

# **Government Institutions and Economic Development in Tokugawa Japan: A Tale of Systems Competition**

- Working Paper -

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*Abstract: This study focusses on the question of what the influence was of the government institutions of the Tokugawa regime (1600-1867) on economic development. The Tokugawa system of governance was quite different from the systems in use in Europe, and in the pre- and post-Tokugawa Japanese governments. Big differences were the controls on social mobility and international contact. This study finds that the continued employment of samurai in the government bureaucracy might have been beneficial to internal stability, but did not protect Japan from outside forces. The effect of the restrictions on outside contact can be seen in the main export sector of precious metals. New estimates of production show a sharp decline as technological advance falters, and a renewed growth after the opening up of Japan. In both military and trade the Tokugawa 'closed' system was outperformed by the Western 'open' system.*

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# Introduction

In 1844, shortly after the conclusion of the First Opium War, King William II of the Netherlands wrote a letter to Tokugawa Ieyoshi, shogun of Japan. This communication was an unprecedented step between the rulers of these nations. William II advised Japan to move away from its traditional trade restrictions, given the danger of being drawn into a trade war, likely with England. It read in part:

*“The number of all sorts of vessels sailing the Japanese seas will be greater than ever before, and how easily might a quarrel occur between the crews of those vessels and the inhabitants of Your Majesty’s Dominion! The thought that such quarrels may end in war fills us with solicitude.”*<sup>2</sup>

- *William II (Greene 1907, pt. IV, p. 112)*

The reply from Shogun Ieyoshi’s advisers was polite but dismissive. It contained the line:

*“Now since the ancestral law has been once fixed, posterity must obey.”*

- *The Gorōju of Japan (Greene 1907, pt. IV, p. 122)*

A few years later – after a famous confrontation between US Navy Commodore Matthew C. Perry and the shogun’s forces in Tokyo Bay – Japan had to give up its ancestral law and shortly afterwards its ruling dynasty. This was a distinct difference from the balance of power at the beginning of the Tokugawa dynasty (1600-1867), when it could decide without hesitation which countries’ traders to admit to its shores. Through the opening up of Japan in the second half of the 19<sup>th</sup> century it was set on a course of modernisation that led to it becoming the first non-western country to industrialise and once again be on equal footing with western powers. Did the old Tokugawa regime hold Japan back from modern economic growth? If so, what were the particular elements that might have prevented Japan from modernising? In this paper we will explore the way in which Japan’s economic development was influenced by the institutions of the Tokugawa government.

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<sup>2</sup>“Het zwerven van allerlei schepen in de Japansche zeeën zal menigvuldiger dan vroeger worden, en hoe ligtelijk kan er twist ontstaan tusschen de manschap van die schepen en de ingezetenen van Uwer Majesteits staten! De gedachte dat uit zulk een twist oorlog kan ontstaan vervult ons met bekommring.” Idem, p. 107.

# Chapter 1: Institutions as cause for growth

Institutions and the related concept of culture have been an intrinsic part of many explanations of the differences in current and historical economic development. Classic examples from political economy and sociology are Marx's 'Asiatic mode of production' or Weber's religion-based explanations. More modern approaches have been called the 'New Institutional Economics' (NIE), a term coined by Oliver Williamson (1975) and the first example of which may be Ronald Coase's 'The Nature of the Firm' (1937). According to R.C.O. Matthews (1986, 903) both the old and the new approaches are based on the proposition that "institutions do matter". He draws a line between them in the conviction by the NIE that "the determinants of institutions are susceptible to analysis by the tools of economic theory". My research aims to add to existing works on both points: the effects of institutions on economic development, and the determinants of those institutions. At the beginning, it is relevant to define what is meant by 'institutions'. Matthews identified four definitions based respectively on the concepts of property rights, conventions (norms), contracts, and rights of authority. (1986, 904) More broadly defined, in the words of Douglass North, institutions are "humanly devised constraints that shape human interaction." (1990, 3) This is the definition that will be assumed in the rest of this work.

As Williamson (1998) suggested in his analysis of social analysis, possibly the most important aspect of the institutional environment is the guarantee of property rights. The most basic argument is that uncertainty in property rights lowers the expected future value of savings and returns from investments. This creates a disincentive to spend money and energy to, for example, develop a business. The discussion of property rights often expands to include other government services as well, such as contract rights, peaceful order and other public goods. Mancur Olson (1993, 567) states that under conditions of "anarchic violence" there can be no guarantee of property rights. Olson further argues that enforcement of contracts is essential for making long-term investments, as is a stable currency. In the view of North (1979) the state does not only set the 'rules of the game', but has the complementary aim of reducing transaction costs in order to maximise income. This leads to state provided (semi-)public goods in situations where contracts are costly to negotiate and enforce. Most theories involving property rights have some form of state at its centre. In most empirical cases, property rights are ultimately guaranteed by the state. This is one of the reasons why the functioning of the state is of economic importance. In addition, states are in a unique position to affect institutional change, since they can create new institutions and have the legal power to force others to respect these institutions. (Matthews 1986, 910)

The fact that states play an important role in economic development does not mean their influence is always positive. The competing views of the state described by North (1979) as both a requirement

for economic growth and an impediment to growth are echoed in other works. Mancur Olson (1993) contrasts the incentives of rulers with different levels of security of their authority. In this framework, insecure rulers become under-investing, over-extracting “roving bandits”, while rulers that can expect a long tenure or even a dynasty become more growth-oriented “stationary bandits”. Acemoglu (2005) in a theoretical paper arrived at a similar dichotomy. He presumed a self-interested leader trying to maximise tax income for their own consumption and showed how both overly weak and overly strong states can be detrimental. When the state is too weak, the future control over the executive is uncertain, and the ruler will under-invest in public goods, in turn hurting economic growth. When the state is too strong, the ruler is able to divert too many resources for his own consumption, resulting in excessive taxation and slowing down economic activity.

A balance in government power, with credible commitments to secure property rights, depends also on a credible threat to whomever holds that power. One of the ways to institutionalise that threat is through a democratic system. Following this line of reasoning, democracy could lead to higher economic growth through better assurances of property rights. In their study on the causal effects of income per capita and democratic institutions Acemoglu, Johnson, Robinson and Yared (2005) found no causal effect of income on democracy after eliminating country-specific fixed effects. They concluded that historical factors were likely the strongest factors to affect income. In addition, they could not eliminate the possibility of a positive effect of democratic institutions upon income per capita. Acemoglu et al. (2014) revisited the subject. Again controlling for country-specific effects, the finding was a positive effect of democracy upon GDP per capita. Their results suggest that the effect of democratic institutions on economic performance works through three processes: economic reforms, lowering unrest, and raising public goods provision (such as public health and schooling).

If the form and policies of government make a substantive difference to the economic development, it is relevant to discuss what determines these factors. The accident of geography determines the environment states face, in terms of the natural environment and the trade partners or rivals in its vicinity. In Europe, this took shape as a group of small- to medium-sized states in competition through trade and war. No single empire was formed, partly through shifting alliances to counter any rising powers. Frequent wars and the military revolution led to rising military expenditure and taxation. In turn, this led to increasing fiscal capacity and bargaining power for wealthy citizens, especially merchants. Over time, European states became increasingly centralised. As Tilly (1992) describes, this change to direct rule meant that there was a more direct line between populace and government, and increasing bargaining power of the former as a result. In states where the citizenry gained sufficient power, more inclusive government institutions formed that were responsive to the

needs of the people. Citizens often demanded more public goods such as education, welfare, infrastructure, and so on, which were also conducive to economic growth.

European trade was another important area of competition, where states tried to outmanoeuvre each other through (protectionist) legislation and the use of force. The ones who were successful could use the resulting economic power for military spending. States – or rather their populations – also interacted through migration. European culture was interconnected enough that if rulers became too demanding of their people, the people could resettle in a different state. Especially in the case of merchants and scientists, this could be a great loss to any state. The large number of different states gave ideas, and business practices, a good chance to spread.

Given the characterisations of states at different points in their development, numerous studies have been performed to test the effect of warfare on fiscalisation and of fiscalisation on economic growth. Kiser and Linton (2001) found strong effects of wars on tax levels in England and France. Moreover, they found that successive wars had cumulative effects on taxes. After a war, taxes did not fall back to pre-war levels. This “ratchet effect” is amplified when the state is more bureaucratised, since part of the revenue was taken up by bureaucrats who protected their position after the war. Karaman and Pamuk (2013) have looked at military, economic and political interactions in early modern Europe. They found that the level of urbanisation and commercialisation mattered in answering the question of which political institutions achieved higher yields during wartime. Under representative regimes, the more developed areas had higher tax revenues, while under more authoritarian regimes, rural and agrarian areas had higher revenues. Besley and Persson (2010) found that government legal and fiscal capacity are important for economic performance, as well as an increased risk for internal conflicts when legal capacity is lacking. Dincecco and Katz (2014) revisit the issue of government centralisation and limitation. They found that in particular centralisation, and to a smaller extent stricter government limitations, increased a government’s fiscal capacity. This in turn led to higher economic growth. Dincecco and Prado (2012) use pre-modern war casualties as an instrumental variable to estimate how fiscal capacity affects economic growth. Their rationale is that greater participation in war stimulated the development of fiscal institutions, which in turn benefited economic performance. They found a positive result of fiscal capacity on economic performance. In these works a convincing case is made for war as a shaping force in the institutions of (at least) European states, and through these institutions economic growth is also impacted.

Warfare did not only influence state formation in Europe, especially in the age of mercantilism it was part of a larger competition between states. Eric Jones (2003) dedicated a chapter to the European ‘States System’ in which he argues that the relative fragmentation of Europe created the right circumstances for competition between states in war, trade, institutions and ideas. As stated above,

the frequent warfare between European states stimulated fiscal and organisational change. Trade was a parallel front where economic institutions competed with each other. Similarities in culture yet differences in government stances on ideology made it possible for people to find new places to settle if their country of origin was unreceptive to their religion or philosophy. This fostered the exchange of ideas throughout Europe.

I would like to reintroduce the term for this phenomenon: *systems competition*. A ‘system’ in this context is a collection of complementary institutions. Jones and others talk about competition between states, but in a sense those are the surface ripples of a competition between economic and political institutions that takes place at a deeper level. During the Cold War the struggle between communism and capitalism was described as ‘systems competition’. See for instance Hans-Werner Sinn, who has used it both in that context, as well as in the context of attempts by modern capitalist states to attract mobile factors of production through legislation. (Sinn 1990; Sinn 2008) In my view, this concept is also useful in the study of other periods of history, particularly for the early modern period, when economic and political systems (institutions) were changing under outside pressure.

Confrontations between states are a widely studied topic in history and economic history, so what does the term ‘systems competition’ add to the existing material? First of all, it focusses on the differences in the organisation of both the economy and the state of the competitors. It follows that institutions, particularly government institutions, play a big role in systems competition. Secondly, it encompasses all the ways in which these systems can compete, including wars, trade disputes, economic competition, and others. Thirdly, it implies that a system has something to gain by outperforming its competitors. The criteria for success depend on the context; for example, it could mean military victory, trade dominance, or higher economic growth. Ultimately, a system can become dominant through growth of its proponents, or by conversion of its opponents. It should be noted that the players (states) are not necessarily conscious of, or actively pursuing the dominance of, their own system; rather, the systems are promoted and depressed through the self-interest of states. Finally, by looking at the topic of government institutions and institutional change through the lens of systems competition rather than more narrowly by the impact of war, it opens up more time periods and geographic areas for analysis. In countries like Japan, state warfare was not always present or even a threat. What did this mean for the development of Japan’s government institutions? Did other factors substitute for war in the shaping of these institutions? What was the impact on economic growth? These questions will be discussed in detail in the following chapters.

## Chapter 2: Tokugawa Institutions

### *Pre-Tokugawa developments*

Circumstances during the Tokugawa period were shaped by preceding events during the *Sengoku* or Warring States period (1467-1568) and the Azuchi-Momoyama period (1568-1600). During this period there were frequent battles between warlords called *Sengoku daimyo*. Several of the most successful lords started changing the support structure for their armies and their samurai liege men. Before the Sengoku period, samurai managed their own estates and provided troops to their liege lord in case of war. Competition between houses caused an increase in the scale of their armies. The army of the Hōjō, the dominant house in the Kantō region (the current vicinity of Tokyo), grew from a few hundred warriors in 1491 to 50 000 during their final stand against Toyotomi Hideyoshi in 1590, who himself had gathered 200 000 men. (Birt 1985, 372)

Such an increase in scale would not have been possible without advances in organisation, taxation and recruitment. The Hōjō present an early case of a phenomenon that would be applied by rival houses and later by the three men that unified Japan, Oda Nobunaga, Toyotomi Hideyoshi and Tokugawa Ieyasu. The Hōjō were in a position to disrupt existing institutions because most of their domain was conquered from enemies. When land was conquered, the Hōjō granted the land rights to loyal samurai, taking care not to create large contiguous sub-fiefs, and to place powerful samurai away from their original power-base, so as not to create internal rivals. The scattering of individual samurai holdings made it difficult for them to organise the collection of revenues themselves, in effect making them dependent of their liege lord for their income and driving another wedge between the samurai and their source of power. Based on surveys of the amount of land they held, samurai were obliged to provide specific numbers of different troops in times of mobilisation. This made it easier to raise and organise an army of predictable size and composition. As the Hōjō faced increasingly powerful adversaries, their mobilisations became broader, drawing in large numbers of commoners to serve as footsoldiers. At the same time the Hōjō's fiscal and judicial administration gained influence straight down to the village level. Village administrators gained direct access to the daimyo through communication channels, while the influence of samurai at the local level receded. During the century up to the Hōjō's eventual defeat, both the military and civilian aspects of government were standardised and centralised in the hands of the daimyo. Power was gradually wrested away from the samurai class and into the hands of the daimyo. (John Whitney Hall and McClain 1991)

Arguably the biggest institutional transformer of the 16<sup>th</sup> century was Toyotomi Hideyoshi, who took power after the most powerful warlord of his time, Oda Nobunaga, was assassinated in 1582. Hideyoshi stepped in to fill the power vacuum and began spreading his control over the whole of

Japan. He issued multiple decrees, some of which formalised and expanded upon existing local changes. The decrees sharply differentiated the different ways in which the separate classes should behave themselves, while switching between classes was prohibited. All samurai had to be organised under a daimyo. Daimyo and samurai could not own or work farmland, they only had the right to taxation of farmland. Wives and family members of daimyo were forced to live in Kyoto as hostages, while daimyo themselves were required to serve Hideyoshi there. Daimyo could also be transferred to different domains at Hideyoshi's behest. For peasants, it was made illegal to own weapons or to leave their land. They were, however, the only group who could own farmland. Peasants were only obliged to pay taxes to one lord, and the village was made responsible for collecting lord's taxes. The patrimonial right to peasant labour was reserved for the national hegemon, Hideyoshi. These measures were directly aimed at preventing rebellion by warriors and peasants alike, as well as to standardise tax collection. To further this cause Hideyoshi ordered a national land survey (*Taikō kenchi*) that registered land tenure, production value and tax revenue of all productive land. The registered yield was expressed in *kokudaka*, a quantity measure of rice, over which taxes and other patrimonial dues were calculated. (Asao 1991, 40–53)

### *Tokugawa Governance Structure*

Hideyoshi died while his generals were leading an invasion of Korea. The ensuing struggle for power was won by Tokugawa Ieyasu. Ieyasu was subsequently established as the first *shogun* of the Tokugawa dynasty. The Tokugawa system of governance is often referred to as *baku-han*, referring to the *bakufu* (shogunate) and the *han* (domains) in allegiance to it, together making up the whole of Japan. Nominally the shogun was a military leader subordinate to the emperor, but in reality the shogun was in command of all matters of government and the emperor's power was entirely symbolic.

The top level of power was the shogunate, whose main source of power was the amount of land directly and indirectly under shogunate control. The shogunate had 'granary lands', known as *tenryō*, that it taxed directly. The shogun's granary lands made up about 16% of the total agricultural land by production capacity in the late 17th century. In addition, another 10% of this land was held by shogunate bannermen (*hatamoto*) that were directly enfeoffed to the shogun. (John Whitney Hall 1991, 152)

The *han* were the domains of local lords, the daimyo. Some of these daimyo descended from – or at the beginning of the Tokugawa period, were themselves – sengoku daimyo (warlords). Other daimyo were created by the granting of land, primarily by the shogunate. From this time however, daimyo started to function more like governors. To become a daimyo, a domain of at least 10 000



*koku*<sup>3</sup> was required. On the other end of the scale, the largest non-shogunate domain was that of the Maeda clan in Kanazawa-han with over one million *koku*. (McClain 1982)

Practically speaking, there was a third level of government, below the han. Villages (*mura*) and other municipal organisations played an important role in the administering of government, since well before the Tokugawa period. They performed many of the government functions at the local level, including tax collection, infrastructure upkeep, maintaining local law and order, and small-scale poor relief. Villages were also the unit of account for taxes levied by the shogunate and the domains. The high level of village self-governance made possible a very small staff of administration officials at the domain level. Han officials worked either in one of the central bureaus in the castle town, or locally as district magistrates. (Smith 1959, 202) The number of villages and inhabitants overseen by a single magistrate was almost large. Although magistrates did have some support staff, they did not generally have any military forces stationed within their district, other than a few guards. According to Thomas C. Smith (1959, 203) “this administrative system was by no means merely a contrivance of the warrior class for its convenience; it had been evolving since prehistoric times. From the beginning of agriculture, the village had a strong corporate life.”

### *Social controls*

Ieyasu upheld many of the governmental and societal changes designed by Hideyoshi. Over time he and his descendants expanded and formalised this system of rules. From the early Tokugawa period society was divided into four classes: samurai, peasants, artisans and merchants. (Howland 2001)

Daimyo formed the top of the samurai class. They were forced to comply with a system of alternate attendance (*sankin kōtai*), to spend part of their time at the at the shogun's court in Edo. The alternate attendance system was conducted at a large cost to the daimyo budgets. Large expenses were incurred for the annual processions of the daimyo to Edo, for the one or more mansions maintained there, and for the consumption of goods and services during the stay. For many daimyo the expenses for *sankin kōtai* were equal to one third of their yearly income. Partly because of this, a considerable portion of government revenue was spent on maintaining the ruling class. Another sink of government money was the employment of large numbers of samurai. Although the ostensible purpose of the many samurai was national security, this was not effectively provided. Soldiers were used as guards

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<sup>3</sup> In land surveys the officially estimated production capacity of agricultural land was expressed in a rice amount called *koku*, irrespective of the crop grown on the land. 1 *koku* was equal to 150 kg, supposedly the amount of rice needed to feed a person for a year.

in peacetime, but during a large part of the Tokugawa period neither their training nor their equipment nor the organisational structure was suited for war. (John Whitney Hall 1991, 158)

The samurai were ordered to move to cities and were, by that time, completely dependent on either their daimyo or the shogun for their income. Samurai filled positions in the government bureaucracies in return for which they received stipends. The total number of samurai was too large to keep productively employed in this way, especially in daimyo domains (*han*) that were left with a large samurai population relative to the size of the land holdings. The land holdings of many daimyo had been changed by the shogunate depending on their loyalty. In contrast the number of samurai families was relatively fixed. In addition, there was a required number of troops (dependant on the size of the land holdings) that a daimyo should be able to send, in case of need. Given the oversupply of samurai for bureaucratic duties many positions were filled by two or more people. The samurai that received stipends were often only temporarily or partially employed. In fact, when the new Meiji government issued regulations on working hours for civil servants in 1869, they set them from 10:00 to 14:00, reflecting custom in many late Tokugawa domains. (Saito 2006, 61)

According to Albert M. Craig (1986), increasing levels of education of the samurai led to development of 'bureaus' within domain governments. Education led to more formalised, paper-based procedures. Daimyo were looking for expertise to handle the administration of their charges, especially in times of fiscal crisis. As Kozo Yamamura put it: "The continued pace of the Tokugawa period gradually changed the shogun's retainers from the samurai of the battlefields into bureaucrats, underemployed soldiers, and unemployed idlers." (Yamamura 1974, 70) It is a classic example of Thorsten Veblen's 'leisure class'. (1899) The over-employment of samurai in the government bureaucracy has been explained as an attempt to keep the warrior class occupied in peaceful activities. (Howland 2001)

Peasants occupied the rung just below samurai. This prominence was based on the fact that agricultural taxes made up most of the income to the shogun and daimyo. Artisans and merchants actually enjoyed the least respect, according to the official dogma. Especially for merchants, this was at times in sharp contrast to their wealth. Conversely, some of the lower ranked samurai lived in relative poverty, as illustrated especially well in the works of Constantine Vaporis (2000). The social system was aimed at keeping people from having ambitions outside their station, and particularly to maintain farmers as the source of income to the regime. (Howland 2001) At times, farmers did resist high tax levels, both through internal revolts (*ikki*) and leaving certain domains to try their luck in the cities or other domains. (Paik, Steele, and Tanaka 2012)

## *International and trade policy*

National trade had first been effectively regulated by Hideyoshi, who had instated a trade permit system. The trade permits, called Red Seals or shuinjō allowed Japanese traders to perform international trading missions. When Tokugawa Ieyasu took power, he consolidated Hideyoshi's system, issuing shuinjō, trading on his private account, and controlling the parties Japan did business with. The trading partners that called at Japan's ports during Ieyasu's time consisted of the Chinese, Dutch, Portuguese, Spanish, and English. In addition to the shuinjō trade, Japanese trading missions were conducted by the Sō clan of Tsushima who acted as an intermediary to Korea and the Shimazu clan of Satsuma who filled a similar role regarding Ryūkyū. Lastly there were small-scale trading contacts with the Ainu of Hokkaido (then known as Ezo). (Tashiro 2004, 105)

Despite the many different trade partners, the ultimate source and destination for the large majority of trade was China. For long stretches of time, direct trade between Japan and China was not permitted by either one or both countries' government. Because of this circumstance, several actors functioned as intermediaries between the two countries. It had been the main reason for the profitable trade of the Portuguese between Macao and Nagasaki. The shuinjō traders travelled mostly to South-East Asia, but often met with Chinese traders there. The same is true for the Dutch, after they lost their trading post on the island of Formosa (Taiwan). The Chinese that were allowed entry to Japanese harbours did so without the permission of their own government. Korea and Ryūkyū also acted as intermediaries, being traditional tributary states to China. (Innes 1980, 54, 65)

The shuinjō system was abolished in 1635, when the owning of ocean-going vessels and foreign travel were banned for Japanese nationals by the third shogun Tokugawa Iemitsu. The trade with Korea and Satsuma continued, however. In 1639, all foreigners were expelled from the country except the Chinese and Dutch. The apparent motivation for the 'closed country' policy or sakoku was to counter the influence of Christianity in Japan, which had the potential of undermining the shogun's power. The edicts severely restricted the number contacts with the world outside Japan. It also had the result of centralising control over foreign trade even more into the hands of the bakufu, at the expense of daimyō and merchants. The effects on the overall size of foreign trade might not necessarily have been very large however. According to Innes (1980, 149) the gaps left by the expelled trading groups were filled by the Chinese and Dutch traders. In the early Tokugawa period the Portuguese and shuinjō ships handled most of the trade. After 1635 the amount of trade handled by the Chinese and Dutch increased significantly, first taking advantage of the end of the shuinjō system, and after 1639 enjoying exclusive trading rights. During the 17th century a number of additional trade restrictions were put in place specifically targeting the trade in metals. Between 1637 and 1646 restrictions were put on the export of copper, as the bakufu needed the copper for reminting

copper coins. (Shimada 2006, 12) The dwindling silver deposits caused increasingly tight regulation of the trade of silver. Meanwhile the bakufu tried to depress demand for imported items – which were usually luxury goods – through sumptuary laws. (Innes 1980, 302–7)

In 1685 limits were set on the value of imports. The Chinese were restricted to a value equal to 6000 kanme (22.500 kilograms) of silver. The Dutch could import goods worth 3400 kanme (12.750 kilograms) of silver, of which 400 kanme was reserved for private trade. (Innes 1980, 418–22) In 1715 new, lower quotas were set on the number of Chinese and Dutch ships permitted into Nagasaki, as well as the volume of metal to be exported. In the following years these quotas were at times amended, but the supply of copper was such that in many years these quotas were not met. (Gramlich-Oka 2008, 93–97)

During the 19th century Western powers increased their reach over many parts of the world. The English and French defeated China in the Opium Wars, Russia consolidated its hold over eastern Siberia, and the United States gained access to the Pacific coast. From all these sides, there were attempts to establish trade relations and gain access to the Japanese market. The arrival of Commodore Perry in Edo Bay in 1853 and the concessions he was able to obtain in the following year have been written of exhaustively. The later Tokugawa years before the encounter with Perry are perhaps the period to which the term 'sakoku' can be most fittingly applied. It is only by 1801 that this word is used for the first time. (Tashiro and Videen 1982, 283) As mentioned earlier, the edicts of the first half of the 17th century, while restricting foreign travel, contact and trade partners, did not directly restrict trade volume. Over time the production of precious metals shrank and the self-sufficiency of the Japanese economy increased. This did have a big impact on trade volumes.

### *Mining Monopoly*

The mining of precious metals is of particular interest because of several connected reasons: Silver and copper were the most important export goods during the Tokugawa period, their production was controlled by the shogunate, and it was an industry heavily affected by technological changes during the early modern era.

In Japan a period of technological development started during the second half of the sengoku period (1467-1568), and production of especially silver mines increased strongly. This meant that they were becoming increasingly important strategic assets for the competing warlords. They strived to open up new mines in their own territories or tried to gain control over existing ones in order to pay for their armies. A trend of centralisation is visible in the governance of the mines. During the sengoku period most mines were claimed by daimyo. The three unifiers Oda Nobunaga, Toyotomi Hideyoshi, and Tokugawa Ieyasu all sought possession of the important mining regions. (Asao 1991,

61–64) Hideyoshi took a large step to gain control over the important mines, declaring them “mountains of the state” in 1589-90. (Sasaki 1980, 7) This policy was continued by Tokugawa Ieyasu. Once the Tokugawa shogunate was established, the centralisation of profitable mines into its hands increased its fiscal potential which increased the shogunate's grasp on power.

### *Tax Revenue*

The Shogunate, daimyo domains, and villages and city neighbourhoods all had resources of different kinds. By far the most important source of income for the shogunate was the land tax, collected either in the form of rice or as money. The official land tax rate over the primary sector output between 1650 and 1850 hovered around 35%. (Asao, Uno, and Tanaka 1997, 1332–37) However, it is generally assumed that the official tax rate is an overestimation, due to the fact that the actual production was higher than the official production estimate, which was based on infrequent land surveys. Recent estimates of agricultural output (Fukao et al. 2015, Appendix 1) have come out higher than previously thought. These new estimates assume both higher land productivity at the start of the Tokugawa period, and smoother transitions to the subsequent Meiji-era productivity. The implication of this is that actual tax levels were much lower than the official rates.

Besides the land tax, the shogunate had other sources of income, although on the whole these were more irregular. The shogunate had the authority to issue currency, and in addition the shogunate levied special taxes and contributions for extraordinary expenses. In the few comprehensive shogunate accounts that survive (1730, 1843 and 1844), we see a big shift towards more extraordinary measures in order to keep the budget in the black. In the 1730 shogunate accounts, the land tax revenue made up 80,1% of total revenue, while special purpose taxes made up 18,9% and a further 1,0% consisted of recoinage profits. For the year 1844 the accounts look very different. Yujiro Oguchi explains the difference as a result of both a gradual worsening of Shogunate finances due to increasing stipends and other costs, as well as a costly reconstruction of Edo's main keep after a fire. The sudden costs were financed by reminting profits and a forced loan extracted from merchants in Osaka. As a result, land taxes only made up 43,9% of revenue in that year. (Oguchi 2004) Total revenue increased from 1,74 million koku in 1730 to 2,47 million koku in 1844, or a growth of 42%.

Daimyo had full authority to tax their own domains. Most domain finances were similar to early shogunate finances, with land taxes making up the vast majority of income. Since taxation was the daimyo's prerogative, the bakufu did not keep records of individual domain tax revenue. Therefore, nationwide estimates of tax levels of the daimyo domains are not available until the early Meiji period when an inventory was made of the production and tax income of the daimyo domains.

## *International Comparison*

Comparing Japan with European states in the early modern period, there are a few stark differences. As mentioned in the previous chapter, many descriptions of state development in Europe focus on the role of wars in increasing the organisational and fiscal capacities. Europe endured centuries of systems competition. During this time there was not just competition between methods of taxation and warfare, but also of trade regimes, technologies and ideas.

Japan shows a lot of similarities during the Warring States period. Power was centralised from the samurai to the daimyo and the scale of warfare increased through changes to taxation and recruitment. During the Tokugawa regime, however, patterns diverge. During the first few decades of the shogunate systems competition is restricted at many levels. Citizens are restricted to their social class, daimyo are restricted to their domains, and outside contacts are restricted to limited visits from the Dutch and the Chinese. Even if trade continued apace in the early years of the trade restrictions, the limited exposure of foreigners to Japan and of Japanese to the outside world meant that there were few chances of new opportunities developing outside the existing trade of precious metals for silk. When the outside world did force their way in, Japan was technologically and militarily too far behind to resist. That is the final level of competition, between the closed system of Japan and the relatively open system of the Western powers, and in this competition Japan was not able to resist.

Japan was unable to defend the sovereignty of its trade access despite having in many regards a well organised government. Comparing the revenue gathering ability of the Japanese government with those of European countries, it is striking how similar it was in some respects. Government revenue around 1850 as a percentage of GDP was comparable to that of Holland or Russia, see below. This is even more remarkable considering that in most European states the military was the main expenditure category, and that Japan had a similar level of expenditure despite being at peace for the last few centuries. One of the factors behind the high government spending in Japan is the employment of samurai in non-productive government positions. The next chapter will discuss this issue in greater detail.

Table 1: Government revenue, % of GDP

	Luxembourg (% of income)	Ottoman Empire	Russia	Castile (crown)	Britain	Holland	Japan
1600-1649							
1650-1699				10	1,3-4,4		
1700-1749					7,3-10		
750-1799	16,1	3			8-12	13,5	
1800-1849		5-6			23		
1850-1869		5-6	12			11,5	12
1870-1889							11

Sources: European states: (Yun-Casalilla, O'Brien, and Comín 2012); Japan ca. 1850: see text, Japan 1885: (Ohkawa, Takamatsu, and Yamamoto 1974).

## Chapter 3: Taxes and transfers

The estimate of Japanese government revenue circa 1850 includes shogunate and domain revenue. For the shogunate, there are separate estimates for the land tax revenue (last year 1841) and complete accounts for 1843. The daimyo domains' tax income for 1850 is based on an inventory of the production and tax income of the daimyo domains during 1869-'70. (Hosokawa 1885) Apart from the daimyo domains, there were lands directly controlled by the shogunate (tenryou), by the shogun's bannermen, and a small amount under control of the imperial household. There are production estimates for these components for the end of the 17<sup>th</sup> century. (John Whitney Hall 1991, 152) Based on the rates of growth of production for the daimyo domains between 1698 and 1869-'70, and the daimyo domain tax levels in 1869-'70, it is possible to extrapolate tax revenues for these other areas. The total land tax revenue arrived at by combining these figures comes in at 12,2 million koku (1,8 mln tonnes) of rice. This amount is comparable with the land tax income in 1871-1874, the last years before the land tax was reformed. (Yamamura 1986, 389)

In the tables below the rice amount is converted to silver by contemporary prices to make an international comparison possible. The amount is further converted into per capita values and into days of urban unskilled wage equivalents. The resulting comparison with some of the leading nations in the world shows that total revenue at the disposal of the Japanese government was a little under half of Chinese imperial government income, and about 1/10th of English revenue. In per capita terms, England was equally far ahead, while Chinese per capita revenue was much less. Looking at the days of unskilled labour equivalents, we see that the tax pressure was higher in Japan than in England, and much more so in China.

Table 2: Government revenue, tons of silver

		China	Ottoman	Russia	France	Spain	England	Dutch Republic	Japan
1650	1699	940	248		851	243	239		
1700	1749	1304	294	155	932	312	632	310	
1750	1799	1229	263	492	1612	618	1370	350	
1800	1849	1367					6156		
1850	1899	2651					10941		1160

Table 3: Per capita revenue, grams of silver

		China	Ottoman	Russia	France	Spain	England	Dutch Republic	Japan
1650	1699	7	11,8		46	35,8	45,1		
1700	1749	7,2	15,5	6,4	46,6	41,6	93,5	161	
1750	1799	4,2	12,9	21	66,4	63,1	158,4	170,7	
1800	1849	3,4					303,8		
1850	1899	7					344,1		36

Table 4: Per capita revenue in days of urban unskilled wages

		China	Ottoman	Russia	France	Spain	England	Dutch Republic	Japan
1650	1699		1,7		8	7,7	4,2	13,6	
1700	1749	2,26	2,6	6,4	6,7	4,6	8,9	24,1	
1750	1799	1,32	2	8,3	11,4	10	12,6	22,8	
1800	1849	1,23					17,2		
1850	1899	1,99					19,4		35

Sources: (Ma 2011, Table 1) Japan: See text for description of tax level, rice price: (Iwahashi 1981); Population: (Fukao et al. 2015) Wages: (Bassino and Ma 2006).

A question naturally emerges from these facts: what was the reason for this relatively high tax pressure? While European countries had high military expenditures, Japan was mostly at peace. One hypothesis is that the employment of samurai drove up government budgets. In a forthcoming paper, I have calculated the overpayment of samurai by comparing levels of government spending and services between the late Tokugawa and early Meiji period. I have calculated these samurai rents to constitute at least 16% of government spending in 1850, but more likely upwards of 30%. These rents took on several different forms. There were the samurai bureaucrats who worked short, possibly unproductive hours for a full compensation. Only the samurai of high rank or those in a high position



in the bureaucracy benefited financially. Most samurai had a relatively meagre stipend, and were faced with rising expenses. The more egregious waste was to be found in higher echelons of the bureaucracy and in the system of alternate attendance, as well as in the private expenses of daimyo on the people's expense.

In the context of taxation and the power of the state, the Tokugawa government could be considered to be too powerful, able to tax its population to an extent not reflected in the public goods it provided. Another way of viewing the system is as a means of keeping the county at peace. After all, the institutions devised by Hideyoshi and Tokugawa Ieyasu that are responsible for some of the waste were probably, at least in part, aimed at keeping the different classes from rebelling against their overlord. The alternate attendance system and the incorporation of large numbers of bureaucrats are the obvious examples.

## **Chapter 4: Precious Metals**

The Japanese precious metals sector is of importance partly due to its role as an export sector, and partly as the source of government revenue and currency. In this chapter we will look at the effect of government institutions on the performance of this sector.

After the Spanish gained access to the mineral wealth of the Americas, for the first time a truly world-wide system of trade emerged, with silver flowing across both the Atlantic and the Pacific Oceans to Europe and Asia. (Dennis O. Flynn and Giráldez 1995) Japan played an important part in this system as the largest silver producer outside the Spanish Empire around the year 1600, and a leading copper producer thereafter. This position attracted significant attention from European trade powers and Chinese merchants.

The significance of Japanese precious metal production and export during the Tokugawa period has not escaped scholarly attention. The mining sector has predominantly been studied by Japanese researchers. The trade dimension has been studied by various researchers from both within and outside of Japan, including research focussed on the main trading partners of Japan. The different viewpoints from which this subject has been approached has led to wide-ranging estimates of the production and trade of precious metals during the Tokugawa period, particularly for silver. The objectives of this chapter are twofold. Firstly, to give an improved account of production and trade estimates, and secondly, to see what the effect has been of international trade regulations.

In this paper, my approach will be to confront the supply and demand sides for silver (I have done similar exercises for copper and gold in a forthcoming paper). Where possible data for production, imports, exports and domestic use have been compared to arrive at consistent estimates. A comprehensive evaluation of this type of data is currently lacking regarding the entire length of the

Tokugawa period. For this study a new approach has been used to interpolate production data for the largest silver mines to check against the demand side data.

### *Institutional setting*

As mentioned above, the shogunate reserved the right to confiscate a mine and its revenue if it so wished. In practice, the ownership and control arrangements varied considerably. The shogunate officials in charge of government mines, would subcontract the work to miners, who would either pay the government official a fixed fee for a concession, or make an output sharing agreement. For big, profitable mines these concessions could be very limited in time and scope. In the case of the rich Innai silver mine, shortly after its opening in 1603 there were 36 different contractors operating simultaneously, some under concessions as short as 10 days. It cannot be a surprise that these arrangements would lead to suboptimal situations. Long-term planning and investment by the owner became more important as mines got older and less rich in ore, necessitating deeper mines. This situation also put pressure on mining profits, leading to falling government shares of the output. In shogunate-controlled gold and silver mines, the government share of gross output was in the range of 25% to 50%. The higher government shares would most likely only apply during the earliest, most profitable years of operation of a mine. When the mine output levels declined the operation would no longer be able to afford such high royalty payments. (Innes 1980, 546–58)

### *Technology*

Japanese silver and gold production grew substantially during the 16th century, according to most accounts as a result of improved refining techniques. In 1533 a merchant who had recently reopened the Ōmori mine, brought in two Korean mining experts. They introduced the *haifuki* or cupellation method by which silver (as well as gold) can be separated from the other metals with which it is often mixed, such as lead. Another refining improvement was the *nanban-fuki*<sup>4</sup> technique for separating silver and copper, taught to local copper refineries by the Spanish or Portuguese around 1600. (Innes 1980)

In contrast to refining, techniques for digging up the ore did not improve fundamentally. Through the improvement of metalworking, bigger hammers and harder chisels became available, improving the efficiency of miners. (Nagahara and Yamamura 1988, 80) However, there seems to have been a strong preference for manual labour. As late as 1907 mechanical mining (use of rock drills and

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<sup>4</sup> *Nanban* means 'southern barbarian', a contemporary term for the Portuguese and Spanish. The stem of *fuki* (吹) means 'to blow'.

similar) was virtually non-existent in Japan. In that year, at 35 large mines 98% of mining output was achieved with hammer and chisel. (Sasaki 1980, 14)

One of the biggest challenges was to drain water from the lower areas of the mines. At the time, Japanese mines used manpower almost exclusively. Various manual tools were used to this end, including buckets and manual piston pumps. The Sado gold mine used efficient double-action Dutch pumps for a short while from 1782, but reverted back to older methods because of the maintenance requirements. (Nagase-Reimer 2013, 32–36) The Dutch again attempted to import a pump in 1825. However, the Japanese concluded that such a machine was not as effective as intensive use of human labour. (Shimada 2006, 52). The transport of the ore to the surface was also done manually. With few straight vertical or horizontal tunnels there was little opportunity to use transport equipment to move ore to the entrance of the mine. Ore had to be carried on the miners' backs.

In contrast, European and American mining used animal, water and later steam power to do the heavy lifting. The Spanish mine at Potosí in South America used tens of thousands of mules and llamas for their labour. (Moore 2010) In the 18th century, English mines pioneered the use of steam power for drainage. The great Swedish copper mine at Falun in the 17th century used both animal and hydro power for extraction of water and ore. Ulf Sundberg (1991) has analysed the energy flows of this last mine, showing that perhaps only one third of the power used at the mine was manual.

Other clues can be taken from the people that first tried to implement Western mining techniques in Japan. When foreign engineers were hired to modernize the industry after the opening up of the country they analysed the shortcomings of the existing system. The single biggest obstacle they identified was the subcontracting system inherited from the Tokugawa period. (Yoshiki 1980, 18–22) Another circumstance undermining the mechanisation of the mining sector was the low cost of labour. An interesting anecdote is provided by J.H. Gubbins, who in the early 1870s visited the Aikawa mining town on Sado island. He describes it as a poor town where labour is “absurdly cheap”. Three years before his visit, a tramway was built to transport ore from the mine to the town but the service had discontinued. As he put it:

*“Owing to the carelessness and ignorance of those in charge of the tramways, accidents were of constant occurrence, and moreover, labour being so cheap, it was found to be just as economical to employ manual labour”.* (1884, 87)

In addition, the transport of ore was an important occupation for the local women, making the tramway unpopular.<sup>5</sup>

In the 1870's the Japanese government employed the American geologist Benjamin Smith Lyman to perform a geological survey of Japan, focussing on oil and mineral deposits. Lyman noted the opportunities and difficulties of introducing labour-saving technologies:

*“It seems pretty certain that, in many cases at least, there would be decided economy in making use of horse power (with a gin) or water power in digging the oil wells; since so large a portion of the power required is applied in so purely mechanical a way. Nevertheless the cost of the capital needed and the expense of repairs to machinery make it advisable to begin experiments in that direction rather cautiously. I am more than ever of the opinion that the setting up of steam engines and boring machines would be unprofitable; for the experiment has had now for a year or more a long trial in Kubikigōri in Echigo... Although the well proved to be in an exceptionally favorable place, the progress of the work was slow and expensive on the whole, and pieces of the apparatus had to be sent for repairs to this city, some two hundred miles.”* (Lyman 1879, 13)

The limited availability and know-how of the more advanced machinery – even in the years after the opening of the country – illustrate the technological disadvantage suffered from the isolation policy. It is interesting, however, that the report also mentions the underutilisation of more traditional labour-saving techniques that should have been well inside the technical capabilities of the contemporary Japanese craftsmen. Lyman noted that the cost of a horse and driver were only about double that of one worker, and still costs remained prohibitive in many situations. In addition, power from small water mills was used in villages to pound and clean rice, but larger applications were uncommon. Lyman supposed this was because of unfamiliarity with the building of large dams and gathering larger sums of capital. (Lyman 1879, 9–16) These observations suggest that the large scale of mining operations might have been an obstacle for mechanisation.

## *International Trade*

As mentioned before, one of the main uses of precious metals was as an export commodity. Although detailed accounts of the goods carried to Japan are very fragmented, by all available accounts silk made up the bulk of the imports from before the start of the Tokugawa period, and it mostly originated in China. Initially the Portuguese were ideally situated to supply silk from Macao

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<sup>5</sup> The mine was operating at a loss. This was partly due to the increasing problem of drainage, which had caused the miners to abandon parts of the mine and made the remaining tunnels more and more difficult to work in without modern equipment. Moreover the organisational overhead seems to have been very large due to nepotism.

to Nagasaki. A Dutch observer in Macao wrote “the commodity taken from Macao to Japan is silk, while only silver is brought from Japan”. (Von Glahn 1996, 126) By the second half of the 16th century the trade of Japanese silver for Chinese silk seems to have been established. Around this time silver began transforming and integrating trade on a global scale. The Spanish mines in the Americas were producing unprecedented amounts of silver, an estimated 368 tonnes per year in the first half of the 17th century. Much of this silver flowed naturally to Spain. However, considerable amounts were re-exported to South and East Asia, or shipped there from the Americas across the Pacific Ocean. China in particular imported an estimated 7.300 tonnes of silver between 1550 and 1645, about half of which came from Japan. (Findlay and O’Rourke 2007, 214–18)

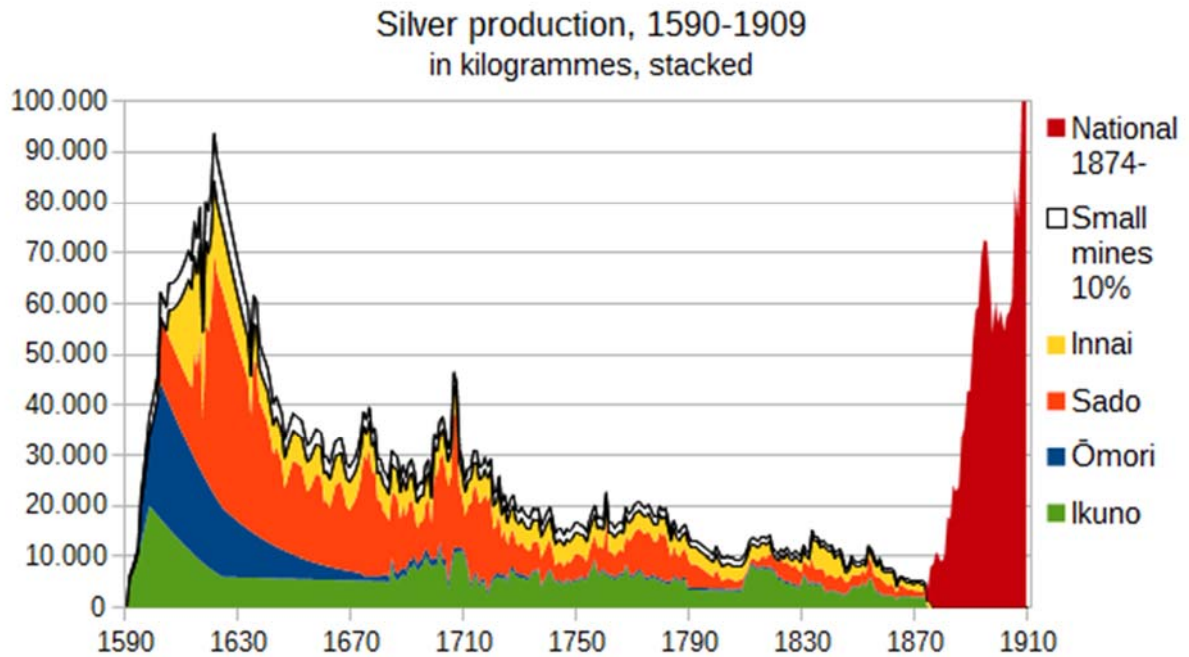
The Chinese demand for silver stemmed from several factors. Firstly, since the 11th century the Chinese economy had relied in part on paper money for its money supply. When this system gradually came undone during the 14th and 15th centuries there was a chronic shortage in the supply of money. This shortage was exacerbated by a large and fast-growing economy. The low amount of domestic production of monetary metal was not enough to cope with these trends. Moreover, the Chinese government began to demand tax payments in silver, with a big push towards this goal in the middle of the 16th century. (Dennis O. Flynn and Giraldez 1994, 71–72)

On the supply side of the silver trade, the Japanese mines' production was in decline in the second half of the 17th century. Silver began to be replaced as the principal export from the 1660s, initially by gold but eventually by copper. During the waning years of Japanese silver production efforts increased to divert the flow of silver from export to internal use. The high level of silver exports, at a time of decreasing production, was threatening the internal money supply. Apart from the practical considerations, there were also ideological motivations, similar to the bullionism, that gained some standing in Europe at the time. In order to prevent the outflow of precious metals, shogunal adviser Arai Hakuseki stressed self-sufficiency in the production of silk, cotton and other goods. This way the export of metals could be decreased while maintaining employment in the garment sector. (Tatsuya and Bolitho 1991) In the longer term self-sufficiency efforts did pay off, as Japan was able to supply itself with sufficient amounts of silk by the second half of the 18th century. (Shimada 2006, 60) While silk imports decreased, sugar imports grew to take up its place as the most important import item. Here too though, import substitution took place and by the early 19th century cheap domestic sugar production drove imports from the market. (Shimbo and Hasegawa 2004, 168)

## *Silver production*

Estimates of national silver output during the Tokugawa period are generally based on export data. Nevertheless, one of the most cited numbers regarding the size of the Japanese silver output is based on production data and comes from Kobata Atsushi. He used a figure of 30 tonnes in annual fees, paid to the local governor of Sado island, around 1620 to arrive at a production estimate for the island of 60 to 90 tonnes – reflecting royalty rates of 33,3%-50%. He also notes royalty payments by mines at Ikuno and Iwami of 10 and 12 tonnes. Based on this material, he makes, in his own words, “a bold conjecture” of annual exports of 200 tonnes in the early 1600s, which he supposed lasted for roughly a century. (1965, 248) While this number of 200 tonnes is often quoted, there are some problems with the estimate. For one the estimated peak production at Sado is higher than reported by some other sources as quoted below. A much bigger problem with these numbers is the assumption that this level of production was sustained for an entire century. All indications based on mine production and royalty payment information point to a pattern of very pronounced peaks followed by longer periods of much lower production. The three mines mentioned by Kobata did not even experience those peak levels at the same point in time. Therefore, it is highly doubtful that a production level of 200 tonnes was reached, much less maintained. However, Kobata's is the only national silver production estimate for the period, as other estimates are based on demand-side data. For this reason, a new interpolation approach will be used, based on the available data from the four biggest producers. The four biggest silver mines of the Tokugawa period all reached peak output in a relatively short time from around the turn of the 17th century to 1630. Given the volatility of output throughout this period, it is very difficult to estimate yearly production levels for it. Although peak royalty levels and some indications for other periods are available, the data for the period as a whole are far from complete.

In an effort to overcome this problem, this section will present a model for the estimation of output for each of the four big mines. This model is based on the level of peak royalty output and a plausible development path based on the remaining available data. I will use the set of data on the Sado mine, which is almost complete, to infer a pattern of development that can be applied to the other mines as well. The data on the Sado mine is complete enough to form a generalised picture of the successive stages the mine went through in terms of the size of its royalty payments. The assumption is that the other mines had a similar trajectory of development, given that they were operating in similar institutional and technological circumstances that influenced their development. The size of each mine's output is scaled to the height of peak royalty payments. Where data shows a different pattern, the pattern of development is adjusted to take this into account.



*Figure 1: Silver production data combined with model estimates*

*Sources: Ikuno: 1598: (Sasaki 1983, 184) 1683-1788, 1809-1837, 1839-1857, 1863: (Kobata 1954, 20, 40-41) Innai: 1819-1875: (Yoshiki 1980, 1); Ōmori: 1590-1594, 1602, 1681-1857: (Kobata 1956, 64-65), 1673: (Sasaki 1983, 183) 1674-1680: (Innes 1980, 555) Sado: 1602-1613: (Innes 1980, 557); 1614-1623, 1634-1867: (Sasaki 1983, 182); National 1874-: (Shinohara 1972 Table 51); Small mines output: 10% of total including production data.*

Using the development of the Sado mine three different stages are identified: a boom, a decline and a tail. The period of highest output consists of the initial boom, the peak and the decline of output. In the case of Sado, the boom lasted for 8 years and the decline took 26 years. The 'tail' is a period of low output and only a very gradual decline that was sustained for over two centuries. The model itself consists of 3 equations expressed in relation to the peak royalty payments and visually fitted to the available data points. For the fit of the individual mine outputs, please see the appendix.

With these series of royalty estimates in hand, the next step is to use these to estimate production levels. According to accounts from bakufu controlled mines the share of royalties in the total output varied from 50% in the higher output years, down to 25% in the lower output years. (Innes 1980, 555) We can infer that production was about twice the royalty amount in the peak years and about four times the royalty payments in low production years. The actual formula used in the calculation of the final series is in the appendix.

It should be stressed that this method will not give an exact answer on the development of production. It is meant as a projection of development that is consistent with the available pieces of evidence. It should be seen as an indication of the order of magnitude of actual production. It is a

useful sketch of the development of silver production that can be confronted with demand-side data to see if those assumptions were realistic.

### *Silver use*

As described in the section on foreign trade, silver was the main export product of Japan during the late 16th and early 17th centuries. The exact size of this trade is the subject of some debate. One group of researchers suggests relatively high silver exports. The estimate of 200 tonnes per year for the 17th century by Kobata has already been mentioned. Another often quoted source is Iwao Seiichi, who combined estimates of the quantities exported to by the separate carriers during the early 17th century.<sup>6</sup> Converted to 93% purity, his total comes to 140 to nearly 180 tonnes per year. (Iwao 1966, 222–23) Based on this data, Shimbo Hiroshi and Hasegawa Akira (2004, 167) estimate that in the early 17th century silver exports represented a value equal to around 10% of agricultural output. Yamamura & Kamiki have used supplemental information from Iwao's and other sources to come to their own estimates for the late 16th and early 17th centuries. For the former period they come to exports of around 40 tonnes per year, while for the latter they suppose exports of 150 to almost 190 tonnes per year. (Yamamura and Kamiki 1983, 351–52) These estimates are summarised in Table 5.

Several other researchers come to quite different, lower estimates. George Bryan Souza used the numbers and types of ships that made the voyages between Macao and Japan to estimate Portuguese silver exports from Japan to China. He arrived at 14,9 to 18,3 tonnes per year during the period 1546-1597. (Souza 2004, 56) For the first half of the 17th century, Richard Von Glahn has estimated silver exports by using the value of total external trade, taken from Innes and quoted in Table 1. Based on VOC accounts for particular years, Von Glahn estimated that at least 80% of the value of the imports was traded for silver. By this method he arrived at yearly silver exports between 1601 and 1645 of 54 tonnes; that is about a third of the figures proposed by Iwao and Yamamura & Kamiki. (Von Glahn 1996, 136)

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<sup>6</sup>Iwao himself is somewhat vague about the period his estimates refer to. Others have interpreted his figures to apply to the years 1596-1623 (Shimbo and Hasegawa 2004, 166–67) or 1615-25 (Souza 2004, 58). The widest plausible limits of the applicable period are the start of the shuinjō system in the 1590s and the start of seclusion in 1639.



Table 5: Estimates of silver export from Japan to China by carrier, in tonnes per year

	Iwao <sup>7</sup> early 17 <sup>th</sup> C.	Y&K 1560-1599	Y&K 1600-1639	Von Glahn 1550-1600	Von Glahn 1601-1645
Portuguese	48 – 57	22,5 – 37,5	45,0 – 56,25	14,5 – 18,0	14,4
Chinese	38 – 49			8,8	13,3
Shuinjō	43 – 53	11,25*		?	18,7
Dutch	13 – 19	-		-	7,6
Total	141 – 177	33,75 – 48,75	150,0 – 187,5	23,3 – 26,8+	54,0+

Sources: (Iwao 1966, 222–23; Von Glahn 1996, 140; Yamamura and Kamiki 1983, 351–52). All figures 93% pure. Totals may differ from individual values due to rounding.

\*Together with Chinese traders.

According to Von Glahn and Innes, the figures by Iwao, Kobata and Yamamura & Kamiki are overestimations of the actual silver exports, because those researchers used each carrier's top years for their estimates of the period. This can lead to very different outcomes, as the export amounts of the traders were very changeable. The Portuguese, Chinese, Dutch and Japanese traders were all competing with each other for trade. The availability of ships, capital, and merchandise, the incidence of shipwrecks, and temporary bans of trade upon certain carriers all influenced the trade volume of the individual carriers and their relative dominance during the years.

Export was not the only destination for the silver produced in the Tokugawa period, as large amounts ended up in the money supply. The gradual commercialisation and monetisation of the economy during this period has been extensively documented. See for instance Hayami et al. (2004) During the Tokugawa era both the volume and purity of silver coins varied greatly from period to period. There was a general tendency for coins to become less pure, as the shogunate was given to temptation to augment their income by currency devaluation.

For most of the Tokugawa period the money supply absorbed more and more silver. However, according to these calculations, during 1710-1714 and 1818-1854 there was a net extraction of silver from the money supply. These years line up with known periods during which the shogunate used its minting monopoly to support the budget. (Miyamoto 2004a; Miyamoto 2004b)

<sup>7</sup>Iwao gives estimate of total export in pure silver and figures per carrier in coin quality silver, apparently using a range of possible purities to arrive at a wider estimate range for the level of the total in pure silver. The carrier figures have been back-calculated to be consistent with the total, both at 93% purity.

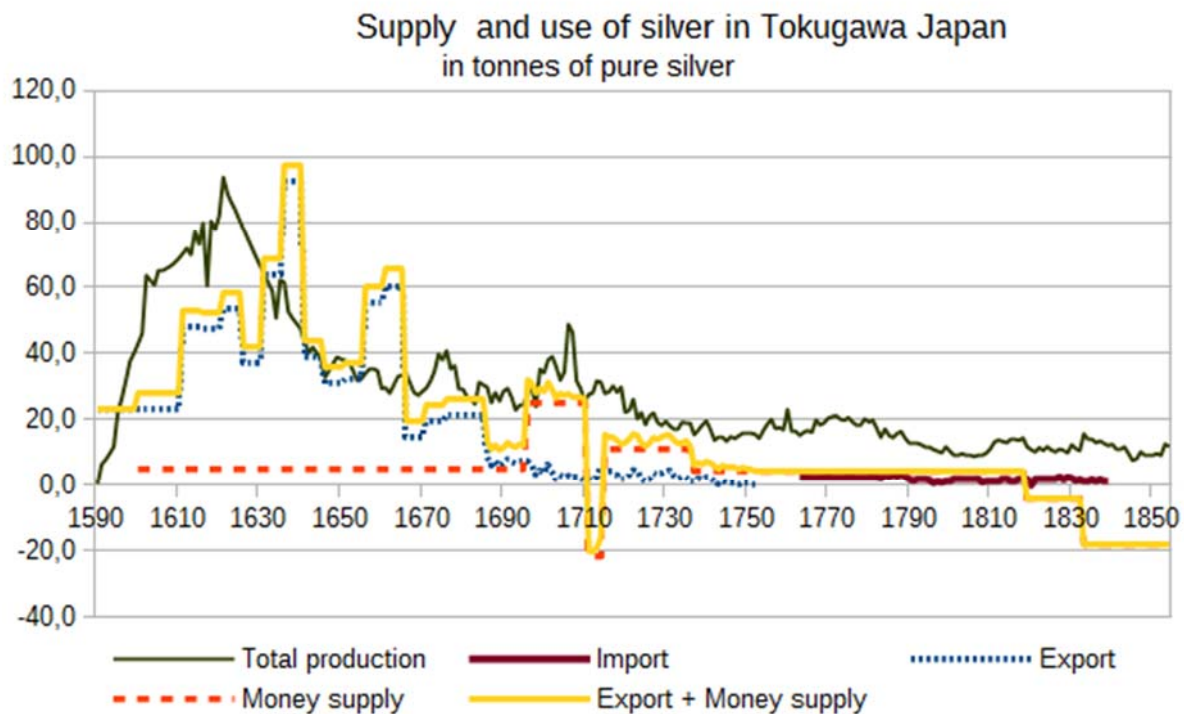


Figure 2: Supply and use of silver in Tokugawa Japan

Sources: Production: see Figure 1; Import: 1763-1782: (Uchida 1921, 1:456–57), after 1782: fixed rate to copper exports; Export: 1590-1685: (Von Glahn 1996, 140, 232), 1686-1752: (Tashiro 1981, 325; Tashiro 1989 Table 1); Money supply: (Yamaguchi 1963); (Nishikawa 2000, 8); (Taya 1963, 388)

The figure above shows the estimates of production and imports together with those of exports and use in the silver supply. These make up the known sources of supply and demand of silver in Tokugawa Japan. One thing that strikes an observer of this graph is the peak in silver exports occurs after the peak in production. This is to be expected, as a large part of the silver was first made into coin, possibly spent some time in circulation, and was only then exported. In addition, the production of coins would be likely be focussed mostly in the early years of the period of issue, for instance in the early 1600s, while in the calculations the use of silver is assumed to be spread equally. A second period of high production relative to observed consumption is when exports of silver were at a low level in the 18th and 19th centuries. Given the impact of the casting of coin on silver consumption in certain periods, and the uncertain spread of currency issue over the time span of currency regimes, it is best to compare the supply and use of silver based on the currency regime periods. The 1600 to 1695 time span includes the period of highest production and export, resulting in excess supply of 568 tonnes, or 5,9 tonnes per year.

For the interpretation of these results there are a few possibilities to keep in mind. Firstly, the production estimates may be too high. The production estimates are speculative, although data availability differs per period. Secondly, there is more use of silver than shown here. There was likely illicit trade taking place between Japan and China during certain periods of the Tokugawa period. The domestic market would have absorbed a certain amount of silver in decorative and household objects. Unfortunately, estimates of domestic consumption are not available. From qualitative accounts it appears there was a growing market for luxury decorations and objects, to the degree that successive shogun found it necessary to increasingly restrict the type of materials people of different social classes could use.(Shively 1964)

### *International comparison*

International silver output before the 18th century is based on summarized data of silver production by C.W. Merrill (1930). He estimated Japanese silver production by looking at exports by Dutch, Portuguese and English traders – not including Chinese traders. With this method, he arrives at an estimate of two tonnes per year for the 17th century; less than half the estimate used in this paper. The three largest producers during this period were all Spanish possessions. Among them, Bolivia had the highest output, reaching over 200 tonnes per year from 1601 to 1620. In comparison, Japan during the 20 years around its peak (1611-1630) produced 77 tonnes of silver per year on average. Even by Merrill's underestimated output, Japan was the fourth-largest silver producer during the 17th century. Using the estimates from this paper, Japan might have held on to that ranking for the 18th century as well, although Mexico was by then a very dominant producer with an output of 500 tonnes per year. During the 19th century, The United States achieved production on a similar scale to Mexico. After the Meiji period, Japan quickly increased production and surpassed the previous peak, reaching 2%-3% of total world output by the 1910's.

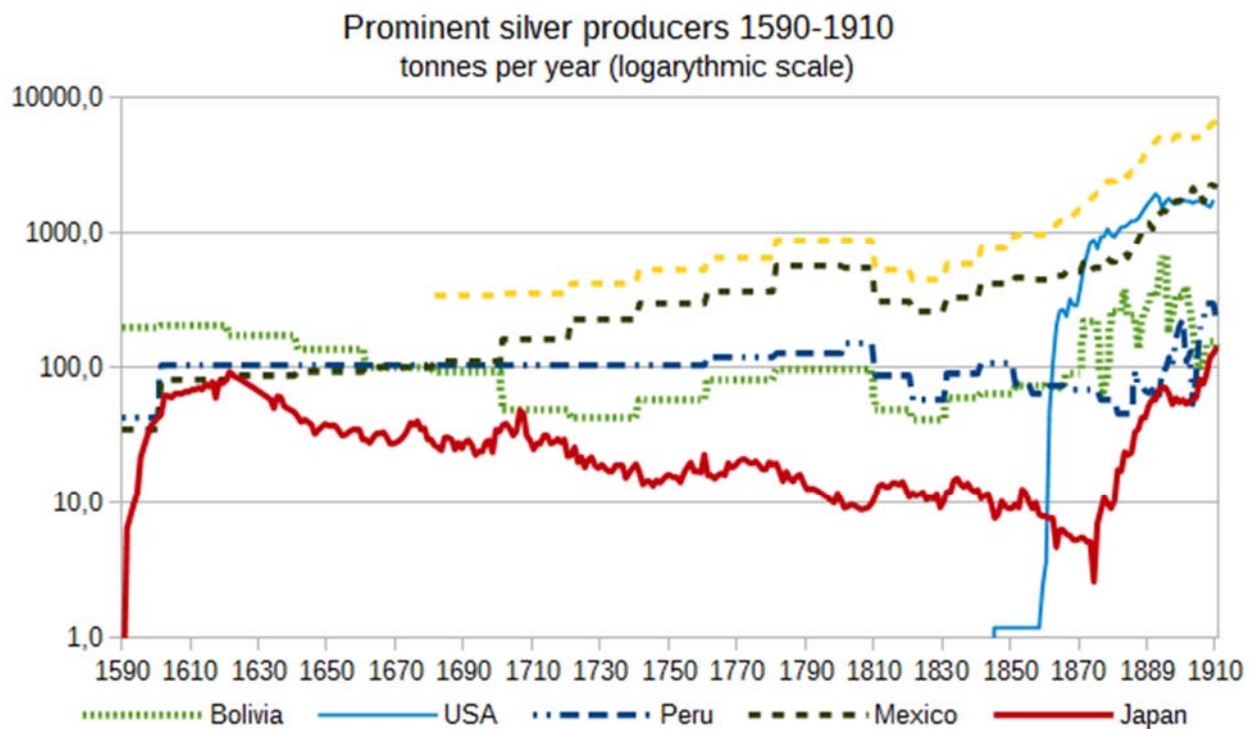


Figure 3: Prominent early modern silver producers

Sources: Japan: 1590-1873: See Figure 1, 1874-1910: (Shinohara 1972, Table 51), others: (Schmitz 1979, 143–59; Merrill 1930, 29, 36, 40)

## Conclusion

The production and subsequent trade in precious metals was heavily influenced by trade policy. However, in contrast to the word 'sakoku', usually used to describe Japanese international policy of the time, Japan was not entirely closed off. Trade policy and the size and composition of imports and exports changed significantly over time. Previous work by Innes (1980) shows that for the first half of the Tokugawa period total foreign trade did not markedly decrease after the restriction of Nagasaki trade to the Chinese and Dutch. Silver production did, however, show a sharp decrease after the 1630s. From the 18<sup>th</sup> century new export quotas reduced the export of copper, although over time supply failed to meet even these lower maximum amounts. This coincided with increasing import substitution, first of silk and later of sugar.

In the early Meiji period the mining industry experienced a boom. This was most pronounced for copper and coal, but silver output also surpassed their Tokugawa period peaks. This boom period seems a response to the opening up of the country. The primary effect of the sakoku trade restrictions was to reduce the number of trade partners. Although volume or value restrictions were in place at times, these were frequently higher than production capacity, especially later in the Tokugawa period. Consequently, the effect of opening up the country is more likely to be related to the increase in

number of trade partners than a relaxation in trade volume restrictions. A second effect is the freedom of movement of people and knowledge. The mining experts hired by the Japanese government and mining companies were able to transform the production capabilities of Japanese mines remarkably.

## **Concluding Remarks**

The Japanese government institutions of the Tokugawa period took a vastly different direction than those in Europe. Where European states were drawn into competition through war and trade, Japan became increasingly disconnected from the outside world. By the end of the Tokugawa period, the shogunate had become powerless to stop the outside world from entering by force. The Tokugawa shogunate did not just try to restrict outside competition, it also restricted societal change. People were prohibited to change from one class of society to another, including the samurai caste, which was bound to serve their lord, even though there were no battles to fight and little else to do. Their number did drain the government budget, but provided little in the form of government services nor national protection. However, the European militaries could be accused of the same thing. If one looks at the world of 1700 without the benefit of hindsight, could one say, with any certainty, that the European system was preferable? Or does the Japanese system of peace and stability at the cost of certain restrictions offer a better life for its people, and a better chance for growth? With hindsight however, we can see in which direction the European system led. Its high military spending spurred the growth of government, increasing bargaining power and inclusion for the populace.

The other angle of competition was international trade. Despite Japan's well-known trade limitations, probably the most influential restrictions on outside contact were the limits to ideas and information. The exports of precious metals did not suffer immediately from trade restrictions, but over time, the lack of access to international mining expertise and new trading opportunities arguably had a bigger effect. It meant that Japanese mines prematurely became uneconomical to run, and that no substitute export good revealed itself, nor was there large demand for foreign imports. In the end the biggest difference between Japan's closed system and the West's open system might have been the openness to new ideas and communication.

By detailing the implications of some of the Tokugawa institutions, I hope I have provided some evidence that these institutions have been important in shaping the economic development of Japan. I also hope to have added some insight into the determinants of institutions by looking at this subject through the lens of 'systems competition'.

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## Appendix: Silver Production

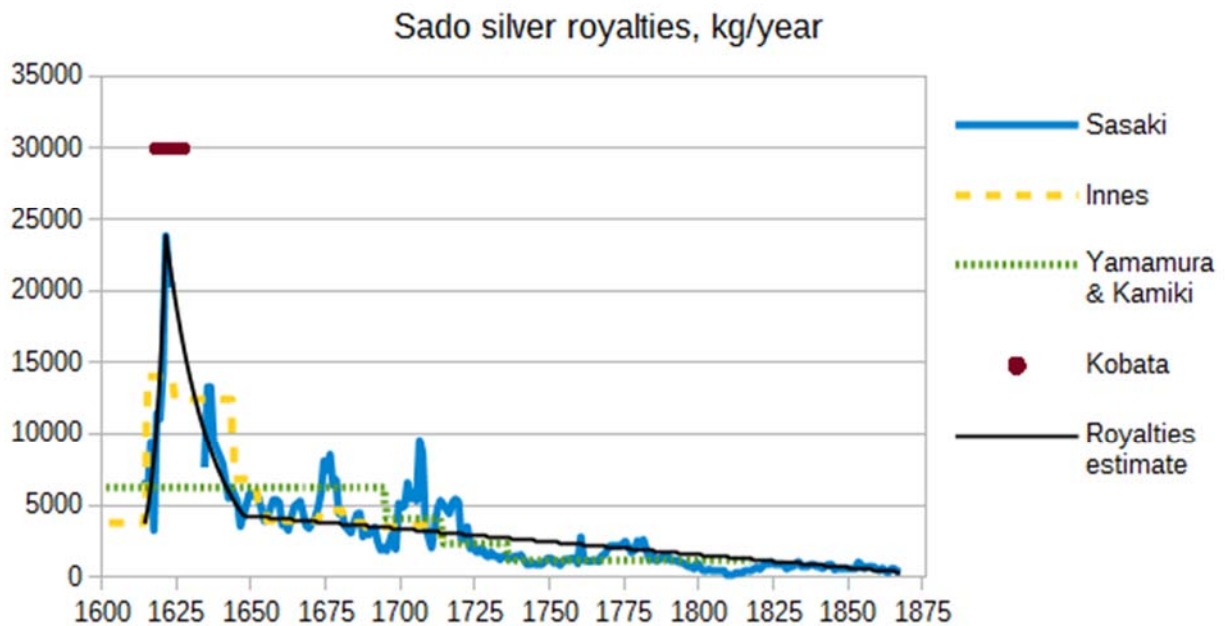


Figure 4: Sado silver royalties

Sources: (Sasaki 1983, 183); (Kobata 1965, 248); (Innes 1980, 557); (Yamamura and Kamiki 1983, 345)

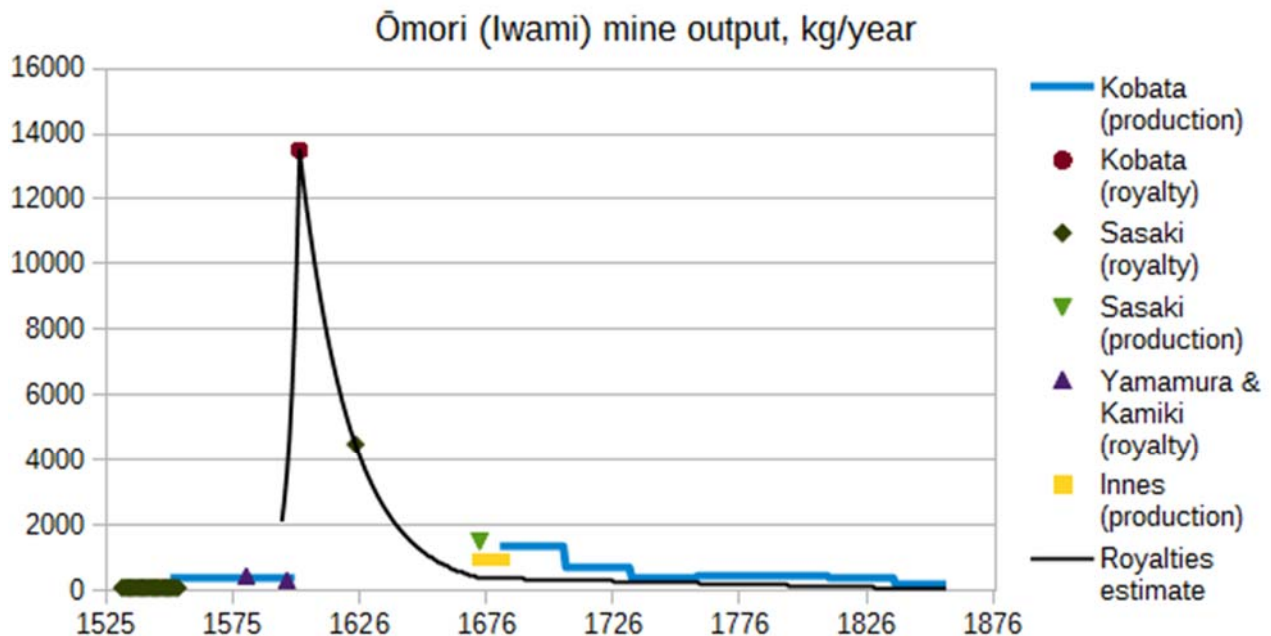


Figure 5: Ōmori silver output

Sources: (Sasaki 1983, 183) (Yamamura and Kamiki 1983, 343); (Kobata 1956, 64–65); (Innes 1980, 555)

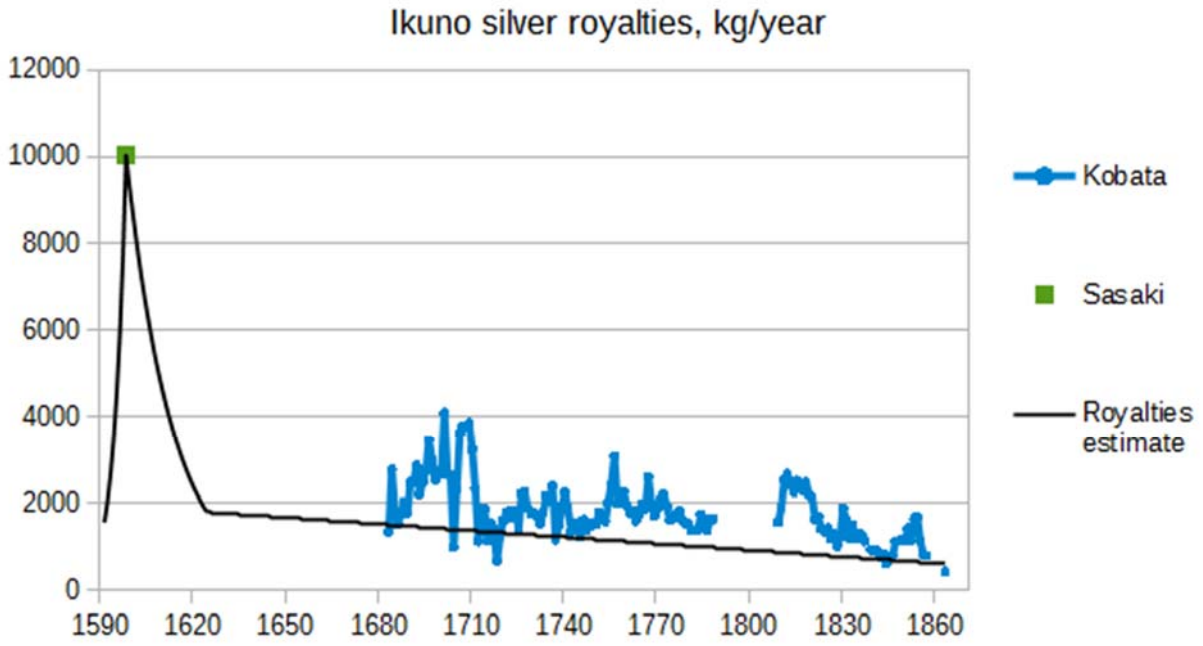


Figure 6: Ikuno silver royalties

Sources: (Kobata 1954, 20, 40, 41); (Sasaki 1983, 184)

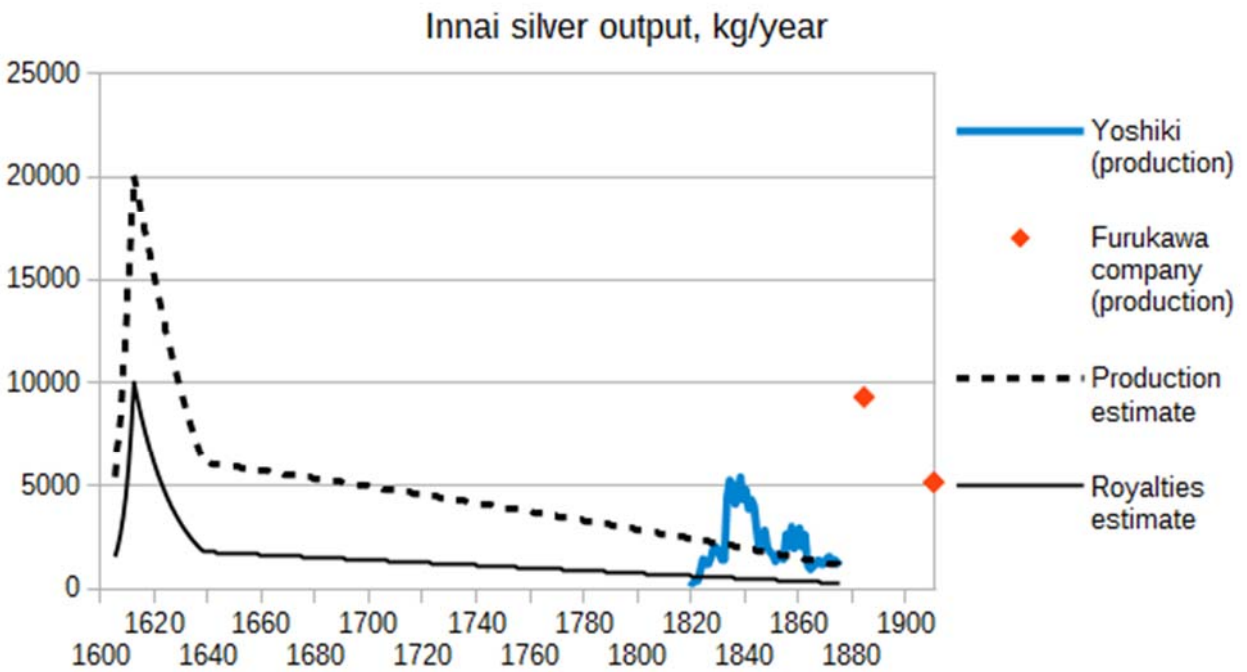


Figure 7: Innai silver output

Sources: (Yoshiki 1980, 1); (Furukawa Mining Company 1910, 51)

Table 6: Silver royalty estimates under assumption of 3-stage development

Mine/Stage	Type of change	Period	Royalty level at end of period	Observation
<b>Sado</b>				
Boom	Exponential growth	1614-1621	23 865	Royalty payment
Decline	Exponential decay	1622-1647	4 292	Royalty payment
Tail	Linear decay	1648-1867	349	Royalty payment
<b>Ōmori</b>				
Boom	Exponential growth	1589-1596	13 500	Royalty payment
Decline	Exponential decay	1597-1673	387	Production level
Tail	Linear decline	1674-1857	40	Production level
<b>Ikuno</b>				
Boom	Exponential growth	1591-1598	10 040	Royalty payment
Decline	Exponential decay	1599-1632	1 806	
Tail	Linear decline	1633-1863	617	Royalty payment*
<b>Innai</b>				
Boom	Exponential growth	1605-1612	10 040	Assumed = Ikuno
Decline	Exponential decay	1613-1638	1 806	Assumed = Ikuno
Tail	Linear decline	1639-1875	296	Production level

\*Average of final two observations

The following equations describe the model for development of royalty payments:

**Sado:**  $Y_{\text{peak}} = 23\ 865\ \text{kg}$

$$\text{Boom (t=0;7): } Y_t = 0,15604 * Y_{\text{peak}} * (1+0,30392)^t \quad (2)$$

$$\text{Decline (t=8;33): } Y_t = Y_{\text{peak}} * (1-0,06386)^{t-7} \quad (3)$$

$$\text{Tail (t=34;253): } Y_t = 0,17984 * Y_{\text{peak}} * (1-0,00418 * (t-33)) \quad (4)$$

**Ömori:**  $Y_{\text{peak}} = 13\ 500$

$$\text{Boom (t=0;7): } Y_t = 0,15604 * Y_{\text{peak}} * (1+0,30392)^t \quad (5)$$

$$\text{Decline (t=8;84): } Y_t = Y_{\text{peak}} * (1-0,04509)^{t-7} \quad (6)$$

$$\text{Tail (t=85;268): } Y_t = 0,02865 * Y_{\text{peak}} * (1-0,00487 * (t-84)) \quad (7)$$

**Ikuno:**  $Y_{\text{peak}} = 10\ 040$

$$\text{Boom (t=0;7): } Y_t = 0,15604 * Y_{\text{peak}} * (1+0,30392)^t \quad (8)$$

$$\text{Decline (t=8;33): } Y_t = Y_{\text{peak}} * (1-0,06386)^{t-7} \quad (9)$$

$$\text{Tail (t=34;272): } Y_t = 0,17984 * Y_{\text{peak}} * (1-0,00276 * (t-33)) \quad (10)$$

**Innai:**  $Y_{\text{peak}} = 10\ 040$

$$\text{Boom (t=0;7): } Y_t = 0,15604 * Y_{\text{peak}} * (1+0,30392)^t \quad (11)$$

$$\text{Decline (t=8;33): } Y_t = Y_{\text{peak}} * (1-0,06386)^{t-7} \quad (12)$$

$$\text{Tail (t=34;270): } Y_t = 0,17984 * Y_{\text{peak}} * (1-0,00353 * (t-33)) \quad (13)$$

**Royalty/Production relationship:**

$$\text{Royalty share of production in period t: } R_t = 0,25 + 0,25 * Y_t / Y_{\text{peak}} \quad (14)$$