Online Appendix 1:

Proof of Proposition 2

Proposition 2 states: *The crown has less incentive to invest in standardization under competitive tax farming relative to both cabal tax farming and direct collection.*

We define an increase in standardization in Section 2 as an arbitrary decrease in both the mean (μ) and standard deviation (σ) of the distribution of costs of collection of tax collectors faced by the crown.

To prove Proposition 2, we will show that the payoffs to the crown of increasing standardization (decreasing either μ or σ) are greater under either direct collection or cabal collection, than under competitive allocation. We begin by investigating the effect on equilibrium payoffs to the crown of a decrease in σ.

Recall that the crown's payoff from competitively auctioning the tax farm is $V(\underline{\theta})$. The crown's payoff from directly administering the tax farm is $V(\bar{\theta})$. And the payoff to the crown from leasing the farm out to the cabal is $\frac{1}{2}(V(\hat{\theta}) + V(\bar{\theta}))$. Since θ is uniformly distributed, we can write the expected value of $\hat{\theta}$ as $\frac{1}{2}(\underline{\theta} + \bar{\theta}) = \mu$. Similarly, $\bar{\theta} = \mu + \sqrt{3} \cdot \sigma$ and $\underline{\theta} = \mu - \sqrt{3} \cdot \sigma$. Substituting these last two expressions for $\underline{\theta}$ and $\bar{\theta}$ into the payoff functions for the crown yields:

$$\begin{aligned}
\text{Crown's payoff under competitive tax farming} &= \Pi_{comp} = V(\mu - \sqrt{3} \cdot \sigma)\,; \\
\text{Crown's payoffs under cabal tax farming} &= \Pi_{cabal} = \frac{1}{2}(V(\mu) + V(\mu + \sqrt{3} \cdot \sigma))\,; \\
\text{Crown's payoffs under direct collection} &= \Pi_{direct} = V(\mu + \sqrt{3} \cdot \sigma)\,.
\end{aligned}$$

Since $V'(\cdot) < 0$, it is clear that the crown's payoff under competitive tax farming falls as σ falls (holding μ constant), while the payoffs to the crown under cabal financing and direct collection increase as σ is reduced.[37] Specifically, $\frac{\partial \Pi_{comp}}{\partial \sigma} > \frac{\partial \Pi_{cabal}}{\partial \sigma} > \frac{\partial \Pi_{direct}}{\partial \sigma}$.

[37] The reason for this is that standardization reduces the value of local knowledge while at the same time imposing one-size-fits all rules across all regions. For example, Francis I requiring government documents to be written in French (langue d'oeïl) rather than in the local patois (i.e., langue d'oc) in 1539. Since everyone in southern France speaks langue d'oc and few speak langue d'oeïl, the costs of administering the tax system there could very reasonably increase for those who have invested in the knowledge of langue d'oeïl and those who transact in it.

The effect of decreasing μ on the crown's payoffs is less transparent. The marginal effects of a decrease in μ on each payoff are given by:

$$\frac{\partial \Pi_{comp}}{\partial \mu} = \frac{\partial V(\underline{\theta})}{\partial \underline{\theta}} \cdot \frac{\partial \underline{\theta}}{\partial \mu}; \tag{5}$$

$$\frac{\partial \Pi_{cabal}}{\partial \mu} = \frac{1}{2} \cdot \frac{\partial V(\hat{\theta})}{\partial \hat{\theta}} \cdot \frac{\partial \hat{\theta}}{\partial \mu} + \frac{1}{2} \cdot \frac{\partial V(\bar{\theta})}{\partial \bar{\theta}} \cdot \frac{\partial \bar{\theta}}{\partial \mu}; \tag{6}$$

$$\frac{\partial \Pi_{direct}}{\partial \mu} = \frac{\partial V(\bar{\theta})}{\partial \bar{\theta}} \cdot \frac{\partial \bar{\theta}}{\partial \mu}; \tag{7}$$

Since $V''(\cdot) < 0$ and $V(\bar{\theta}) < V(\hat{\theta}) < V(\underline{\theta})$ it follows that $\frac{\partial V(\bar{\theta})}{\partial \bar{\theta}} > \frac{\partial V(\hat{\theta})}{\partial \hat{\theta}} > \frac{\partial V(\underline{\theta})}{\partial \underline{\theta}}$. Also, since $\bar{\theta}$, $\hat{\theta}$, and $\underline{\theta}$ are uniform, then $\frac{\partial \bar{\theta}}{\partial \mu} = \frac{\partial \hat{\theta}}{\partial \mu} = \frac{\partial \underline{\theta}}{\partial \mu} = 1$. Equations (5), (6), and (7) can thus be rewritten as,

$$\frac{\partial \Pi_{comp}}{\partial \mu} = \frac{\partial V(\underline{\theta})}{\partial \underline{\theta}} > \frac{\partial \Pi_{cabal}}{\partial \mu} = \frac{1}{2}\left[\frac{\partial V(\hat{\theta})}{\partial \hat{\theta}} + \frac{\partial V(\bar{\theta})}{\partial \bar{\theta}}\right] > \frac{\partial \Pi_{direct}}{\partial \mu} = \frac{\partial V(\bar{\theta})}{\partial \bar{\theta}} \tag{8}$$

Thus, the benefits to the crown of decreases in σ and μ are both greatest under direct management, second greatest under cabal management, and lowest under competitive allocation.

Propositions 3 and 4

Proposition 3 states: *The amount of lending supported under monopsony, or, cabal tax farming is greater than under competitive tax farming.*

Under competitive tax farming, the payoff to the king for not reneging on a tax farmer is:

$$\mathcal{V}^{\mathcal{ND}}{}_{comp} = 2\frac{B^*_{ND}}{1-\delta}$$

As defined in the text, B^*_{ND} is equal to the payment in each period of the two period tax farm contract under no default. If the king reneges he obtains a one-off payment of x and loses the difference between the valuation of the best and the second best tax farmer in the second half of the lease and and in all future periods:

$$\mathcal{V}^{\mathcal{D}}{}_{comp} = x + 2B^*_{ND} - \Delta B + \frac{\delta}{1-\delta}2(B^*_{ND} - \Delta B)\ ,$$

where ΔB is defined in the text to equal the difference in receipts between the lowest cost and the second lowest cost tax farmer. Therefore for $\mathcal{V}^{\mathcal{ND}}{}_{comp} \geq \mathcal{V}^{\mathcal{D}}{}_{comp}$ we require:

$$\delta^* \geq \frac{x - \Delta B}{x + \Delta B} \,. \tag{9}$$

As n goes to infinitely we have already noted that ΔB goes to zero. This means that it is impossible for the king to credibly commit to repay any loan from the tax farmers under perfect competition.

In contrast, lending can be sustained under cabal tax farming. To derive equation 4, note that $\mathcal{V}^{\mathcal{ND}}{}_{cabal} \geq \mathcal{V}^{\mathcal{D}}{}_{cabal}$ requires:

$$\frac{[V(\hat{\theta}) + V(\bar{\theta})]}{2(1-\delta)} \geq x + \frac{1}{4}[V(\hat{\theta}) + V(\bar{\theta})] + \frac{1}{2}V(\bar{\theta}) + \frac{\delta}{1-\delta}V(\bar{\theta}) \,.$$

Multiplying both sides by $(1 - \delta)$ and rearranging yields:

$$\frac{1}{4}(V(\hat{\theta}) + V(\bar{\theta})) \geq x - \delta x - \frac{1}{4}\delta(V(\hat{\theta}) + V(\bar{\theta})) + \frac{1}{2}V(\bar{\theta}) - \frac{\delta}{2}V(\bar{\theta}) + \delta V(\bar{\theta}) \,.$$

which can be rearranged to obtain equation 4:

$$\delta^* \geq \frac{x - \Delta V}{x + \Delta V} \,.$$

where $\Delta V = \frac{V(\hat{\theta}) - V(\bar{\theta})}{4}$.

Proposition 4 states: *Cabal tax farming is more sustainable in an economy where standardization is low ($\sigma(\gamma, \rho)$ is high). Cabal tax farming is less likely to be sustainable in economies which have less underlying fiscal heterogeneity (low γ) or have invested in standardization (high ρ).*

This requires us to simply substitute the values for θ from the uniform distribution into equation 5:

$$\delta^* = \frac{x - \frac{1}{4}[V(\mu) - V(\mu + \sqrt{3} \cdot \sigma)]}{x + \frac{1}{4}[V(\mu + \sqrt{3} \cdot \sigma) - V(\mu)]} \,. \tag{10}$$

It follows from a simple application of the quotient rule that $d\delta^*/d\sigma < 0$ which is what is required for Proposition 4.