospects move to poorer neighborhoods. These moves will appear in the diagonal cells in our tables: the wealthier/higher and poorer/lower cells. The argument made above implies that citizens who moved in order to lower their tax liability would also appear in the lower/poorer cell at the bottom right. The question then is whether this cell has an aberrantly high number of wealthy taxpayers in it. This seems clearly not to be so, given that nearly as many of the rich who moved to a poorer parish paid higher taxes, and there is no non-strategic economic rationale for citizens to appear in the higher/poorer cell as there is for them to appear in the lower/poorer cell. [36]

(Table 6 about here)

The other factor that makes a strategic move more profitable (and hence more likely to occur in the face of moving costs) is high wealth. Panel C shows that the rich movers in the higher/poorer cell had the same average income as those in the lower/poorer cell. If there were many strategic movers in the latter cell we would expect the average wealth of that group to be higher than that of the group in the higher/poorer cell.

We now turn from the rich taxpayers who moved to the entire population of Parisian taxpayers, to test whether heavily taxed parishioners tended to move more in order, perhaps, to lower their tax payments. We ran panel probit regressions using the entire panel of taxpayers for the years 1292, 1296 and 1297 (24059 observations), to see if wealth had a positive impact on the likelihood of moving. The left hand variable was the probability a taxpayer moved (to a wealthier, poorer or any parish), which was regressed on a dummy for being in the top wealth decile ('Rich') and on the tax paid before the move, as well as on being female and year and parish dummies. In all three regressions the coefficients on wealth are statistically zero, and the 'Rich' dummy variable was statistically significant and positive only for a move to a wealthier parish. Thus there is no evidence that higher wealth, which increases the gain from a strategic move, increased the probability a citizen

[36] Using a Chi square test we cannot reject that the distribution of taxpayers among the cells is random.

actually moved, and we take this as further evidence that strategic moves were not a significant issue.

(Table 7 about here)

Finally, we ask a different question: is there evidence that a move to a different parish significantly affected tax payments, and in particular, did moving to a different parish lower post-move tax payments, relative to those who did not move? To investigate this we regressed current tax payments on the previous year's payment as well as dummy variables for movement to wealthier and poorer parishes and controlled for parish and year effects. We also included the previous year's payment variable, and the dummies for moving to a richer or poorer parish all interacted with a dummy variable for being a top decile taxpayer. Table 8 shows that the only variables that had statistically significant coefficients were the previous tax paid and the two interaction variables of being 'rich' and moving. It is to be expected that the previous tax paid by a citizen would have a significant positive impact on current taxes. Importantly for our purposes, being a citizen from the top decile who had moved also has a significant impact on current taxes, but it is positive whether the move was to a wealthier or poorer parish. This, together with the evidence presented previously, suggests that attempts at tax evasion by moving across the city were not significant enough to have undermined the legitimacy of the *taille*.

(Table 8 about here)

Indirect evidence

The most convincing evidence that the use of taxes based on repartition was regarded as a success may be the fact that it was used often. As mentioned in Section III, variations of the Parisian *tailles* system were used throughout France in the years leading up to the period we study, and continued to be used into the 16th century. Beyond that, in England the Lay Subsidies imposed by the crown were converted from the standard tax rates system

to a *taille*-like mechanism in 1334[37] - this importation from France seems a particularly sincere form of flattery of the *tailles*.

VI. Conclusions

In this paper we documented and analyzed the *taille* - a mechanism for collecting taxes in medieval Paris. Our analysis demonstrated that this tax system was remarkably successful, and that its success derived from the fact that it was based on two indispensable principles: i) partition of a fixed tax liability among taxpayers and ii) a process that revealed each taxpayer's claimed tax liability to their neighbors. In the environment of medieval Paris, with each citizen living and working in close proximity to their neighbors, this resulted in a tax collection game in which taxpayers have an incentive to challenge false claims by others, which in turn induces truthful reporting, resulting in an efficient tax assessment and collection procedure. We provide evidence from the Parisian *tailles* levied between 1292 and 1313 and other historical records that indicates that these royal taxes were collected from the city of Paris at a remarkably low cost, without violence and with limited recourse to legal action against tax evaders.

We conclude by coming back to the question of whether the success of the medieval *tailles* suggests it has any contemporary manifestations: we know of one. The Obama administration's health care reform bill (H.R. 3590) employs one revenue raising mechanism that is a rather exact analog of the Parisian *tailles*. That bill imposes a fixed annual tax on US pharmaceutical companies that is calculated in much the same way as was the *tailles*.[38] These companies are collectively liable for a fixed tax of $2.3 Billion per year, with each year's total payment divided among the firms on the basis of their sales for the year. Similar taxes are imposed on medical device manufacturers ($2 Billion in total) and health insurance providers ($6.7 Billion), and the portion each company pays is calculated similarly. This is a situation in which the information structure we showed to be

[37] Glascock (1975).

[38] The Patient Protection and Affordable Care Act (H.R 3590); Title IX- Revenue Provisions of the bill SEC. 9008. IMPOSITION OF ANNUAL FEE ON BRANDED PRESCRIPTION PHARMACEUTICAL MANUFACTURERS AND IMPORTERS.
http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h3590enr.txt.pdf

important for the *tailles* is clearly present: each of these firms has an incentive to understate its sales in order to reduce its share of the total tax liability, and each firm has a clear incentive to challenge any under-reporting of those figures by its rivals. General under-reporting by all firms in the group has no impact on tax liability due to the fixed sum being collected, and it seems very likely that these firms know enough about their rivals that any serious under-report by any subset of firms would be detected and challenged by the others.

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Appendices

A.1 – Tables

Table 1

Number of taxpayers and tax collected in Parisian tax rolls

Year	Number of taxpayers	Tax to be collected (*livres tournois*)	Tax collected (*livres tournois*)
1292	14,566	10,000	12,287
1296	5,703	10,000	10,024
1297	9,930	10,000	10,372
1300	10,656	10,000	11,479
1313	6,352	10,000	10,394

Source: A.N. KK 283, Michaelsson (1951, 1958, 1952)

Table 2
Professions of Assessors compared with professions of taxpayers

	Data from tax roll		Data from Assessor list	
profession	**Taxpayers' Average tax**	**Taxpayers**	**Assessor's Average tax**	**Assessors**
changer	6.11	37	8	6
draper	5.49	94	11	6
spice merchant	3.31	79	4	2
firewood merchant	3.22	53		
tanner	3.00	31	1	1
wholeseller	2.29	159	6	4
saddler	1.99	67	4	1
hotelier	1.80	111	1	1
butcher	1.46	79	4	5
tavernier	1.30	678	2	1
goldsmith	1.27	271	7	3
Merchant	1.12	24	6	7
Grain merchant	1.06	18	3	1
boot maker	1.00	53		
baker	1.00	144	4	4
fishmonger	0.92	102	7	2
seaman	0.85	49		
harness maker	0.82	51		
Sargent	0.62	237		
used clothes merchant	0.60	191	1	4
weaver	0.60	368	2	5
candle maker	0.60	71		
skinner	0.59	368	9	2
agent	0.56	65		
crate maker	0.56	56	1	1
belt maker	0.53	161	2	2
tailor	0.51	157		
barber	0.44	121		
barrel maker	0.44	96		
pastry maker	0.44	58		
buckle maker	0.44	77	2	2
shoe maker	0.43	284	1	3
carpenter	0.38	116		
builder	0.36	138		
fuller	0.34	85		
oven guard	0.34	83		
wine merchant	0.27	81		
food merchant	0.27	267		
porter	0.26	119		
longshoremen	0.24	59		
footwear	0.18	179		
tailor women's clothes	0.17	149		

Source: Authors calculations based A.N. KK 283, Michaelsson (1951, 1958, 1952) and Le Roux and Victor (1846)

Table 3
Time frame of known economic activity of tax assessors

Years of Activity	Number of Assessors
1292 - 13	8
1296 - 13	7
1292-9	1
1292-00	31
1292	1
1296-00	1
1292 - 7	7
1297-00	1
1298-00	1
1300	2
1308-13	1
1313	3
unknown	2
Total	66

Source: Authors calculations based A.N. KK 283, Michaelsson (1951, 1958, 1952) and Le Roux and Victor (1846)

Table 4
Rank of assessors in the tax distribution

Rank in tax distribution	Number of Assessors
0.5%	3
1.0 – 0.5%	6
5 – 1%	27
10 – 5%	8
20 - 10%	15
30 - 20%	1

Source: Authors calculations based A.N. KK 283, Michaelsson (1951, 1958, 1952) and Le Roux and Victor (1846)

Table 5

Distribution of taxpayers and tax payments and assessors by Parish – Paris 1292

Parish number	Tax collected (pounds)	Number of taxpayers	Number of elite taxpayers	Share of elite taxpayers	Share of elite in tax collected	Number of assessors *
1	2420	2474	377	0.15	0.70	13
10	1497	1445	236	0.16	0.73	20
2	1167	1335	182	0.14	0.64	9
14	998	1222	141	0.12	0.63	4
12	878	836	87	0.1	0.75	1
9	755	1455	94	0.06	0.53	7
11	669	964	100	0.10	0.62	7
8	381	848	34	0.04	0.39	2
13	363	924	45	0.05	0.40	2
15	330	674	45	0.07	0.46	2
24	214	384	27	0.07	0.37	
4	194	440	26	0.06	0.54	
21	171	408	20	0.05	0.33	
18	159	225	25	0.11	0.63	
6	79	214	8	0.04	0.27	
3	70	231	5	0.02	0.16	1
5	54	85	8	0.09	0.48	2
16	48	149	5	0.03	0.32	1
23	45	234	5	0.02	0.20	
7	43	73	6	0.08	0.41	
17	23	62	4	0.06	0.36	
20	22	79	2	0.03	0.22	
22	17	62	1	0.02	0.12	
19	8	21	0	0	0	
Total	**10606**	**14844**	**1483**	**0.1**	**0.62**	

*The number of assessors for all the years we have data for.

Source: Authors calculations based A.N. KK 283, Michaelsson (1951, 1958, 1952) and Le Roux and Victor (1846)

Table 6
Analysis of rich taxpayers who moved between parishes 1292-1297

A. Number of taxpayers

Tax after move \ **move to**	Wealthier parish	Poorer parish	**Total row**
paid higher tax	30	42	**72**
paid same tax	7	6	**13**
paid lower tax	31	44	**75**
Total column	**68**	**92**	**160**

B. Percentage of taxpayers

Tax after move \ **move to**	Wealthier parish	Poorer parish	**Total row**
paid higher tax	19%	26%	**45%**
paid same tax	4%	4%	**8%**
paid lower tax	19%	23%	**47%**
Total column	**43%**	**58%**	**100%**

C. Tax before move

Tax after move \ **move to**	Wealthier parish	Poorer parish	**Average row**
paid higher tax	160.0	120.3	**136.9**
paid same tax	113.4	155.7	**132.9**
paid lower tax	106.7	120.0	**111.4**
Average column	**130.9**	**120.0**	

Source: Authors calculations based A.N. KK 283, Michaelsson (1951, 1958, 1952) and Le Roux and Victor (1846)
Rich refers to a tax payer in the top decile of the taxpayers' distribution

Table 7

The probability of moving to a different parish: panel probit estimations

	(1) Move to wealthier parish	(2) Move to poorer parish	(3) Move to any parish
Female	-0.338**	-0.166	-0.280**
	(-3.17)	(-1.90)	(-3.15)
Tax paid	0.000708	-0.00000932	0.000483
	(1.89)	(-0.02)	(1.22)
rich	0.226*	-0.00738	0.0898
	(2.43)	(-0.09)	(1.09)
Constant	-2.223***	-1.715***	-1.746***
	(-14.64)	(-15.34)	(-21.21)
Observations	22022	22022	22022
chi2	191.0	239.1	505.3
chi2_c	26.66	15.80	313.6

Controlling for year dummies and parish dummies.
z statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The regression ran: $\boldsymbol{prob(move, wealthier, poorer)_t = \alpha_0+\beta_1*female+\beta_2*tax\ paid_t+ \beta_3*rich_t+\varepsilon_t}$

Table 8
Moving to a different parish and tax payment

Dependent variable	**Tax paid**
Lagged tax paid	0.409***
	(17.85)
Lagged tax* rich	0.410***
	(18.21)
move to wealthier parish	-0.651
	(-0.37)
move to poorer parish	-0.938
	(-0.55)
Move to wealthier parish * rich	19.60***
	(4.45)
Move to poorer parish * rich	12.96**
	(3.23)
Observations	13150
R2	.742

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Controlling for year dummies and parish dummies using random effects

The regression:

$$Tax_t=\alpha_0+\beta_1*tax_{t-1}+\beta_2*tax_{t-1}*rich+\beta_3*move\_wealthier\_parish_{t-1}+b_4*move\_poorer\_parish_{t-1}+\beta_5*move\_wealthier\_parish*rich_{t-1}+\beta_6*move\_poorer\_parish*rich_{t-1}+\varepsilon_t$$