High Corruption Income as a Source of Distortion and Stagnation: Some Evidence from Ming and Qing China

Shawn Ni
University of Missouri
nix@missouri.edu

Pham Hoang Van *
University of Missouri
pham@missouri.edu

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JEL Numbers: O10, O53.

Keywords: Calibration, Growth, Corruption, China.

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1 Introduction

Historians consider China under the Tang (618-907) and Sung (960-1279) dynasties as the world technological leader. During this golden age, innovations like gunpowder, iron casting, textile spinning, time measurement, waterpower, paper, and advanced cultivation techniques were found in China well before their introductions in Europe (Mokyr, 1990). It is thus puzzling why the application of these technologies seemed to have declined or stopped altogether after 1400. Chinese decline became painfully apparent after the late 1700s as Europe embarked on the Industrial Revolution and the economies of Europe and China diverged for the next two centuries.

While the divergence between Europe and China was most readily seen after the start of the Industrial Revolution,[1] the seeds of Chinese stagnation may have been sown many years before at the start of the Ming dynasty in the 14th century. This paper argues that rising government officials' incomes from corruption beginning under the Ming (1368-1644) and increasing through the Qing dynasty (1644-1911) were perhaps one important reason for China's stagnation during this period. Our model estimates corrupt income to be almost 30 times official income by 1600 and 20 times circa 1873 resulting in 19% of agricultural output accruing to less than one-half of one percent of the population. These exorbitant incomes from rent-seeking may explain why an attempt at reform in 1727, when officials' salaries were increased three-fold, failed to have any impact on the corrupt bureaucracy.

Mokyr (1990) pointed out that under the Ming, cutbacks in government spending under-funded the production of industrial goods that under the Sung had been sponsored by the government. We argue that the same fiscal tightening during the Ming lowered government officials' salaries to a point that allowed corruption to

[1] Pomeranz (2000), for instance, argues that around 1750, Europe and certain regions in China had similar industries and economic performance.

take root. Corruption then became more entrenched and potential rents expanded with the country's increase in land and labor endowments. The result was significant growth of the official's rent-seeking income even when per-capita output stagnated. By the time the Qing government attempted to curb corruption by raising salaries, rent-seeking income was so high and corruption so entrenched that the three-fold increase in salary could not–and as we will show, no fiscally feasible increase could–restore honest behavior.[2]

While there are stories that can be told as to why corruption might be growth-enhancing (see, for instance, Huntington, 1968), evidence suggests that corruption causes lower investment and growth (see Mauro, 1995). The high incomes for corrupt officials in Ming and Qing China may have impeded economic progress for the following reasons.

1. High incomes from rent-seeking drew talent away from productive activities not able to match such high returns (see Murphy, Schleifer, Vishny, 1991). The civil service examination used to select government officials contributed to the waste in human resources. We return to this point later.

2. High incomes for officials concentrated wealth to the small gentry class. We estimate that around the year 1873, 0.4% of the population received 18.7% of agricultural output and over 25% of GDP. The extreme inequality in income prevented the formation of demand for mass consumption of industrial goods (see Murphy, Schleifer, Vishny, 1989).

3. Rent-seeking subjected the population to an extremely high effective tax burden (46% of output by our estimates) and thus, for the vast majority of the people, there was little surplus left for investment and little incentive to innovate.

[2]Relatedly, Acemoglu and Verdier (1998) noted that some corruption is optimal because higher salaries to eliminate corruption require higher taxes and would thus increase distortions. In this paper we dont comment on the optimality of corruption but merely make the observation that corruption under the Qing was to the point where the salary increase required to eliminate corruption was fiscally impossible.

4. The high corrupt incomes strengthened power monopolies and created obstacles to positive change. Parente and Prescott (2001) argued that a barrier to economic growth is government using its power to protect monopoly rights of certain interest groups. Similarly, Acemoglu and Robinson (2002) argued that entrenched interests, in addition to not making investments in technological change, may in fact try to block change from occurring since it may jeopardize their current monopoly position.

This paper presents a model of corruption in the Chinese countryside that allows us to quantify the high and expanding levels of rent-seeking under the Ming and Qing. We make two key assumptions that are motivated by the historical context, and allow us to obtain tractable results.

First, we start from the idea found in previous models of corruption (for example, Schleifer and Vishny, 1993) where the official is seen as a monopolist selling a government service. But in context of Ming and Qing China, the official had wide-ranging authority, at times serving simultaneously as tax-collector, judge, and employer so that in effect the corrupt official was selling a wide range of services. Consider also that within villages, transactions are not anonymous. Thus, a corrupt official could price discriminate almost perfectly for each of the services he provided and could extract maximum rents from the local farmers. For modeling purposes, we can approximate the situation as the corrupt official levying an "extortion tax" on income.

Second, Park (1997) reports that the penal code dictated very harsh penalties for corruption but did not increase much with the extent of the corrupt act. Therefore, if the official found it in his interest to be corrupt at all, he would want to extort as much as possible. And although penalties were harsh on paper, the evidence suggests punishment came down only on a small fraction of the number of corrupt so that the expected value of punishment was not that high. Thus, many officials

would choose to be corrupt and his corrupt income would be determined by the optimal extortion tax rate. The rate turns out to be land share's of output. So by the power of their positions, government officials were the de facto landlords in rural China, receiving land's share of output and accruing almost the entire agricultural surplus. We exploit this result to calibrate the model and to impute the corrupt official's income at various periods.

We should note from the outset that we abstract away from many issues discussed in the vast the literature on corruption (see Bardhan, 1997, for a survey). The reason for doing so is not to deny the importance of such issues but rather, our approach is motivated by the evidence on salaries and corruption in this particular period of history.[3] The fact that our simple model yields results that closely match facts and events in the historical record says that it is a good first approximation useful as a tool to talk about corruption in this period.

The next section presents historical evidence on low salaries and corruption in Ming and Qing China. This serves as the motivation for the model of corruption presented in section 3. In section 4, we calibrate the model to parameters for the economy under the Qing. We use the results of the calibration to impute the level of rent-seeking during various points of Ming and Qing rule. In section 5 we impute the salaries that would have to be paid to induce officials to be honest and argue that when punishment probabilities are state-dependent this salary level was fiscally untenable under the Qing. Section 6 concludes.

[3]For example, we dont consider the issues of monitoring and detection because the evidence suggests that during Ming and Qing times (and even in many countries today), corrupt officials are often easily identifiable but punishment came down only on a few and usually for reasons not associated with the actual corrupt act.

2 Historical Evidence Of Low Salary and High Corruption

Low government salaries may have allowed corruption to take root during the Ming and to expand during the Ming and Qing.

> "... [C]orruption under the Ming was another result of inadequate budgeting. The operating expenses of many offices were clearly below the necessary minimum... Throughout the fifteenth century there were numerous cases in the capital of officials heavily involved in corruption. ... In 1470 Minister of Personnel Yao Ku'ei reported that his office was haunted by professional moneylenders ... offer[ing] selective loans to officials in the capital ... The situation apparently worsened in the sixteenth century. The recorded impeachment cases reveal a general lowering of moral standards: offenses considered serious in the previous century were now no longer recognized as such." (Huang, 1974, p. 48)

Throughout Chinese history, government officials were generally poorly paid. But the problem of corruption became significantly worse after the Ming possibly for two reasons. First, under the Sung, predecessor to the Ming, China was constantly threatened by foreign invaders and the presence of political competition kept corruption in check. By contrast, the Ming and the Qing, up until their fall, were able to establish very effective control over the country by a powerful government. The absence of checks of power from political competitors made wholesale corruption possible.

Second, the Ming system represented a significant break in Chinese fiscal history: tax revenues plummeted and government official salaries were greatly reduced. The main source (about 75%) of government revenue was the land tax.

Throughout the three centuries of Ming rule, grain collected as land tax showed little change. The collection in 1633 was about 28 million piculs, even slightly lower than the collection of 29 million piculs in 1393. The tax rate was relatively low, estimated to be about 5% on average during the Ming and was collected under a rigid system that made taxation virtually independent of cultivated land and failed to increase with output. Revenue under the Ming was considerably lower than that during the Sung dynasty when by the mid-eleventh century the annual state budget had already reached a level between 126 million to 150 million copper cash units (one copper cash unit was comparable to one picul of grain). The rigid tax system was preserved through the Qing dynasty. Huang (1974, p. 322) noted that after adjusting for price inflation, revenue actually declined in the Qing dynasty's final years.

Consistent with low tax revenues, nominal pay for government officials was also low. Fixed in 1392, the salary schedule effective throughout the Ming was not generous at its inception and got increasingly meager as the real value of the payments deteriorated over the next two centuries. By the fifteenth century, about half of salaries were paid in grain, and half in commodities such as silk fabrics, cotton cloth, pepper and sapanwood. By 1434, however, it was estimated that the value of the commodity payments was only 4% of the scheduled amount. In 1432, some officials were paid with confiscated garments and salvaged materials, and in 1472, peas were used as payment. In the following year in Nanking, it was found that the peas "were suitable only for feeding horses" (Huang, 1974, p. 48). From this account, it is apparent that salaries steadily fell over the course of the Ming and by the mid-1400s, half of the salaries was effectively unpaid!

The salaries of the early Qing officials were not much improved compared to the Ming. By contrast, the top Sung officials were paid (excluding numerous regular allowances in kind) much higher salaries than were paid to Ming and Qing

officials. For instance, (Deng, 1999, p. 303) reported that the "First Rank" Sung official was paid about 10 times his Qing counterpart. Although this number may be too high to be taken literally, it is clear that Sung officials were paid much higher than Qing officials. Since the Sung economy was smaller than the Ming and Qing economies, potential corruption income was also less. Lower rents and higher salaries made conditions less favorable for corruption during the Sung.

By the time of the Qing, fee-taking and corruption made salary a negligible portion of income for an official because there were ample opportunities to collect rents. The local government officials served not only as administrators of public affairs but also as tax collectors and judges of local courts. Increases in population (from 60 to 400 million) and expansion of cultivated land (from 370 to 1210 million shih mou) during the Ming and Qing increased the potential gain from corruption, especially among the top rank of the government. Total output increased while tax collection and officials' salaries were not correspondingly increased, leaving even stronger incentive for officials to be corrupted. Recognizing the problem, official salaries were raised significantly during the Qing in the hope of curbing corruption. In the early Yung-cheng period (1727), allowances called yang-lien (honesty nourishment) were instituted to supplement regular salaries. Key provincial and local officials, as well as military officers, also received an additional allowance known as kung-fei (administrative expenses). Chang (1962, p. 38) reported from Qing records that the total legal annual income to all officials amounted to about 6.3 million taels of silver including 1.4 million in salaries, 4.3 million yang-lien, and 0.6 million kung-fei. The extra allowance intended to curb corruption was over three times regular salary.

It is not surprising that the salary reform had little impact on curbing corruption because even though the salary increases were generous, compensation was still negligible compared to incomes from corruption. Chang (1962, p.42) estimated

that the aggregate extra-legal income was about 115 million taels of silver, shared among 23,000 Chinese officials, with more than half of the income shared among 1,700 top officials. In other words, corrupt income was 18.5 times legal income! This extraordinary amount came from office-holding alone and did not include the officials' income through land-holding and other activities in commerce, where they also enjoyed advantages over common citizens.

The extra income from office-holding came at the expense of the small land-owning farmers. For example, it was customary for a county magistrate to collect an extra amount in proportion to the land tax quota set by the central government. Besides the magistrates, provincial officials such as governors-general, governors, commissioners, intendants, and prefects could also impose special fees. Other officials who did not handle the flow of tax money received less extra income, mainly through cash presents and gifts.

A good indicator of how much income could be derived from office holding is provided by the price tag of office that could be purchased. The price of a circuit intendant, the highest office in the province purchasable, was worth 30,000 taels of silver, whereas the annual salary of a circuit intendant was 105 taels with two or three thousand taels of additional allowance. It would take the purchaser at least ten years to gain back the capital were he to earn it honestly. Unprofitable as it might appear, the list of the "waiting officials" who qualified to purchase increased to such an extent that Emperor Tao-Kuang found it necessary to make up another price list for those who wanted to purchase the privilege of getting an appointment before the regular turn came (Marsh 1961, p64). Chang (1962, p. 40) estimated that a circuit intendant could take 75,000 taels of extra income per annum, which made the price paid a very worthwhile investment. Lippit (1978) noted that the powerful Governor-General Li Hong-Zhang, with his hundreds of thousands of acres of land, numerous silk shops and pawn stores amassed through his position

in government, was considered by late nineteenth-century contemporaries as the richest man in the world. For another extreme case, He Shen (1750-99), the Grand Secretary of the Qing Court, managed to accumulate a fortune of 80 million taels of silver through corruption over his career, 400,000 times his annual salary!

Given the widespread acts of gift-taking, acceptance of bribes, and extortion by government officials, it is fair to assume that most corrupt officials went unpunished. For those unlucky few, however, punishment, which was often affected by extralegal factors, could be harsh and swift. Park (1997) cited the examples of Guizhou governor Liangqing who was impeached in 1770 for accepting presents from a subordinate and Zhejiang governor Fusong in 1793 who was impeached for soliciting fees to build an excursion boat for his mother to travel to scenic locations. Though only a few thousand taels were involved in each case, both men were executed. Their conduct, unremarkable relative to that of other corrupted officials, brought them harsh punishment mainly because they were under investigation for administrative failures, and their character was viewed with suspicion by Emperor Qianlong. The law against corruption was enforced in an arbitrary fashion because if it had been enforced according to the letter nearly all officials would deserve capital punishment.

According to the punishment scale under Qing law, the penalties for very minor offenses were quite stiff. For example, those who took up to 15 taels of silver in exchange for unlawful favors were subject to 70 to 100 blows with "heavy bamboo" and those caught taking over 80 taels would receive "death by strangulation" (Park, 1997, Table 1). The penalty of 70 to 100 blows of "heavy bamboo" for minor corruption would kill most adults. The incremental penalties beyond that would not be so meaningful for most small bribe-takers. Therefore, it is reasonable to say that should a corrupt official be prosecuted, the penalty is fairly flat over a wide range of bribes. Thus, if an official found it profitable to be corrupt at all, then he

would extort as much as the people were able to pay.[4]

In practice, penalties were usually handed out arbitrarily, and the probability that a corrupt official would be punished was quite small. During the 60-year reign of Qianlong, there were only 400 reported cases of impeachment, and most of these cases were never prosecuted (Ma, 1974). To assess the probability of being penalized for corruption, consider that there were more than 20,000 ranked officials in a given year, and assume that on average each official was in office for three years, then there were over 400,000 officials during the Qianlong era. If all these officials were corrupt to some degree, the probability of an official being impeached was then about 0.001; the probability of further punishment was much smaller still.

3 A Model Of Corruption In Ming And Qing China

Below, we present a model motivated by aspects of salaries and corruption in Ming and Qing China highlighted in the previous section. This simple model will allow us to do calibration exercises that quantify the relationship between salaries and corruption income and we are able to closely match the historical record. It will also help explain some of the events in the Ming and Qing period.

The key elements of the model are the following. There is a given number of government officials each having jurisdiction over an equal number of citizens. In other theoretical models of corruption, the corrupt official is often modeled as a simple monopolist selling a government good (see for example, Schleifer and Vishny, 1993). In our context, the local official had wide-ranging authority in his

[4]One could argue that for an official prosecuted for grand-scale corruption, his own execution was but a small part of the punishment. The usual package of punishments also included execution of immediate family members and close relatives and the disgrace of family name. We could model this as infinite penalty being imposed when the extent of the corruption reached very high levels. Most officials would not have been able to extract rents on such a scale. Thus the penalty is effectively a flat function of corruption.

jurisdiction so the official could be thought of as a monopolist providing a whole range of services. Because of the local nature of the transactions, he would also have the ability to price discriminate almost perfectly for each of these services. The effect then would approach that of an official having the ability to levy a tax on income. Therefore, we assume that a corrupt official imposes an "extortion tax" at a rate b on the farmer's after-[legal]-tax output.[5]

In pre-modern China, landownership was highly skewed. A large fraction of the population was landless and had to work on someone else's land for a wage or as sharecroppers. This wage (or income as share tenant) was relatively constant over many centuries at around subsistence. Thus, this group did not really contribute to the corrupt officials' income or to the government tax base. The corrupt official's extra income came mainly from the portion of population that owned enough land to have surplus. For our purposes, we need only model this group's behavior. Represent the number of farmers falling into this sub-population as βN and the amount of land that they owned as γT where N and T are the aggregate population and cultivated land area respectively, β is the fraction of population in this group and γ is the fraction of land that they owned.

These βN "small" farmers each supply effort, $l \in [0, 1]$, on his own plot. The opportunity cost of his effort is the market wage, w, which he takes as given. As we noted above, this wage can be assumed to be constant at subsistence. Production takes the form $Y = g(l) = (\gamma T)^{1-\alpha}(\beta N l)^{\alpha}$, where α is labor's share of output. The production function $g(\cdot)$ exhibits constant returns to scale in land and labor input. A fraction, t, of output is turned over to the emperor in the form of a land tax, and another fraction, b, of after-tax output is given to the corrupt official. We assume that both farmers and officials are risk-neutral and that all farmers and officials are

[5]Though this is a static model, it captures the theme of the dynamic issue discussed by Olson (2000) of the trade-off between taking a big piece of slow-growing output and a smaller piece of faster-growing output.

identical, thus the representative small farmer's problem can be written as follows,

$$\max_{l}(1-b)(1-t)(\gamma T)^{1-\alpha}(\beta N l)^{\alpha} - w\beta N l.$$

Work effort, l, will satisfy the marginal condition

$$\beta N l = \gamma T \left(\frac{\alpha(1-b)(1-t)}{w}\right)^{\frac{1}{1-\alpha}}. \tag{1}$$

Effort, l, falls as b or t increases.

A fraction s of tax revenue is used to pay officials' salaries, $S = stg(l)$. The remaining fraction $1-s$ of revenues goes to the government treasury which is spent on such things as the military, infrastructure, and the royal court's consumption. For the sake of simplicity, we assume that this part of tax receipts is simply disposed of.

In addition to his salary, S, the corrupt official collects rents where there is a chance, q, that he will be discovered and punished.[6] If caught and punished, the penalty imposed on him, $D(B)$, would depend on the total amount he has extorted, $B = b(1-t)g(l)$.[7] The penalty function, $D(B)$, has the following properties. D is zero for $B = 0$, but jumps discontinuously as B increases from zero. Thus if he is caught collecting even a small bribe, his penalty would be D_0. For $B > 0$, D is convex in B (see figure 1). The discontinuity of the penalty schedule $D(B)$ at $B = 0$ and the flatness of the $D(B)$ schedule up to some level are motivated by the historical evidence on punishment noted in the previous section.

[6] It has generally been documented that these corrupt officials often live lavishly, beyond what a government salary could afford. Therefore, it is best to think of q not as the probability of the officials corrupt actions being detected but as the probability that he will actually be punished.

[7] Alternatively, we can think of $D(B)$ as the bribe that the corrupt official would have to pay to another corrupt official if he is caught (see Basu, et. al., 1992).

The official's expected utility, V, can be written as

$$V(B(b)) = \begin{cases} S, & b = 0 \\ (1-q)\,(B(b)+S) - qD(B(b)), & b > 0, \end{cases} \tag{2}$$

where $B(b) \equiv B(l(b))$ and $l(b)$ is the small farmer's effort function given in equation (1). The official's problem is $\max_{b \geq 0} V(b)$. An interior solution, b^* satisfies the first-order condition

$$B'(b)\left((1-q) - qD'(B(b))\right) = 0,$$

which results when either

$$b'(B^*) = 0, \text{ or} \tag{3}$$

$$(1-q) - qD'(B(b^*)) = 0. \tag{4}$$

To understand the intuition of this solution, b^*, we can think of the official's problem the following way. First, the official chooses a B^* that would maximize expected utility. Then, he would select a b^* to achieve this optimal B^*. This is illustrated in figure 2. In the top panel, the optimal B^* is shown as that which solves equation (4), and the bottom panel shows the optimal choice of b^* solving $B^* = B(b^*)$. Consider the lower of the two values of b^* that solves $B^* = B(b^*)$.

As drawn in figure 2, the optimal choice of B^* exceeds $B_{max} = \max B(b)$, or in other words, the B^* that solves (4) is not achievable by any choice of b^*. The official would have to settle for $B_* = B_{max}$ which solves equation (3). The flatness of the $D(B)$ schedule that the historical record suggests makes the B^* solving (4) unreachable. The intuition of the flat $D(B)$ schedule is now apparent. Since the penalty is in effect almost equally harsh for any degree of corruption, if an official is corrupt, he will try to extract as much as he can from the worker without regard

for the additional penalty that it would bring.[8]

Substituting the worker's effort function (1) into (3) and simplifying gives

$$(1-b)^{\frac{\alpha}{1-\alpha}}\left[1-\frac{b}{1-b}\frac{\alpha}{1-\alpha}\right]=0, \text{ or}$$

$$b=1-\alpha.$$

This result is illuminating but not surprising. Government officials get land's share of output. By holding wide-ranging authority over people in their respective locales, government officials are in effect the *de facto* landlords in the economy. The income of office-holders from corrupt activity would be a fraction $(1-\alpha)(1-t)$ of the small landowners' output. The effective tax burden on the small farmer is $(1-\alpha)+\alpha t$.

4 A Numerical Exercise

4.1 Calibration

In this section, we calibrate the model to data from the Qing period. The model allows us to arrive at a prediction for the ratio of income from corrupt activity to the officials' salaries. This ratio is given by:

$$\frac{B}{S}=\frac{(1-\alpha)(1-t)(\gamma T)^{1-\alpha}(\beta N l)^{\alpha}}{msR},$$

where R is total government tax revenue, s is the fraction of tax revenues used to pay government salaries, and m is the fraction of total salaries that went to officials in the countryside.

[8]The model setup is in the spirit of Beckers (1968) model of crime and corruption, though our application to pre-modern China makes this more of an optimal taxation problem.

The main source of government revenue during Qing rule was the land tax. Deng (1999, p. 356) estimated tax receipts to be about 5% of GDP. However, this tax burden was not shared equally by all. The Qing gentry class (the class of the office-holders) owned about 25% of the land. As local tax collectors, office-holders were able to exempt family land-holdings from taxation by collecting more from commoners to meet the tax quota. Chang (1962) estimated the effective tax rate collected from small farmers to be about 10%. At around 1880, salaries of government officials were 8% of government tax receipts. Labor's share of output, α, estimated from share-cropping contracts, was 0.6 (Chao, 1986).

Recall that the parameter β is the fraction of the non-gentry population that owned enough land to produce beyond subsistence (the small farmers) and γ is the fraction of land that they owned. To estimate these parameters, we take the fraction of the non-gentry population that owned more than 15 mou (about 2.5 acres) of land. These farmers were thought to have surplus. Farmers with holdings between 3 and 15 mou were at self-sufficiency while those with less than 3 mou of land had to find additional work to survive[9] (Chao, 1986, p. 117). Based on the limited records that existed, previous studies suggest that land distribution in China did not change much throughout the Sung, Ming and Qing (Chao, 1986, and Brandt and Sands, 1992). Therefore, we estimate these two parameters by averaging the values based on records of five administrative districts at various periods.[10] By this method, we get 28.3% for γ and 20.3% for β.[11]

[9]We should note that land varied greatly in quality, but it is likely that the big landowners also got the best land due to their influence in society. And so those who owned little land were also those who got the lower quality land.

[10]The records are of four villages: Ch'ang-chou in 1676, Hsiu-ning in 1711, Hsui-ning in 1716, Ch'i-men in 1850, and subdivisions of Chu-lu, Hopei in 1706, as reported in Chao (1986, tables 6.4 and 6.5).

[11]Assuming the same labor-to-land ratio for all plots of land would mean that an additional 8% of the population (of those who don't have enough land of their own) would be working for a wage on the land of these small farmers. Including this extra labor input would slightly increase the estimate of corruption income.

As noted, tax receipts were 5% of GDP, $R = 0.05Y_{total}$. Our model only considers corruption in the countryside so we would like to know as a proportion of agricultural output. In the 1880's, agricultural output was about 60% of total output, so $R = 0.05(Y_{ag}/0.6)$.

For m, the fraction of total salaries going to officials in the countryside, we take the share of agriculture output in total GDP which, in 1880, Chang (1962, Table 40) estimated to be 60%. Using these parameter values, the ratio B/S can be computed to be:

$$\frac{B}{S} = \frac{(0.4)(0.9)(0.283)^{0.4}(0.203)^{0.6}}{(0.08)(0.05/0.6)(0.6)} = 20.9.$$

As we noted above, Chang (1962), through official publications of salary schedules of the Qing court and through clan records documenting total income of office holders estimated that, around 1880, income from corrupt activity was 115 million taels of silver, 18.5 times the salary income of 6.2 million.[12] Our calculation of 20.9 is in the ballpark but slightly higher than this number. There are two possible explanations for the discrepancy.

First, a value 0.6 for m might be too low. The total salaries paid to officials in a particular sector depends on the number of officials posted there. Though 60% of output comes from agriculture, over 90% of the population was rural during Qing times. Thus, the number of officials in rural areas may have been more than 60% of the total. Second, we should note that our simple model is one for potential corrupt income, that is, the maximum rents that corrupt officials might be able to collect. It is possible that not all officials were corrupt or that some of the corrupt ones,

[12]The total corruption income of 115 million taels of silver came from all activities in the economy not just agriculture and the 6.2 million was total salaries to all officials. We, of course, only model corruption in the agriculture sector. And so to have a meaningful comparison between our model's calibration results and Chang's (1962) accounting, we must assume either that the ratio B/S is roughly the same in agriculture as it is for corrupt officials posted in other parts of the economy or that agriculture is the main sector in the economy. Both assumptions are plausible in the case of Ming and Qing China.

perhaps because of dynamic considerations or institutional concerns not modeled here, opted not to extract the highest possible rents. Interestingly, the fact that our calculations–of the maximum rents possible–are very close to the historical record means that the Qing officials must have been pretty close to extorting all that they possibly could.

The gentry class also gained income from owning 25% of the land in China. Adding this source of income to office-holding income brings the gentry's total share of agricultural output to

$$\begin{aligned}\frac{B+S+(\text{Land Income})}{Y_{Ag}} &= b(1-t)(\gamma)^{1-\alpha}(\beta)^{\alpha} + \frac{ms(0.05)(Y_{Ag}/0.6)}{Y_{Ag}} + 0.25(1-\alpha) \\ &= 18.7\%\end{aligned}$$

According to Chang's estimate, the gentry's share of agricultural output was about 16.9% in 1880. The model shows that the effective tax burden on small farmers was $(1-\alpha)+\alpha t$ or 46%.

4.2 The Evolution Of Corruption From Ming To Qing

Our model suggests that the official's corruption income increased as population and cultivated land increased.[13] In this section, we calculate the ratio of corrupt income to salary throughout the Ming and Qing using population and land estimates from past researchers and salary levels inferred from the historical record.

Table 1 shows that population increased over five-fold from 1400 to 1893 while land increased four-fold over the same period. As noted in section 2, salaries were reduced to very meager levels at the start of Ming rule and continued to fall in real terms throughout the Ming. Salaries, by the mid-1400s, were half the value at the

[13] Although applied to a different context, Ades and Di Tella (2002) also suggested and documented the positive relationship between the opportunity for rents and the level of corruption.

end of the 1300s, and were stagnant through the early Qing. In 1727, salaries were raised over three-fold and were raised again in the early 1900s in an effort to curb corruption.

Wages were also stagnant throughout this period. We take these values to be constant at the level in 1873. From this, we calculate the ratio B/S at various periods (reported in the last column of table 1) to get an idea of the evolution of corruption during the Ming and Qing.

The plot of B/S is shown in figure 3. In 1400, at the beginning of Ming rule, the ratio was about eight. By 1600, the ratio increased to almost 30 as salaries fell to half the level in 1400 and output increased from the expanding population and land. The slight drops in potential corruption income at the beginning of the seventeenth century and again in the mid-nineteenth century were due to reductions in population that resulted from popular uprisings to demand land redistribution. After the salary reform in 1727, the ratio dropped to 15 in 1750. Although this was a significant decrease, income from corruption was still so high relative to salary that the reform likely had little effect on officials' behaviors. We discuss this in more detail in the next section. The ratio continued to rise after that, reaching 22 by the end of the nineteenth century. As officials got richer and richer over this time, it is easy to see how career choices for the young became more distorted. For those without the means to invest in human capital, this meant a life of subsistence farming while those who did have the means, the goal for most would be to attain the few coveted government positions.

5 The Failed Salary Reform Under The Qing: Expanding Corruption Income And Hysteresis

At the beginning of the Ming dynasty, government salaries took a significant drop. Salaries may have dipped so low that corruption began to spread. During the Qing, raising the salaries of officials failed to reduce corruption. There may be two factors why the salary reforms were ineffective. First, as population and land expanded, output increased and the potential income from corruption also increased making even the higher salaries negligible in comparison. Second, hysteresis effects may have been important. That is, even if income from corruption stayed constant, the threshold salary above which a corrupt official would turn clean was far more than the threshold salary below which a clean official would turn corrupt. Hysteresis would occur if the probablity of being punished is state-dependent. Concretely, the punishment probability falls with the number of corrupt officials,[14] or alternatively, the probability of being punished is greater for a clean official with a corrupt past than for clean official who had never been corrupted.

In a setting of expanding corruption income and hysteresis, we ask: by what amount would salaries have had to increase to make corruption unattractive to the government official? Below, we impute the required salary increases at different time periods for different values of the punishment probability, q. From these imputations, it will be apparent why the Qing salary reforms were ineffective in curbing corruption.

An official would choose to be honest if his expected income from being honest

[14]The idea that the punishment probability and expected punishment decline with more corruption has been discussed by Lui (1986), Cadot (1987) and Andvig and Moene (1990).

exceeded his expected income from being corrupt:

$$S > (1-q)(B+S) - qD(B).$$

We can define a threshold salary level, S_C, implicitly as that which solves

$$S_C = (1-q)(B+S_C) - qD(B). \tag{5}$$

(5) For any salary $S > S_C$, the government official would choose to stay clean. Equation (5) can be manipulated into the following form:

$$\frac{B}{S_C} = \frac{q}{1-q}\left(\frac{D(B)}{S_C} + 1\right). \tag{6}$$

In section 2, we argued that the penalty schedule was relatively flat in Ming and Qing China. For simplicity, then, let us assume a constant penalty, $D(B) = D_0$, for all values of $B > 0$. We take this value of D_0 to be 50 times salary–twice the present value of salary collected for 25 years at no discounting–to capture both lost income and non-material loss. The required increase in salary is the ratio of the B/S ratio calculated from the calibrated model in the previous section to the ratio B/S_C given in equation (6). A plot of the ratio of required salaries to have zero corruption to the estimated actual salaries at various years for different values of q is shown in figure 4.

In figure 4, the required salary increase increased with time as the potential corruption income rose and as actual salary fell throughout the early Ming. In 1400, at the beginning of the Ming, for , salaries would have needed to be only 40% higher its actual level to induce officials to not be corrupt. For $q = 0.1$, if salary had risen with output–only by 2.5 times from 1400 to 1600–then corruption might have been kept in check. Instead, since salary actually fell by a half over this 200-year

period, corruption got worse. Consider now the case for $q = 0.001$, a much lower probability of punishment. In 1750, after the first set of Qing salary reforms, it would have taken almost a 300-fold increase in salary to bring about honesty–an amount exceeding all of agricultural output! In other words, no possible level of salary would have been enough to "nourish honesty" as the salary increase in 1727 had literally intended.

There are reasons to believe that when a system is corrupt, the probability of being punished is much less, say $q = 0.001$,[15] than the probability of being punished in a system that is not corrupt, say $q = 0.1$. It is plausible to assume that the value of at the beginning of the Ming, when corruption just started to take root, was much greater than the value of during the Qing, when corruption was rampant. Thus, in figure 4, the plot for $q = 0.1$ is probably more applicable to the early Ming period and the plot more applicable to the later Qing period. What this shows then is that had the early Ming emperors only kept salaries a little higher–five times the level in 1600–it would only have had to let salaries grow with output to keep corruption in check. Had it kept that path, in 1750, salaries would only have had to be 2.7 times what it was to keep officials honest. But because corruption was already well entrenched by that time, no salary increase would have sufficed to restore integrity to the system.

Another reason for why q might be state-dependent is the absence of "grandfathering" in punishment. A corrupt official might still be punished for his past transgressions even if he were to stop his corrupt behavior. Thus, for the same salary, an already-corrupt official would always find corruption more tempting than one who started from a blank slate.

In addition to the explanations of state-dependent detection/punishment prob-

[15]The value $q = 0.001$ is consistent with the record of prosecutions from the 60-year reign of Qianlong during the 1700s as discussed in section 2.

abilities, there is another possible reason for why the Qing salary increases failed to reform the bureaucracy. In an economy where office-holding can bring such great rewards, government officials invested heavily to obtain their posts, financially as well as in terms of human capital. The investments were of such magnitude that they could be recovered only through corruption. Hickey (1991, p. 395) noted that the expenses of local officials included repayment of debts accumulated acquiring the positions. In the late Qing, the number of magistrates appointed by the Board of Civil Appointments (libu) far out-numbered the available positions (Watt, 1972, pp. 45-55). The vast majority of magistrates held their positions for about one year before being transferred to other posts. Appointees on the waiting list had to wait five or six years in the provincial capitals and spent thousands of taels of silver on gifts, banquets, and outright bribery for the provincial officials who were in charge of making assignments. These investments had to be recovered during the short period of time the magistrates were in office.

It is fairly straightforward to model this formally, and we offer a sketch of such a model here. Consider an economy with overlapping generations of senior and junior officials. In each period, senior officials select a number of junior officials for promotion among many candidates. It is the junior officials who come in direct contact with the people and a corrupt one would collect fees from citizens. The junior officials decide to be corrupt or upright. When junior officials become old, some get to be senior officials and the rest retire. A corrupt senior official takes bribes from junior candidates, and the highest bidder gets the junior post. When there are many competitors for government jobs, the juniors cannot afford to be clean. Starting from a clean system, a decrease in officials' salaries will make many officials corrupt. When the first generation of corrupt junior officials become senior, they stay corrupt because of the low salaries. These corrupt seniors now take bribes from the junior candidates. Now consider a sharp increase in the official's

salary. The current junior officials will have already paid the bribe to get to office and will have to collect fees to recover their costs. The dynamics of corruption does not change with an increase in officials' salaries once the "culture" of corruption is in place.

6 Concluding Remarks

The fortune of the Chinese official was tied directly to the land. The evidence supports the implication of our simple model that the official's income was the same as if he were the landowner. Not surprisingly, the periodic uprisings to bring about land redistribution throughout Chinese history did not bring about any lasting improvement in the standard of living for farmers. Our model suggests that as long as officials possessed as much power as they did in the countryside, nominal landownership did not matter since the corrupt official could always extract land's share of output by virtue of his position.

The model also suggests a close link between corruption and income inequality. Murphy, Schleifer and Vishny (1989) argued that extreme income inequality may prevent industrialization from taking place because the absence of a middle class would mean low demand for industrial goods. In pre-modern China, this might have been the case with the root-cause being corruption. We should note again that inequality in landholdings makes no real difference in this context.

Baumol (1990) and Lin (1995) suggested that the lack of technological progress in China since 1400 was due to the diminished potential of experienced-based improvement and lack of progress in science, and that the development of science was hampered by the institution of the civil examination. Beginning with the Ming dynasty, the civil examination became the primary method by which officials were selected and its contents featured more prominently the moral teachings of Con-

fucius and had less to do with science and public administration. To prepare for the civil exam, candidates spent many years memorizing the Four Books and Five Classics, more than 400,000 characters in all, read commentaries on the classics, scanned other classical, historical and literary works and wrote poems and essays (Miyazaki, 1981, p. 16). Only 100 who earned the chin-shih degree were guaranteed a high-rank or middle-rank post in the government (Ho, 1964, p. 120, p. 189). Despite the long odds of success, for talented young people, taking the civil examination was by far the best option towards riches because the potential payoff of office-holding was much higher than any other alternative. For most of the hundreds of thousands of hopefuls, trying to make it to the top was a lifelong struggle. Once they sunk many of their best years into the lengthy preparation, it was optimal to keep trying because if they stopped studying, then the years spent memorizing this special set of knowledge, which had no other productive use, would be lost. The waste of human resources was tremendous.

Corruption gave rise to a host of conditions that may have all been factors in China's decline since 1400 to the beginning of twentieth century. Because of corruption's path-dependence and the widening income gap between corruption and honesty, one is left to ponder the importance of the salary reductions at the start of Ming rule forcing officials to supplement their meager incomes. Once the system was corrupted and the opportunities for rents expanded, reforming the system became impossible. So while no great historical trend can be explained without a multitude of events converging together, it is at least fair to say that the policies at the beginning of the Ming contributed to China's sorry fate in the centuries subsequent.

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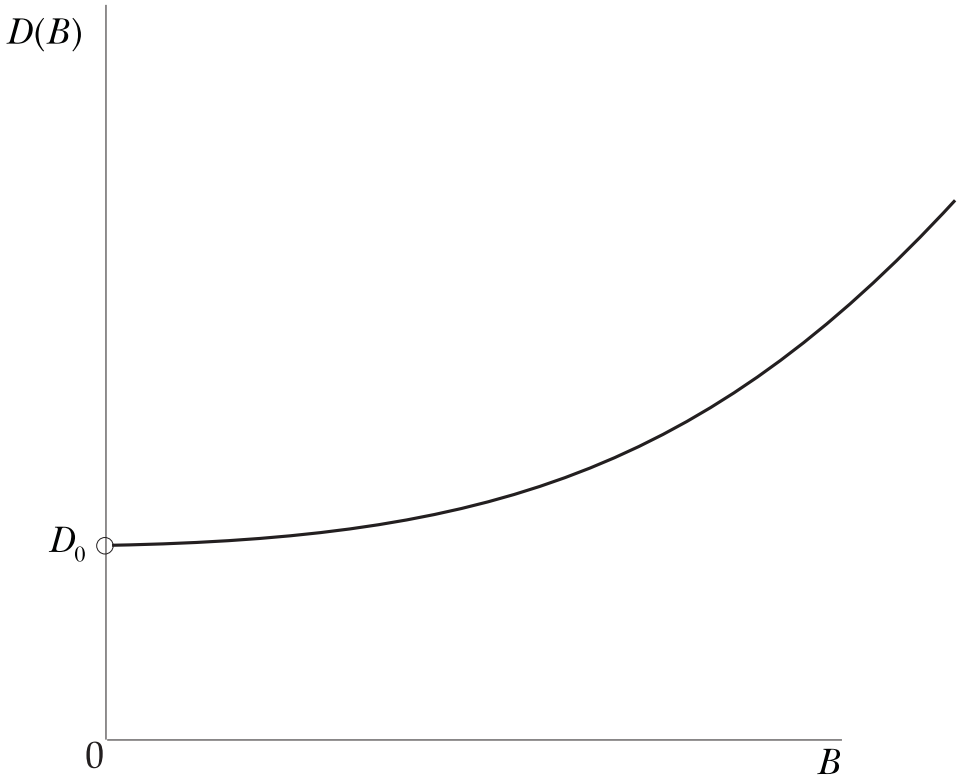

Figure 1: The penalty function.

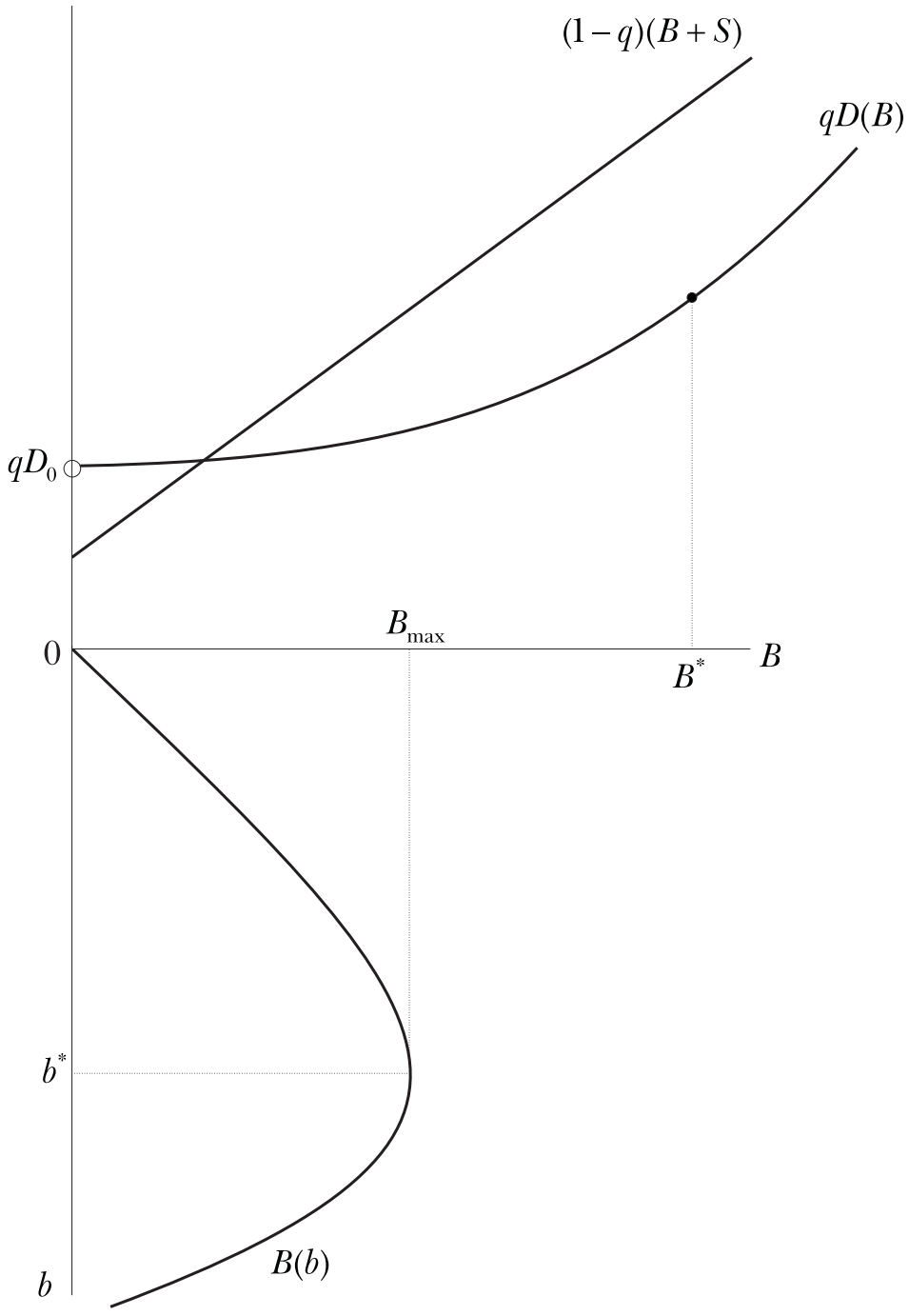

Figure 2: The official's optimal level of extortion.

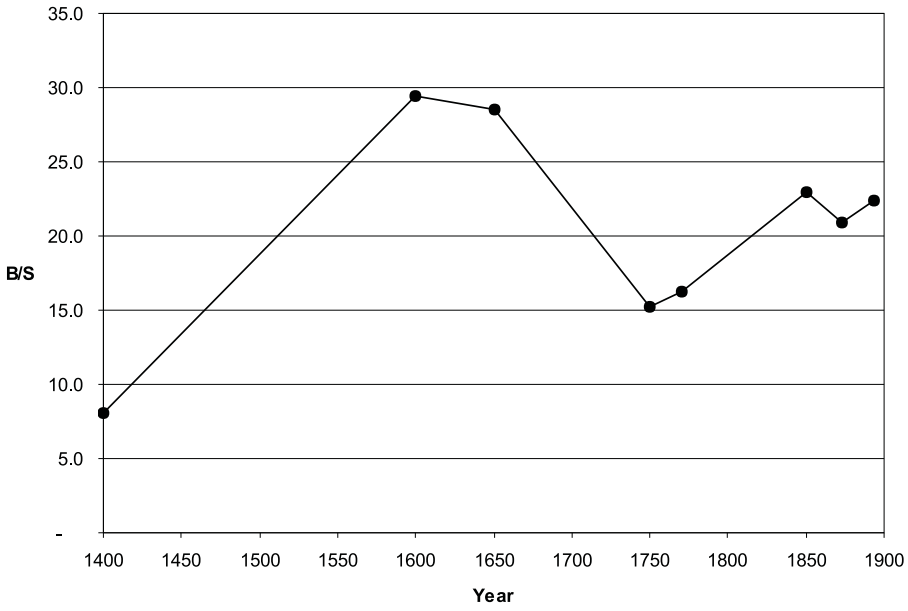

Figure 3: Ratio of Potential Corruption Income to Salary.

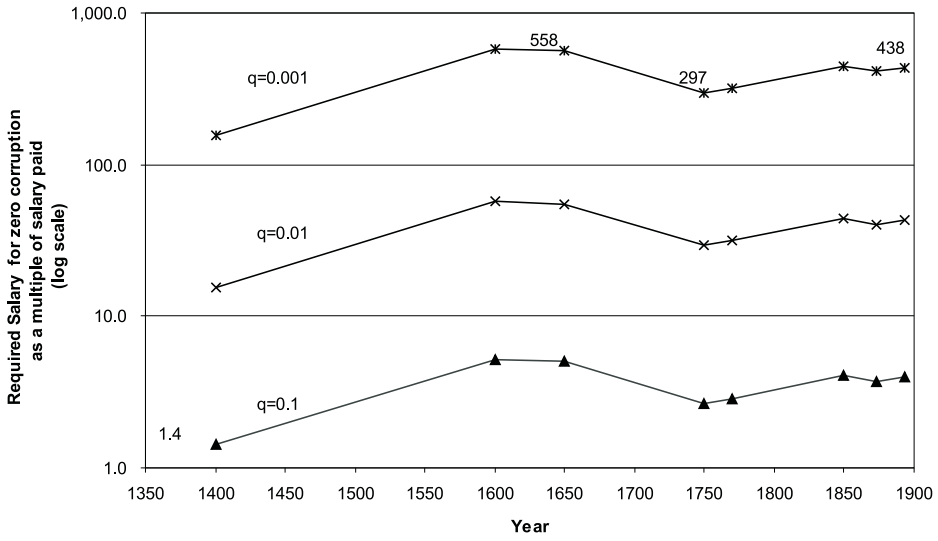

Figure 4: Required salary increase to have zero corruption.

Table 1: Population, land and estimated ratio of potential corrupt income to salary.

Year	Population* (mil.) N	Land* (mil. shih mou) T	N/N_{1873}	T/T_{1873}	S/S_{1873}	B/S
1400	80	370	0.23	0.31	0.67	8.1
1600	200	670	0.57	0.55	0.40	29.5
1650	150	600	0.43	0.50	0.33	28.5
1750	250	900	0.71	0.74	1.00	15.2
1770	270	950	0.77	0.79	1.00	16.2
1850	410	1,210	1.17	1.00	1.00	23.0
1873	350	1,210	1.00	1.00	**1.00**	**20.9**
1893	430	1,360	1.23	1.12	1.00	22.3

* From Wang (1973, Table 1.1)