8 Inventing in a World of Guilds: Silk Fabrics in Eighteenth-century Lyon

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This chapter examines the production of silk brocades in Lyon in the eighteenth century through the technical possibilities and skills that underpinned inventiveness, the social status of inventive artisans, and the policy of innovation that the powerful silk guild known as the Grande Fabrique developed in tune with the municipality.¹ Thanks to Lesley E. Miller and Carlo Poni, we know about the practices and the context of artistic creation in Lyon, especially the part played by design.² The success of the Lyon silk fabrics relied on design creativity and on the management of stocks of patterns owned by local firms. Their protection, application, and fraudulent circulation were the basis of the new Lyon fashions launched yearly across Europe. The utility of design was based upon technical ingenuity. Inventing a new fabric relied on a combination of new patterns as well as new devices and commercial projects, calculations, and plans. No refined patterns could have been realised without the multiplication of warp threads and of numerous tiny shuttles for weft threads, new devices for quickly changing patterns on looms, and new stitches giving the illusion of relief, shades, and half-tones in portraits. New flowered silks were

¹ I am very grateful to Alain Cottereau, Paul A. David, Dominique Foray, Daryl M. Hafter, Christine MacLeod, Lesley E. Miller, Jacques Mairesse, Giorgio Riello, Kate Scott, and Joan Unwin for their helpful comments on this chapter.

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at the heart of a web combining work on shapes, materials, processes, and projects.  

These claims raise several questions. How could technical creativity develop within a silk guild that dominated the economic, social, and political life in Lyon? How did the guild cope with theft, fraud, copying, and poaching in a system in which competition between craftsmen was intense? Did guild officials contrast legitimate copying with illegal imitations? How did inventors express and explain the linkages between creating new patterns, contriving new technical devices, and launching new enterprises?

We shall first analyse how the Grande Fabrique and the municipality fostered innovation through the collective management of technical initiatives. In Lyon, politics supported innovation and technology helped shape public policy. Alain Cottereau has described this process for the Revolutionary Era and the nineteenth century; we will push back the enquiry into the eighteenth century when the guild was still the main economic actor in town. Second, we shall examine the balance between

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guild activities and inventors. Paradoxically, the collective aims of the
guild fostered individualistic claims and competitiveness. Invention was
shaped by conflict. In that context, how did a heroic model of invention
emerge from the legends of de Lasalle and later Jacquard?

Artisans, Guilds, and Innovation

Artisans constituted the main workforce in Lyon during the Ancien
Regime and they produced most finished goods. Most Lyon inventors
up to and during the Industrial Revolution came from their ranks, espe-
cially in the luxury trades, where constant innovation was essential for
business.

Historians have generally considered artisans and their guilds as brakes
to innovation because of their alleged secrecy, conservatism and inherited
know-how, the strict rules for quality standards, and the barriers between
trades. More generally, artisans are supposed to have been subjects of
‘blind routine’ and of a collective ethos that choked initiative. Steven
L. Kaplan has demonstrated how masters could express contradictory
feelings toward guilds, which helped them gain reputation, authority, and
credit in the marketplace, but also restrained their personal ambitions.

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7 D. M. Hafter, ‘Women Who Wove in the Eighteenth-century Silk Industry of Lyon’ in
Hafter (ed.), European Women and the Preindustrial Craft (Bloomington: Indiana Uni-
au négoce illégal à Lyon au XVIIIe siècle’, in N. Coquery, L. Hilaire-Pérez, L. Sall-
mann, and C. Verna (eds.), Artisans, industrie. Nouvelles révolutions du Moyen Âge à nos
jours (Lyon: SFHST/ENS-Editions, 2004), 249–58; C. Fairchilds, ‘Three Views on the

8 Fox and Turner (eds.), Luxury Trades and Consumerism; Hilaire-Pérez, L’invention
technique; M. Berg and P. Hudson, ‘Rehabilitating the Industrial Revolution’, Eco-


9 S. L. Kaplan, La fin des corporations (Paris: Fayard, 2001); Kaplan, ‘Les corporations
Also P. Minard, La fortune du Colbertisme: État et industrie dans la France des Lumières (Paris:
Fayard, 1998); Minard, ‘Les communautés de métier en France au XVIIIe siècle: une
analyse en termes de régulation institutionnelle’, in S. R. Epstein, G. Haupt, P. Soly, and
Kaplan and Minard (eds.), La France; A. Thillay, Le faubourg Saint-Antoine et ses ‘faux
ouvriers’. La liberté du travail à Paris aux XVIIe et XVIIIe siècles (Seyssel: Champ Vallon,
2002); Thillay, ‘La liberté du travail au faubourg Saint-Antoine à l’épreuve des saisies des
jurandes parisiennes (1642–1778)’, Revue d’Histoire moderne et contemporaine 44 (1997),
634–49; and several articles on these questions in I. A. Gadd and P. Wallis (eds.), Guilds,
Society and Economy in London 1450–1800 (London: Centre for Metropolitan History–
Institute of Historical Research–Guildhall Library, 2002).
Eighteenth-century French liberals, from Vincent de Gournay to Turgot, fiercely opposed guilds on this basis.\textsuperscript{10} As a matter of fact, the artisan world was never as immobile or routinised as its critics have assumed. Recent studies have stressed three points for understanding technical innovation within guild-based manufactures. First, the artisan world was highly heterogeneous, with powerful merchants and ambitious masters eager to make profits, some of them combining individual patenting activities and membership of a guild. A competitive atmosphere fostered inventiveness. There was intense copying, imitating, and stealing of other workers’ devices. The fact that entrepreneurs relied on extensive subcontracting among complementary trades also made it easy to transpose technical processes and stimulated invention.\textsuperscript{11} Second, the boundaries between specialities were porous: growing specialisation went hand in hand with multi-tasking. In the Grande Fabrique, individual masters could equally weave, develop new technical mechanisms, and draw patterns for brocades.\textsuperscript{12} Artisans could also belong to several guilds and combine different skills and networks of expertise.\textsuperscript{13} Third, this dynamism was sustained by cooperation. Urban artisans in France obtained financial support, material supplies, skilled workers, commercial opportunities, and political protection through complex social networks involving family ties, kinship, neighbourhood, and wider circles that included courtiers, financiers, and academicians. Guilds provided support by testing new devices, certifying and regulating new products, and securing inventors’ rewards – including providing advice for patenting.


\textsuperscript{12} Cottereau, ‘The Fate’.

French guilds were ‘open technique institutions’ that taught, demonstrated, and bought new equipment.¹⁴ For a long time, continental European guilds and private incentive mechanisms such as exclusive privileges (the functional equivalent of modern patents of invention) that often included the obligation of teaching within guilds, were complementary – two sides of the same mercantilist coin of promoting the economy of the state.¹⁵ This arrangement also applied to Ancien Régime France. French guilds also offered strong incentives to invent and to spread inventions by financing innovation and rewarding merit. Guilds offered resources to inventors within a public, collective management of innovation that included technical expertise, funding of new equipment, and protection against frauds and imitations.¹⁶ Technology was ‘ politicised’.¹⁷ Hence, guild policy and state policy could be in tune, especially when egalitarian liberals like Véron de Forbonnais, Vincent de Gournay, and Trudaine controlled French commercial administration. Although they criticised guilds as conservative, their innovation policies relied in practice on the guilds themselves. In eighteenth-century France, Lyon’s Grande Fabrique was a model and laboratory for establishing a national system of innovation management.

Artisans, Municipalism, and Merchant Capitalism

Lyon is an example of the arrangement that Charles Sabel and Jonathan Zeitlin call ‘municipalist’, by which they refer to the agreements between authorities and producers in some European cities during the eighteenth and early nineteenth centuries, whereby local institutions helped coordinate skilled independent workshops and encouraged manufacturing strategies based upon labour flexibility and product innovation.¹⁸

¹⁶ Hilaire-Pérez, L’invention technique, 155–6, 179–80.
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With 143,000 inhabitants in 1789, Lyon was the second largest town in France. The Grande Fabrique or Manufacture des étoffes de soie, d’or et d’argent directly employed nearly a quarter of the population, not including the guilds of velvet makers, dyers, carders, throwers, silk stocking weavers, gold wire drawers, ribbon weavers, and gold lace makers (just the last two accounted for more than six thousand workers). The Fabrique itself was responsible for fourteen thousand looms in the eighteenth century, twice the number under Louis XIV. 

The silk guild was at the heart of Lyon’s economy. It was also the main nexus of its political organization.

The first attempt to institutionalize the manufacture of silk fabrics in Lyon occurred in the fifteenth century and became a source of conflict between Louis XI and the municipality or Consulat. Lyon already had a monopoly over the trade in silk fabrics linked to its great annual fairs; the aim of the legislation of 1466 was to extend this prerogative to manufacture. Silk consumption was increasing, and foreign skilled workers had to be attracted, especially Italians. However, the Consulat successfully resisted the foundation of a guild under royal control (métier juré or jurande), and in 1554 Henry II accepted that the guild be turned into a free trade (métier libre). Indeed, under the Ancien Regime only four out of sixty-eight guilds in Lyon were métiers jurés.

None the less, freedom of work inside the Grande Fabrique was pretty much illusory. The trade came under the town’s control and strict rules were soon established for apprenticeship, journeymanship (compagnonnage), and the masterpiece (from which masters’ sons were exempted). The Consulat named the guild leaders (maîtres gardes), following a procedure common to nearly all guilds in Lyon. Over time, this enhanced the power of the silk merchant-manufacturers (marchands fabricants), who were allowed from 1667 to enter the guild, to subcontract work, and to sell their own fabrics.

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20 Italian technologies in the silk industry were transferred to France during the papacy’s Avignon exile (1309–77). During the fifteenth century, however, concentrated clerical demand came from Lyon, which was then a major religious centre and was also favoured as a ceremonial site by the French monarchy. The large community of Italian merchants and bankers associated with Lyon’s fairs may have fostered the immigration of silk weavers. See Godart, *L’ouvrier en soie*, 4–8; R. Gascon, *Grand commerce et vie urbaine au XVIe siècle: Lyon et ses marchands* (Paris: SEVPEN, 1971), vol. 1.
Gradually, merchants extended their control. In 1702 it was stipulated that four out of six maîtres gardes had to be merchants, in 1712 subcontracted workers had to pay a substantial fee if they wanted to sell directly on the market, and in 1731 combining the roles of weaver and merchant was outlawed. After a period of troubles and a temporary victory of the workers in 1737, a new set of regulations in 1744 further enhanced the power of the merchants. They were aided by government reforms led by the inspector of silk manufactures, Jacques Vaucanson, who wished to rationalize the entire French silk trade under the control of Lyon merchants who ran silk throwing mills in southern France. Although the scheme failed and Vaucanson was forced to flee to Paris, by then the seventy top merchants had taken charge of the industry. The number of independent weavers decreased during the eighteenth century, while the number of subcontracted workers, still called masters (canuts in the nineteenth century), rose to seven thousand.

The domination of the merchants coincided with the expansion of trade, and the introduction of design regulations and stronger protection of industrial activities, including an early form of copyright. This was echoed by strict rules against the emigration of workers and by the

25 Ibidem, 574; Godart, _L’ouvrier en soie_, 90–1.
28 Design copyright emerged in Lyon in the context of growing tension between commissioning merchants and designers. The merchants' right was first asserted in a statute (arrêt) of 1711 that punished copying by workers. In 1725 the merchants asked the French government to uphold the designers' obligation to respect contracts and to sign their works if they lacked a contract. Regulations of 1737 and 1744 allowed merchants perpetual rights of ownership. In 1787, a more liberal rule limited ownership to six years for dress designs and to fifteen years for furniture patterns; designs had to be deposited at the guild office. This was the first copyright legislation for patterns in France. See Poni, 'Fashion', 47–50; L. E. Miller, 'Innovation and Industrial Espionage in Eighteenth Century France: An Investigation of the Selling of Silks Through Samples', _Journal of Design History_ 12 (1999), 271–92. Merchants complained against time limits as designs were a major investment and they opposed depositing these assets in a public office. Instead, they asked to consider private ledgers as proof of property (Archives départementales du Rhône: 1C34) [hereafter ADR]. These negotiations between artists and investors fostered the creation of a modern copyright for designs in Lyon in 1806; see Cottereau, 'La désincorporation'. Designs had to be deposited at the Conseil des Prud’hommes; copyright deposits, by contrast with patents for inventions, were free of charge. After copyright expired, designs were kept openly accessible at the Conservatoire des Arts de Lyon. See A. Vaunois, *Les dessins et modèles de fabrique – doctrine, législation jurisprudence* (Paris: A. Chevalier-Marescq, 1898), 15–16, 294–8; E. Pouillet, *Traité théorique et pratique des dessins et modèles de fabrique* (Paris: Marchal et Billard, 1899); A. Fauchille, *De l’Exécution des fideicommis universels, en droit romain: De la Propriété des dessins et modèles industriels, droit français, législations étrangères, droit international* (Paris: A. Rousseau, 1882).
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exclusion of Protestants (the latter dating back to 1667) and of ‘foreigners’ from the guild. Whereas in 1737 aliens – who were expected to provide information about foreign industries – were still allowed to work three months in Lyon, by 1744 permission had been withdrawn on the grounds that they threatened local designs and devices.29

Except for looms, capital investment in buildings and equipment was not large. Far more important for the industry’s success were the investment in circulating capital (silk threads, gold and silver wire, designs) and the ‘fluid exchanges’ (Sabel and Zeitlin) between skilled agents, that is, the coordination between merchants, designers, metteurs en cartes who transposed designs on point paper, weavers, dévideuses (the female silk winders), silk throwers, dyers, and other female workers.30 The silk guild and the town authorities played an essential part in providing skills through craft apprenticeship and by fostering links between agents. Lyon relied for its success upon a combination of ‘organizational mobility’ and ‘economy of variety’ that balanced the interests of individuals and the collective management of technical and human resources.31

Merchants ordered samples and fabrics from different workshops and master weavers dealt with several merchants over their lifetimes or (after a reform in 1700) at the same time. In 1667 a system of receipts (billets d’acquit) established a credit system for buying equipment, whereby the looms (up to four per weaver) belonged to the masters but the cost was shared with the merchants.32 This arrangement was not a free gift by the merchants, however, but a mechanism to lock in subcontracting masters; subcontractors wanting to work for a new merchant had to reimburse any advances by their former employer.33 Some of this system’s rigidities were loosened from the 1740s, when the guild and town authorities began to offer financial support to masters who adopted new kinds of loom. From 1770 indebted masters were allowed to switch merchants provided they paid back one-eighth of their future earnings. This arrangement was reinforced in 1806 with the creation of the Conseil de Prud’hommes, a local tribunal that helped settle credit disputes; the Prud’hommes upheld

29 Godart, L’ouvrier en soie, 153.
33 Godart, L’ouvrier en soie, 180–90.
loans for more efficient looms and permitted weavers to change employers provided they had their current merchant’s consent.34

Coordination in the Workshop

Silk brocades were made with complex machines called draw looms. In plain weaving, warp threads were pulled in groups linked to vertical coupling cords (lisses) fixed into frames (lames) operated by pedals. Patterns could be sophisticated but were always symmetrical and repetitive. In Lyon’s métiers à la tire, by contrast, all kinds of designs, even portraits, could be woven because the warp threads were chosen individually, and were not gathered into frames but were pulled by drawgirls (tireuses) by means of attached cords; the four hundred to eight hundred hanging cords formed the simple (semple).35 One simple permitted one design that was programmed by arranging cords in small groups linked by lashes or loops (lacs) and tied to a thick cord in the order they had to be pulled. Each loop corresponded to one colour of weft. The weft, in turn, was composed of threads (duites) of different shades reeled on small shuttles. It took twenty-five days to set up a new pattern. When a master had finished weaving a design, it was removed, and he moved on to another loom while the first one was reloaded.

This technology relied upon a complex coordination between weavers and auxiliaries, which included reader girls (liseuses) who transposed the patterns from point paper into simples, loopmakers, drawgirls, dévideuses, and remetteuses, who mended damaged threads and cords. Four looms employed seven auxiliaries, in addition to the weaver himself, his wife, an apprentice, and a journeyman. The guild regulations made a distinction between weavers and auxiliaries. The former belonged to the Fabrique and were a privileged workforce. Journeymen could not be paid less than half the price of the product they made, and, although they were bound to their masters by credit, advances were restricted, which supported skilled journeymen’s mobility in the long term.36 The auxiliaries were not members of the guild, they were bound to their master and their earnings were low.37

34 Cottereau, ‘La désincorporation’, 97–145.
Most inventive activity in the eighteenth century aimed at lowering the cost of simples and, even more, at reducing the number of auxiliary workers and at easing the coordination of tasks in the workshop so as to adapt more quickly to changes in fashion. At the same time the technical context for pattern design evolved. Inventive efforts concentrated on programming patterns, in parallel with the intensified activity of designers connected to Parisian merchants and customers. From the early eighteenth century most new devices aimed at easing the selection of warp threads and the reading of designs onto the simples. In 1725 Basile Bouchon developed a loom whose hanging cords were armed with horizontal needles that were pushed against a roll of perforated paper. When a needle struck paper (rather than holes), it was pushed back and grasped by a fork, connected to a pedal operated by the drawgirl that would pull the warp thread down. Bouchon's partner, Jean-Philippe Falcon, improved this device in 1742 by replacing the roll with a chain of perforated cards hanging from a prism. The principle was the same, but the greater number of needles for each line of design made more complex patterns possible. Falcon improved the mechanism several times and was still adapting the loom for making rich brocades when he died in 1765. But his major contribution was his device to perforate the boards, the so-called reading machine. Cutting stamps were tied up to hanging cords, making it possible to perforate cardboards according to the pattern transposed onto a simple. This 'reading' operation could then be repeated as often as necessary, providing perforated cards for numerous workshops and enabling the industry to launch new designs on a massive scale. What is more, the reading process was independent of the loom and could take place outside the workshop, freeing up valuable workspace. Falcon's inventions were matched by devices aimed at making cord-pulling easier, reducing the size of the simple or making it possible to detach the simple from the loom, the latter being a major contribution by Philippe de Lasalle.

38 Poni, 'Fashion', 68. Official motives for labour-saving improvements included both medical and philanthropic concerns – the drawgirls' task was physically demanding (the cords had weights attached to them to keep them straight) and a work-day lasted twelve to fourteen hours – and alleged labour scarcity and the drawgirls' demands for higher wages. At the end of the century, as the scale of design motifs diminished, the speed of weaving accelerated and raised the problem of synchronizing the actions of weavers and drawgirls. See Miller, 'Innovation and Industrial Espionage'; L. Hilaire-Pérez, 'Inventions et inventeurs en France et en Angleterre', unpublished Ph.D. thesis, University Paris-I-Sorbonne, 1994, 4 vols., vol. III, 92–107.

39 Poni, 'Fashion', 64.

40 On the inventor, merchant, and teacher Philippe de Lasalle, see P. K. Thornton, Baroque and Rococo Silks (London: Faber & Faber, 1965); D. M. Hafter, 'Philippe de Lasalle:
A third type of innovation was to combine pattern programming and labour saving by mechanical means. Such contrivances were generally attempted for small-sized designs (*petite tire*). Only Jacques Vaucanson’s draw loom offered a solution for larger designs, but it was forgotten until Joseph-Marie Jacquard rediscovered it much later in the collections of the Conservatoire des Arts et Métiers. Vaucanson’s device, invented between 1747 and 1750 in Paris, was a perforated cylinder set up on the loom; the needles that struck it were connected to hooks that pulled the warp threads. However, the holes on the cylinder were too few to allow complex designs.\(^{41}\) In 1804 Jacquard combined Falcon’s cardboards and Vaucanson’s cylinder and grate into a major breakthrough. A chain of perforated cards that rotated around a prism selected the needles and, by that means, also the hooks, the coupling cords, and the warp threads. Although the Jacquard loom could not be used for rich brocades, it permitted more sophisticated patterns than Vaucanson’s, in particular flowered silks or façonnés. Yet, far from being a radical invention, as later legend would have it, it was the outcome of a host of small, incremental inventions and it required major improvements to be effective. It stemmed from an original policy of innovation based upon guild activity and township funding.

**Public Management of Innovation**

Technological progress was a major concern of the Lyon elites, and Lyon was the most technologically innovative city in France. Lyon artisans accounted for at least 170 of the nearly 900 inventors who applied to the French national administration for a privilege of invention or a reward. At least seventy-three of them were connected to the Grande Fabrique; only twelve of these were large merchants.\(^{42}\) The Lyon inventor was characteristically an independent master, a member of the social category that relied most on guild cohesion and whose reputation was based on its high skills. The corpus of Lyon inventions accounted for 265 proposals: 229 of these were related to textiles, of which 116 applied to draw looms. No other French city seems to have been so ‘invention intensive’ – by

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\(^{41}\) This draw-loom must not be confused with the automated plain weaving loom of 1745; cf. Doyon and Liaigre, *Jacques Vaucanson*, 207–34.

\(^{42}\) We know the profession of 121 of the 170 Lyon inventors; 105 stated they were artisans and 73 definitely belonged to the silk community.
Silk Fabrics in Eighteenth-century Lyon comparison, Parisian inventors in the same corpus accounted for 193 applications and were not specialized in any one sector.43

Lyon inventors were strongly encouraged by the local municipality to invent and develop new initiatives. Already in the sixteenth century, the king and Consulat had taken measures to attract foreign artisans to Lyon to increase luxury trades and give work to the poor. In 1536 Etienne Turquetti, a merchant from Piedmont with support from Lucca (then still a major silk-producing centre) was given the right to tax artisans who used the machinery he had introduced to the city; having obtained further loans and tax exemptions, he settled in Lyon and became a leader of the velvet-makers’ guild in 1540.44 Lacking a specific study of invention and innovation in Lyon in the seventeenth century, it is hard to make any firm statement for this period, although a local policy to support innovators was probably already in place; certainly immigration by foreign silk workers is well documented. By the beginning of the eighteenth century, local privileges (ordonnances consulaires) were granted by the Lyon Consulat and state privileges were managed by a local Police des Arts et Métiers.45

Nevertheless, the main feature of eighteenth-century innovation policy in Lyon’s silk industry was the substitution of monopoly concessions for inventions with public funding.46 The first instance of this shift took place

43 The Parisian inventors were more likely be manufacturers, to propose metallurgical devices, chemical processes and mechanisms, and to apply for exclusivity; see Hilaire-Pérez, L’invention technique, 134–5, 358.


45 In the 1708, Jacques Ponsard was granted a local privilege by the Consulat for a carpenter’s saw (Archives municipales de Lyon, BB 268) [hereafter AML]. In 1717, Jean-Baptiste Garon received an exclusive privilege from the Consulat for a machine to draw cords; in 1730, he obtained a privilege from the government, but the Consulat issued the letters patent only in 1731 (AML, HH 156; Archives nationales, F121443) [hereafter AN]. In 1725, Claude Raymond and André and Jean Saint-Michel were granted an exclusive fifteen-year privilege by the Prévôt des Marchands and his counsellors acting as ‘judges of the police of arts and trades’ (AML, HH 156). In 1735, following approval by the Grande Fabrique, Nicolas Moulin was granted a consular privilege for the invention of a machine to reel silk fabrics (AN, F122201). In 1735 the Mouchot brothers received a ten-year monopoly from the Consulat for a new cloth that resembled leather (AN, F121444B).

46 A search through E12 and E* (AN), BB 1 to BB 360, HH 156 to HH 158 and HH 624 (AML) found twelve exclusive privileges for invention granted in eighteenth-century Lyon, most before 1750; four of these were modifications or extensions. Few were related to the silk industry, as the following list shows: Claude and Joseph Verdun, for woolens in 1700; Jacques Ponsard, for a carpenter’s saw in 1708 (a local privilege granted by the Consulat); Claude Raymond and André and Jean Saint-Michel, for a draw loom in
in 1734 when, in response to Pierre Chaussat’s request for a monopoly patent for a new velvet fabric, his competitors proposed that the Fabrique pay him 10,000 livres instead and make the invention public.\footnote{Chaussat refused the exchange but did not get the privilege (AN, F 12 1443). In 1742, the Prévôt des Marchands proposed to grant Falcon a monopoly for his new loom and permission to collect fees from users – but the privilege was only a financial solution to the fact that the guild’s funds were low (AML, HH 157).} By mid-century this strategy had become commonplace.

Funding was provided through two closely related channels. First, the guild itself granted financial support, which could be significant. For instance, the guild paid Jean-Philippe Falcon, one of the most rewarded inventors in Lyon, 52,194 livres between 1738 and 1755, first to pay off his debts and later as a loan.\footnote{See note 66.} However, guild support was occasional rather than standard practice, and followed approval by the Consulat and agreement by the central administration.

The second funding channel was used more regularly, and drew on a tax on foreign silk entering Lyon that had been established in 1711 and was administered by the town council through the Caisse du droit des étoffes étrangères.\footnote{The tax raised the price of Lyon fabrics relative to foreign cloth, and in 1716 it was turned into a tax on silk brocades entering the city. The accounts, verified every six months by the Contrôleur general des Finances in Paris, are held in the Department of Trade’s archives; see AN, F\textsuperscript{12} 1447.} From 1725 half the revenue, 30,000 livres, was handed over to the prévôt des marchands to reward deserving silk manufacturers; the other half was destined to the hospital of La Charité. The first grants were made in 1732.\footnote{In 1732, Jeantet, a maker of crêpes, was assigned the annual rent of his workshop worth 1,000 livres for 11 years. The first inventor to be rewarded, described as ‘son of Bietrix’, received 6,000 livres in 1737 for a mixed cotton and silk fabric described as ‘Levantine’ that could substitute calicos; the order to reward him came from the government. In 1738, Falcon received 2,500 livres for a new kind of cloth, and Jean-Baptiste Rouillier was granted 800 livres for a new velvet fabric. New technical processes were rewarded from 1739 onwards, beginning with 6,000 livres to Girardon for improvements to silk dyes.\footnote{In 1725; Jean-Baptiste Garon, for a draw loom in 1730; Pierre Chaussat, for an extension to Garon’s monopoly in 1733; a local privilege to the Mouchot brothers, for a fabric imitating leather in 1735; a local privilege in 1735, turned into a state one in 1737 and extended in 1744, to Nicolas Moulin for a machine to reel fabrics; Joseph Combe and Jacques Marie Ravier, for earthenware in 1738, extended on behalf of Françoise Blateran in 1748; François Grange, for ovens in 1746; John Badger, for a calender (press) in 1754; Jean-André and François Orsel, for a metal contraption in 1781.}} The French government, which was open to liberal reformers such as Trudaine and Vincent de Gournay who favoured public over private initiatives, turned Lyon into a kind of laboratory for its policy. In 1752 the state representative or intendant took control of the fund, with the Consulat and the Fabrique maintaining oversight; management
became more complex and gave rise to permanent bargaining between royal and local administrators. At the same time, the government created a national fund, the Caisse du commerce, mainly devoted to supporting industry.51 From 1752 growing numbers of Lyon inventors were rewarded and payments were diversified according to a scale of merit; grants made in 1753 ranged from 300 to 12,000 livres. A system of bounties, varying from 30 to 300 livres for each new loom and indexed to the number of looms built to the new standards, was introduced in 1760.

As the sums bestowed increased from mid-century, payments could be shared between the Caisse and the Fabrique; each paid half of Philippe de Lasalle’s bonus of 200 livres for every one of the first 150 new looms set up in 1771.52 Moreover, as the funding system became more sophisticated, examinations, proofs, and estimations got more complex. The fund financed innovation from the research stage to training experts right through to commercialization, and the authorities had to determine the technical efficiency and economic value of inventions based on a detailed monetary index and in relation to inventors’ needs and merits.

**Negotiating Technical Utility**

The central principle underlying the fund in the eighteenth century was that inventions were a collective good.53 Most artisans were expected to invent, improve their devices, show them and sell them to their Lyon peers. Inventing was considered a service to the town and this assumption lay at the basis of the examinations that brought together weavers, guild officials, and members of the Lyon Académie des Sciences, Belles-Lettres et Arts. Public utility was, however, validated by, and negotiated between, two distinct networks: the intendant and a local academician, Georges-Claude de Goiffon, on the one hand and the town officials and guild

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51 Although Gournay’s opposition to the Grande Fabrique was virulent and has attracted historians keen to highlight liberal administrators’ hostility to guild regulations, the situation was not so clear-cut, for the Lyon institutions clearly also provided a model for the French government to develop a policy based on rewarding innovation according to merit and utility.

52 AN, F12.2199.

53 The notion of collective ethos, stressed by Sabel and Zeitlin, has been criticized by Maxine Berg, ‘Commerce and Creativity in Eighteenth-century Birmingham’, in Berg (ed.), *Markets and Manufacture*, 185. Although it could be misleading to extend this notion to all urban management of innovation (towns like Sheffield and Birmingham were places of fierce competition), it must be emphasised that in Lyon a collective pattern did exist, even if tensions were strong, and was reinforced by an ideology of public good among the educated elites.
inspectors on the other.\textsuperscript{54} Other local institutions could also be involved in the procedures, mainly the inspector of manufactures (Antoine-François Brisson was particularly active) and the Chamber of Commerce. The Paris Academy of Sciences and new societies like the Free Society of the Abbé Baudeau were also addressed by well-connected and ambitious inventors like Claude Rivet, Jean Paulet, and Philippe de Lasalle, whose proximity to the court and other seats of power and to the enlightened elites allowed them to lobby central government. But the most frequent procedure in mid-century involved the \textit{maîtres gardes} and the academician Georges-Claude de Goiffon.

Technical validation combined academic legitimacy and guild expertise. The procedure was deliberately set up by the central administration to get a range of opinions based on different criteria of efficiency and utility. When the \textit{contrôleur général des finances} addressed the Consulat and the \textit{intendant} in 1761 about Jean Bouvard’s loom, the \textit{intendant’s} notes read: ‘do not report the \textit{prévôt des marchands}’ advice’.\textsuperscript{55} When disagreements arose, the final decision always fell to the central government, which generally followed the \textit{intendant’s} advice. In 1756 with regard to a draw loom invented by Jean-Baptiste Peyrache, the state administrator Vincent de Gournay wrote to the \textit{prévôt des marchands}, who transmitted the case to the \textit{maîtres gardes} of the guild, who proposed a reward of 1,000 livres.\textsuperscript{56} Gournay then turned to the \textit{intendant}, who consulted academician de Goiffon, who in turn proposed 500 livres. The inventor was then granted 500 livres. Although lobbies and cabals did exist, not least because the \textit{maîtres gardes} were themselves involved in trade, the management of innovation attempted to balance local interests with public

\textsuperscript{54} The Lyon Academy was heavily involved in supporting the arts and trades, including silk, and published prizes for resolving economic problems. See D. Roche, \textit{Le siècle des Lumières en province. Académies et académiciens provinciaux, 1680–1789} (Paris: Écoles des Hautes Études en Sciences Sociales, 1978), 2 vol., I, 353–4, 375; R. Chartier, ‘L’Académie de Lyon au XVIIIe siècle’, in \textit{Nouvelles Études lyonnaises} (Geneva-Paris: Droz, 1969), 131–250; Garden, \textit{Lyon et les Lyonnais}, 558. Nevertheless, only three among the entire corpus of inventors identified in the F\textsuperscript{12} archives admitted to having competed for local academic prizes; inventors applied more frequently for simple approval by the Lyon Academy. The academician Georges-Claude de Goiffon (1712–76), a former architect who specialised in arts and trades, wrote an unpublished dissertation on weaving, \textit{Description des arts, dont l’objet est la tissure} (Academy of Lyon, Ms 189), several reports on inventions and ‘L’art du maçon pisueur’, \textit{Journal de Physique}, March 1772. He took part as professor of design in the creation of veterinary schools in Lyon and Alfort and published methods for measuring and drawing horses in collaboration with Antoine-François Vincent. I am grateful to Michel Dürr, curator of the Académie in Lyon, for his information on de Goiffon.

\textsuperscript{55} AN, F\textsuperscript{12} 1443.

\textsuperscript{56} AN, F\textsuperscript{12} 1445, F\textsuperscript{12} 1445, F\textsuperscript{12} 2201, F\textsuperscript{12} 2424.
policy, leading to a kind of ‘public distancing’ or deflection of local antagonisms.57

Behind the bargaining between local and central institutions, local experts were mobilised to establish the value of inventions based on public interest. De Goiffon and the guild’s officials were practical-minded, and user approval rather than judgements of authority was the main point of reference.58 This concept of utility fostered a system of bonuses indexed on diffusion that required making enquiries in the workshops and among weavers. In 1763 the maîtres gardes approved Jean-Jacques Maynard’s loom that reduced the required number of drawgirls, made the work easier, and improved the quality of cloth; they noted that eight of the new looms were already in use in the Fabrique and proposed a reward of 1,800 livres. De Goiffon approved the invention on the same grounds. He also compared it with an earlier and more sophisticated invention by Jean Benoît Allard, noting however that Maynard’s was less cumbersome and was preferred by the workers, who had already adopted it: as de Goiffon put it, ‘now in this case, the worker is the best judge’.59 Maynard was granted 300 livres and a bonus based on the loom’s take-up in town.

The academician and the guild’s inspectors did also disagree. De Goiffon complained that the inspectors ‘pretend to be the sole and sovereign judges of any innovation in silk making, [and thus] free themselves from giving reasons for their judgments’.60 In 1764 his employers challenged a new satin fabric invented by the journeyman Jean Paulet. Although the maîtres gardes approved the new fabric, de Goiffon sided with the employers in stating that it was neither new nor interesting; although the cloth saved on raw materials, its quality was unacceptably poor.61 The intendant confirmed that such contrivances had to be forbidden or at least resisted. In 1765 the academician thought that Etienne Chassagneux’s latest improvement to roping for draw-looms did not deserve a reward, although the guild’s inspectors had approved it. The intendant Jean Baillon

59 AN, F121444B.
60 Duon and Farcy’s folio, AN, F121444A.
61 AN, F121446. Paulet became an authority himself, writing the Art du Fabricant en Etoffes de Soie published in 6 volumes (1773–1777, 1789) in the Académie’s Description des Arts et Métiers.
wrote to the Bureau du Commerce in Paris that the guild officials had misunderstood the invention because they were ‘busy with many details, makers who only know the practical side of production and have not studied, like M. de Goiffon, the theory of the loom and the different parts it is made of’. The matter at issue was about how experts belonging to different institutions could reconcile their views on utility. In this context, the inclusion of the guild was quite remarkable.

Lyon’s examination procedure expressed the slow, conflict-ridden emergence of expert status during the Old Regime. Utilitarian proof was based upon matter of fact, a rationale that underlay all French procedures of the period even though it could threaten academic authority. In Lyon, it was formalised into regular administrative procedures.

**Collective Practices of Innovation**

This system of technical assessment reinforced interaction and debate – including allegations of improper lobbying with the maîtres gardes. Local institutions supported collective practices of learning and knowledge, and frowned upon secrecy and private appropriation of knowledge. After a reward was granted, the loom was deposited in the guild’s office, which thus became a repository of inventions; making the reward commensurate to the number of pupils he trained ensured that the inventor share his know-how widely. When the merchants drafted a new regulation for the Fabrique under Jacques Vaucanson’s direction in 1744, they decided to promote Falcon’s loom developed in 1742 by demanding that journeymen model their masterpieces on the new device. In 1760 Michel Berthet, who had invented a new loom based on Falcon’s innovation, was granted 1,000 livres after de Goiffon’s report to the intendant Jean-Baptiste-François de la Michodièrre – 600 livres immediately and the rest if he taught the maîtres-gardes and if four of his looms were set up in town. In 1765 he got 300 livres for another improvement, but again only if he shared his secret with the guild officials; the intendant forced him to deposit a model and description of the process at the guild’s office.

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62 AN, F12 1443.
64 Falcon, who was close to the Lyon elites, was frequently attacked for corruption. In 1754 one of his opponents, Buisson, claimed that Falcon had offered a grand dinner to the maîtres-gardes to obtain a life pension for a new loom. Buisson claimed that twelve workers of his could testify that the loom worked poorly, and Falcon’s pension was briefly suspended (AN, F12 1444A).
65 AN, F12 2201.
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Whereas some inventors like Falcon and de Lasalle received huge rewards and life pensions and were upheld as glorious examples for the Fabrique, some officials suggested offering inventors equal sums to avoid rivalry. De Goiffon advised to lower the grant that the prévôt des marchands proposed for Jacques Roche from 600 to 400 livres, arguing that a smaller sum ‘will be more proportionate to the rewards offered so far to inventors, who must not be incited to jealousy’. In practice, the city authorities differentiated between high-, medium-, and lower-quality inventors. At the bottom of the scale, poor inventors might receive financial support even if their devices were not considered successful (a measure that was also adopted by government administrators); in this case the funding system came close to a form of poor relief. In 1780 the inventor Fleury Parra requested a life annuity for a new type of spinning wheel, arguing he was economically distressed; the intendant and prévôt des marchands agreed to pay him 300 livres to refund his expenses and improve his circumstances, even though the innovation was of little use. In the case of François Corbet, de Goiffon advocated support in 1764 because the man’s hardship arose from a disease contracted from being a velvet maker.

Grants that rewarded general merit or helped artisans fallen on hard times coexisted with a more focussed system, which aimed to manage the commercial exploitation of inventions by compensating inventors for making their innovations public or through incentives to diffuse new technologies. In the first case, inventions were bought at an officially set price and machines were exploited collectively. In 1760, for example, the inventor de Barme was given a life annuity of 600 livres provided he sold his new silk reel for 360 livres to the masters.

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66 The intendant Baillon estimated that Falcon received 95,479 livres over his lifetime, including 52,194 livres from the guild for his first loom and 43,285 livres from the Caisse, which included 7,200 livres as bonuses for the reading machine and a life pension of 1,200 livres (later raised to 1,800) a year, for a total of 33,085 livres. His wife, daughter and son-in-law were still benefiting from the bonuses and pensions after his death. On my computation, de Lasalle received 122,000 livres over his lifetime, mainly from the Caisse. His wife was also granted a life annuity.

67 Roche had to leave a model at the guild’s office and to teach masters how to use it. AN, F12:2201.


69 AN, F12:1445. The Contrôleur général des Finances lowered the sum to 240 livres. Fleury Parra had to deposit a model at the guild’s office.

70 The intendant refused on the grounds that the fund was not a charity and that a general charitable hospital existed in town (AN, F12:1445).

71 AN, F12:2201.
was John Badger's calender (press).\textsuperscript{72} Badger had been enticed to France through the government’s efforts; after settling in Lyon he was granted a pension from the local fund, was paid expenses to build the new calenders for which he kept exclusive rights in the city, and was allowed to limit the initial spread of know-how to only two apprentices, Seguin and Scott, who were also his translators and partners. However, the contract with the silk guild also stipulated that the calenders were the king’s property (they still belonged to the state following the Revolution), that Badger could not ask masters to pay more than 6 s. per \textit{aune} (1 m) of pressed silk, and that he could not refuse to work for anyone.\textsuperscript{73} Another calender used to press brocades and improved by Vaucanson was owned instead by the town, which leased it to the finisher Claude Collet.\textsuperscript{74}

After 1760 most grants in Lyon were based on a bonus system indexed to the number of new looms employed, which replaced one based on private licence fees paid by users. There are several examples of exclusivity granted at the beginning of the century. In 1725 Claude Raymond applied for a monopoly that would allow him to levy 100 livres per loom; the town officials reduced his claim to 68 livres.\textsuperscript{75} In 1730 Jean-Baptiste Garon was allowed to collect a tax of 40 livres per loom based on his technical principles, and in 1762 François Jacquette asked to collect 100 livres per loom from users who would register with the guild officials; but Jacquette’s request was turned down, since by then the system was based on a one-off, publicly funded bonus.\textsuperscript{76} Rather than taxing users, the authorities paid inventors according to the number of looms they could sell to Lyon masters. The bonus could be significant: in 1760 an inventor of a brocade loom that imitated embroidery named Ringuet was granted a bonus of 300 livres for each of the first ten looms set up in town, 200 livres for each of the next ten looms and 100 livres for each of the subsequent hundred made within a space of ten years. His loom proved so popular that he had received 19,900 livres already by 1764.\textsuperscript{77}

How well did the system perform? Reports by guild officials provide detailed information about the diffusion of several new looms. Falcon’s looms were quite numerous: forty were working by 1765, hundred by 1773 (out of 14,000 looms in town), and in 1786 one rich merchant

\textsuperscript{72} There is a huge documentation on Badger, as his calenders were used in Lyon from 1754 to 1844. See AML, HH 158, 475 WP 29, 784 WP 13; Chambre de Commerce de Lyon: Reports years X-XI, Reports 1802–1815, Reports 1813–1827, Reports 1855–1856; AN, F\textsuperscript{12} 1442, F\textsuperscript{12} 1443, F\textsuperscript{12} 1444–A, F\textsuperscript{12} 1444–B.
\textsuperscript{73} AML, HH 158.
\textsuperscript{74} See Doyon and Liaigre, \textit{Jacques Vaucanson}, 270–90.
\textsuperscript{75} AML, HH 156.
\textsuperscript{76} AML, HH 158.
\textsuperscript{77} AN, F\textsuperscript{12} 1445, F\textsuperscript{12} 1447.
alone had fifteen of them. The loom of the weaver Fleury Dardois was rewarded with a single payment of 300 livres in 1776 and 24 livres for each of the first twenty-five machines set up in the city. In 1777 the guild officials recorded seven looms, six more in 1778, and in 1779 fifteen others, for a total of twenty-eight – which was more than they expected.\textsuperscript{78}

Six of the masters who bought the looms lived in parishes near the rue Grollée (in the old center of the Lyon peninsula) where Dardois had his workshop, and twelve of the masters lived in his own street. But although neighbourhood and kinship were clearly important for diffusion, a further ten looms were set up in the northern part of the peninsula on the Saint-Vincent slopes and on the west side of the river Saône, where such ties mattered little.

These networks were the basis for Lyon’s pattern of innovation. Inventive artisans, both weavers and others, were quickly informed of new devices and constantly strove to improve them. Indirect evidence that invention was a collective activity is that the new drawing looms, from Falcon to Jacquard, had compatible programs resulting in ‘cumulatively compatible’ technology.\textsuperscript{79} Vaucanson’s programming cylinder was inspired by Falcon’s first loom of 1742 that had paperboards passing round a prism. In 1777 Claude Rivet signed one of Dardois’ certificates; a few months later Rivet presented a new loom of the same kind. When building his second loom, Falcon called upon a weaver, Jean-Benoît Allard, who had registered an improvement in 1763. Jacquard’s invention, itself inspired by Vaucanson’s model kept in the Conservatoire des Arts et Métiers in Paris, was made operable by a group of masters and mechanics, including Jean Antoine Breton, a mechanic from Privas, when he returned to Lyon.

Although we do not know what effect marketing rewards had on the price of looms, we may reasonably assume that the system prevented inventors from demanding prohibitive prices, and that it thus incentivised merchants, who were the main source of credit for equipment, to invest. Equally, local funds could come in aid of inventors, allowing them to pay back their debts or raise new credit, as happened extensively with Falcon.\textsuperscript{80}

Whereas women do not appear as inventors, widows inherited their husbands’ rights on the basis of their right to run a business in the guild. Falcon’s daughter and his son-in-law Balthazar Servier built fifty-five of Falcon’s second looms of 1762 after his death in 1765 and were paid

\textsuperscript{78} AN, F12 2201, F12 1443.
\textsuperscript{79} A. Cottereau, ‘The Fate’, 144.
\textsuperscript{80} AML, HH 158.
24,000 livres in grants between 1765 and 1790; the daughter also received a third of Falcon’s pension, formerly granted to her mother. The same system benefited de Lassalle’s wife, who was still asking to be paid her annuity in 1805.81

Innovation helped build up a mechanical engineering sector. Locksmiths, joiners, combers, and lathe-turners developed their mechanical skills by making the new devices invented by master weavers. In so doing, mechanics also became increasingly involved in the inventive process. Thus, for example, in 1785 Dardois presented five user certificates, one of which came from a joiner who claimed to have built a loom à la Dardois in 1781 on behalf of a master weaver. But the process had begun earlier in the century. Thanks to Falcon’s debts we know about the mechanics to which he subcontracted work in the 1740s: a carpenter, Guillot; a lead merchant, Laubréaux; a turner, Comte; and two smiths, Bruno and Tripier. The latter was an important metal specialist involved in making steel draw benches.82 Bruno’s widow appeared in John Badger’s accounts regarding his calender in 1755; Comte (or Conte) also took part in the introduction of the flying shuttle at about the same time.83 Both Badger and Vaucanson called upon the locksmith Vial to make his cylinders to press brocades. Skilled mechanics from Switzerland were also employed: Jean Ulric Tumbal, from Basel (where draw looms were well established), developed a new loom for Philibert Dementhon in the 1750s;84 Frederick Hildebrand, a wood turner, was involved in introducing the flying shuttle to Lyon. The silk trade was encouraging technical innovation and ‘spillovers’ in tool making, gold wire drawing for brocades, roll casting and polishing for moirés, beating gold spangles and developing new alloys in substitution for gold and silver.85 Iron forging and steel refining became Lyon specialties and great care was taken to promote metallurgical innovation and to control the flow of skills and materials to the city, as the examples of John Badger (called upon for his calender) and Abraham Mason (brought in for his metallic reeds for looms) demonstrate.86 Paul Lecour and the Orsels brothers (from a family with a tradition in Alpine

81 Artisans like de Lassalle who married a master’s daughter or widow could become masters without paying a fee or making a masterpiece. The master was then ‘indebted’ to his wife throughout his lifetime, which may explain why some widows were able to claim their husband’s pension.
82 AML, HH 157.
83 AML, HH 158.
84 AML, HH 158.
85 See also Hilaire-Perez, L’invention technique, for the names of Charmy, Tripier, Trenet, Gay, and Badin.
86 For Mason, see AML, HH 158, F12 1444B.
metallurgy and the silk trade) also set up major manufactures and work-shops producing ‘toy ware’ in the English manner.87

The success of Lyon ‘collective invention’ was based upon active public and private networking, coordination, and funding applied to a dynamic economic sector operating on a European scale. Whereas the Grande Fabrique was the main agent in these developments, paradoxically its actions gradually subverted the guild’s structure and traditions by strengthening links between different trades and developing cross-trade skills.

**Horizontal Conflict: Priority Disputes**

Lyon’s municipal system of rewards to inventions did not abolish priority disputes; in fact, it may well have enhanced them. Collective innovation and incentives for diffusion fostered controversy over public grants and reputation. The issue arose because the distinction between improvement, imitation, and theft was very fine and depended on judgements by guild officials who were potential competitors. Other difficulties came from the diffusion policy itself. The masters who bought Falcon’s looms quickly adapted and modified them and then claimed inventors’ grants. This was perfectly legitimate. Michel Berthet was rewarded in 1759 for adapting Falcon’s first loom and, in 1765, for modifying Falcon’s second one, which he had bought in 1764. The same occurred with a weaver named Bourgeois, who bought a Falcon loom in 1775 and submitted a modification in 1777. Such modifications could, of course, threaten inventors’ positions if they were deemed improvements. In 1765 Falcon accused Barbier of having simply modified a device he himself had invented years ago; but Barbier’s loom was preferred and Falcon was even asked to reimburse the 1,000 livres he was granted in 1764.88 Generally speaking, the authorities were benevolent towards incremental improvers whose machines were hard to distinguish from clear inventions.89

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88 AN, F122201, F121443, F121447; Ballot, L’introduction du machinisme, 350–1. Eventually, Barbiers’ device gave way to de Lasalle’s invention in 1767.

89 The turner Milliet, who had copied de Lasalle’s reversible devices during his employment by the inventor in 1769–70, was identified as an impostor by the prévôt des marchands and the guild officials but was not punished (AN, F12 1444A). Milliet had been rewarded with 300 livres for a calender in 1753 (AML, BB 320 folio 144).
Subcontracting to mechanics also gave rise to fraudulent imitations. In 1757 Philibert Dementhon, a velvet maker, complained that Jean Ulrich Tumbal, a Swiss mechanic he had employed to build his new draw loom, pretended to be the real inventor. The turner Milliet, who had copied de Lasalle’s reversible devices in 1769–70 while being employed to make them, was presented as an impostor by the prétendu des marchands and the guild’s officials.

The introduction of the flying shuttle also gave rise to complex claims and counterclaims. The importer of John Kay’s invention was François Buisson, formerly an inspector of manufactures involved in Kay’s work for the French government in 1748, who had become associated with a Swiss lathe turner and projector called Frederick Hildebrand and with a member of the Fabrique named Chambeau. To adapt the flying shuttle to the silk industry, the three subcontracted work to Conte, another turner, and Catin, a joiner and Chambeau’s neighbour in Saint-Just parish. In 1772 when the Consulat approved the new flying shuttle for silk looms, Buisson and Hildebrand refused to share the bonus with Chambeau. They accused him of having asked Catin to copy pieces of the mechanism and of having developed, with a cabinetmaker, a loom in which the new device was hidden. Chambeau’s network among local mechanics was at stake. Each party lobbied actively. Trudaine, who supported Buisson, argued that the first inventor was John Kay and that Buisson was simply the French importer; nevertheless, thanks to the intendant’s help, Chambeau was rewarded, provided he deposit a model in the guild’s office.

Besides the considerable involvement of mechanics, the affair illustrates the growing concern with priority claims. As privileges of exclusivity became increasingly rare after the 1730s, inventors became eager to defend their priority and certificates attesting to the date of invention proliferated. In 1785 Fleury Dardois complained that his new loom had been copied by master Pierre-François Perrin, to whom he had sold it, and asked the Academy of Lyon to certify his priority; in support, he presented a document signed by ninety-one masters and merchants certifying him as the true inventor, and another one written by Perrin himself who promised not to show anyone the invention without Dardois’ permission.

90 AML, HH 158.
91 Ballot,  L’introduction du machinisme, 351; F121 444A. De Lasalle himself seems not to have pressed for action.
92 AN, F72 992, F72 1443, F72 2202.
93 Musée des Tissus: E 7/033 c (printed memoir).
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Whereas the storage of models in the guild’s office aimed to make inventions a shared patrimony, the registration of certificates established an inventor’s individual rights. Control over the guild’s written records gradually acquired more importance. In 1765 the authorities rejected Falcon’s opposition to Barbier because the guild could not discover in its ledgers any certificate for the loom Falcon claimed to have invented.94 In 1777 during the Bourgeois affair, the intendant Jacques de Flesselles sent the Bureau du Commerce a scheme to improve the registration of inventions.95 He claimed that because inventions tended to be forgotten or to appear outdated with time, successful machines were sometimes ‘rediscovered’ and modified by artisans who were then paid undeserved subsidies.

In fact, the guild and the town did keep records of past inventions. Formal registration of the few monopolies of invention bestowed in Lyon was taken very seriously. In 1725 the authorities asked that the drawing of Claude Raymond’s draw loom be deposited at the town hall and be signed by the prévôt des marchands as a precondition for enforcing his local privilege. Users had to pay a registration fee at this office, which issued a certificate enabling them to get inventors’ permission to work on their looms. Reports of counterfeiting had to be sent by the guild to the town hall.96 Registration practices also developed for managing the grant-based policy that followed the concession of individual privileges. In 1777 guild officials visited Bourgeois’ workshop to verify that he had not simply copied Gillet’s invention, which had been rewarded in 1756.97 In 1781 Ponson’s loom was rejected by the guild officials as an imitation of Vulpillat’s, invented in 1751 as proved by certificate.98

Intendant de Flesselles also proposed that the ledgers record drawings of new machines free of charge, as this would help apprentices and journeymen to become masters. There would be two copies of the plans and the examiners would provide written explanations. He further suggested that inventors deposit cardboard models at the local academy. The first proposal anticipated developments in the 1780s, when French privileges of exclusivity began to adopt some features of English patents. From then on, drawings and models were kept in a national repository of inventions, first in the Parisian Hôtel de Mortagne and

94 AN, E12 2201, folio Bonnafond.
95 AN, E12 1443, folio Bourgeois.
96 AML, HH 156.
97 AN, E12 1443.
98 AN, E12 2201.
256 Liliane Pérez

later in the Bureau des Dessinateurs at the Conservatoire des Arts et Métiers.99

Although the depositing of specifications and models in Lyon was initially related to the management of exclusive privileges, the reward system, which fostered competition, increased pressure on registration practices that would become critical after 1791, when inventors’ rights were first recognized. Lyon led France, in terms both of designs and inventions, with a nascent practice of registration that was embedded in the guild’s collective management of innovation.

Although they became marginal to the Lyon silk trade after the 1730s, claims for private property rights still emerged occasionally. The principle that inventors owned their inventions was subsumed both ideologically and practically into the public reward system, via the concept of priority. Buisson accused his partner Chambon of claiming ‘property rights to invention’, whereas he considered them to be only improvers (rectificateurs), albeit the first, of Kay’s invention.100 In 1765 the guild officials decided that Louis Jean-Baptiste Duon was the first inventor and ‘owner’ of an invention disputed with two other weavers, although neither Duon nor his rivals asked for a monopoly, only a subsidy.101

The system also fostered debates on secrecy. The authorities were unclear whether subsidies were incentives to invent or a public pre-emption over inventions.102 Some officials believed that disclosing secrets was unfair. When Jean-Baptiste Condurier demanded a reward in 1764 for inventing a new lining out of silk and wool, the guild officials offered 800 livres in exchange for disclosure to every master who wished to learn the process. However, the first alderman disagreed, writing that ‘the order of natural equity should let [Condurier] keep the production of his newly invented cloth for his own profit, so the reward could be granted without conditions’.103 The state intendant Jean Baillon backed the guild, reminding everyone that ‘it was unnatural for the inventor to be rewarded before


100 AN, F12 2202.

101 AN, F12 1444A.


103 AN, F12 1444A.
making his knowledge available’. ‘Natural’ meant different things to the two men and referred to a different set of principles: the alderman associated it with the private benefits secured by secrecy, the intendant referred to the sharing of innovation for the common weal.104

The inventor and entrepreneur De Lasalle reflected the guild’s ethos in being a strong supporter of the free circulation of knowledge, including – perhaps ambiguously – stealing. Like Diderot, he was a strong opponent of secrecy and could be caustic on the matter. In 1760, as he was succeeding Dacier in the Fabrique drawing courses, he assured the government that he would not even condemn copying and forgery of his own business. He did not condemn the theft of patterns or inventions and was pleased when his printed silk cloth was copied and his workers enticed by rivals: ‘more than twenty of my colleagues employ hand-painters and entice mine every day as soon as they are trained, and they get from them colours and even my own drawings; but I do not complain about these events if they can help to prove that all prejudice against new styles is useless for the common weal and for private business’.105 In fact, De Lasalle was generous as long as his priority as inventor was recognized. This was not difficult in Lyon, where he had strong connections and was adequately rewarded; but in Paris he was not so magnanimous. In December 1759 he sent a sample of a new allegorical fabric in the king’s honour to the contrôleur général, asking that it not be shown to craftsmen (gens de l’art) before the king had approved it.106

For much of the century, the tendency was increasingly to give public rights precedence over private ones. By the end of the century, however, inventors began more frequently to invoke the argument for secrecy, with the aim not just to compete against rival masters but also to fend off the growing pressure from powerful merchants.

**Vertical Conflict: Apprentices versus Masters, Masters versus Merchants**

Often mingling with horizontal conflicts, vertical ones seemed more violent. Some opposed apprentices to masters; others opposed individual inventors to the merchant elite. For instance, the introduction of English calendering by John Badger fostered such competition, probably because

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105 AN, F12 2199.

106 AN, F12 2199.
his 'apprentices' were in fact highly skilled workers who collaborated closely with the inventor. Badger's apprentice, Seguin – the pupil that Badger was asked to train in exchange for his grants and privilege – became Badger's partner and later his rival when he set up his own calendering workshop.\footnote{AN, F\textsuperscript{12} 1442; AML, HH 158.} Quite the same problem occurred to the finisher Claude Collet, who was in charge of Vaucanson's first calender and imitated Badger's one; his worker, a turner named Milliet, copied Collet's latest improvement.\footnote{See also note 112.} In 1755 the weaver Antoine Bonnafond, one of Vaucanson's rivals in calendering, complained that his journeyman Bouchon had stolen his 'precious thread', his tools, and even the invention, which Bouchon had submitted to the government as his own. Bonnafond, however, had planned for such circumstances, having got Bouchon to sign a contract compelling the journeyman to pay 2,000 livres if he divulged his master's secret.\footnote{AML, HH 158.} In 1765 Barbier (Falcon's rival), formerly also a journeyman with Bonnafond, was accused by Bonnafond's widow to have copied the master's new loom; but the authorities paid the bonus to Barbier rather than to Bonnafond, who was described as simply the financial backer.\footnote{AN, F\textsuperscript{12} 1443.} At stake in this case was how to keep a skilful worker in the widow's workshop, which could justify some degree of compromise; but the situation was less easily managed when it pitted inventive masters against merchant power.

Contests arose also from the perverse effects of public funding, which bound inventive artisans to public innovation policy. Thus, although Falcon was celebrated by the Fabrique and by the town council, was granted huge rewards, became a sort of role model for artisan-inventors, and was considered a symbol of merchant power in the Fabrique, his daughter – herself rewarded for diffusing her father's looms – kept pestering the town authorities long after his death.\footnote{Falcon was targeted by masters who wished to challenge the merchants' increasing authority. In 1737, when the masters briefly took the upper hand, they stopped paying Falcon a pension he had recently acquired to encourage him to invent. Falcon had to wait for the merchants' revenge in 1744 to get his money back (AN, F\textsuperscript{12} 2201). See also note 66.} Her arguments reveal the peculiar frustrations of elite inventors. Falcon's daughter claimed that her father had been humiliated for he had been \textit{compelled} to invent.\footnote{AN, F\textsuperscript{12} 2201.} He had had to teach workers and show his devices to anyone passing through Lyon, whereas he would have earned more money if he had worked for his own business: 'his superior genius could have granted him
a huge fortune in trading, but he would have worked for his sole benefit'. His membership of the merchant elite should have been given far more credit (‘my father was never brought up as a worker’). ‘Whereas his talent and genius should have secured him and his family a fortune, they brought about their ruin’. Collective management, she implied, did not suit the best inventors, for whom public service turned into a relation of dependence.

The complaints by Falcon’s daughter echoed a wider opposition to the Lyon authorities, who were accused of exploiting the artisans on behalf of a merchant oligarchy whose powers kept growing during the eighteenth century. Some inventors argued that the collective ethos had been subverted by merchants who used it to force artisans to submit their inventions to the town oligarchy and deprived them of adequate profits from their creations.

Artisan initiatives were not fully encouraged by merchants, who feared that the more dynamic workers could challenge their economic power. In 1775 Fleury Dardois complained that the authorities had asked him to invent a loom within one month for 144 livres, but that he was only paid half the amount. When a guild official asked to see his device, Dardois contrived to conceal the new mechanism. He finally disclosed the invention in return for the promise of a certificate, which however he never received. Property rights to knowledge became part of a broader struggle and resistance to merchant power. Dardois wrote in anger that merchants ‘persist (in) . . . keeping the worker under their claws, to want him to depend on them as if they had sovereign power and even stronger: a despotic power . . . Tyranny’. He was ‘ill-treated, insulted when he asked for his money’, reduced to a beggar . . . because the guild wanted to deprive the artist of the reward and merit of his work’. ‘Was it possible’, he asked rhetorically, ‘to treat men . . . humanity so badly?’.

Open conflict between inventors and authorities was nevertheless taboo. Public support for collective invention allowed the Lyon elites to forge a myth of the disinterested inventor that hid the fact that the latter could want a higher return on his invention. The glorification of benefactors began with Philippe de Lasalle’s death, in February 1804. Immediately, the Commission of the Conservatoire des Arts wrote a panegyric and a marble inscription was set up in the Conservatoire to honour the gift of de Lasalle’s machines to the town. Jean Marin made copies of the looms for the Crystal Palace Exhibition of 1851,

113 AN, F12 2201.
114 AML, 77 WP 001.
and in 1910–12 the town proposed erecting a monument in de Lasalle’s honour.115

Conclusion

The case of eighteenth-century Lyon is a good example of an open technique policy adapted to a local context. The Lyon silk industry was framed by institutions that helped devise and sustain a policy for innovation based on the collective management of invention. The rewards were considerable and sustained the international success of Lyon’s silk industry. An unusual compromise was set up between the economy of fashion and a policy of public assistance that encouraged innovation and enterprise within the guild. The market economy did not oppose public support; inventions were considered a public good.

This public funding relied on persistent negotiation between the silk guild, the local academy, the municipality, the intendant, and the inspector of manufactures on one hand, and the central government and eventually the Paris Academy of Sciences on the other. The part played by the Fabrique was critical, as its officials evaluated inventions according to their users’ judgements, negotiated their value with local and central administrators, counted the new looms in town to assign the bonuses, kept models of devices for public information, and delivered certificates of invention to individuals. Innovation policy in Lyon was in tune with the restructuring of guilds that took place under the finance minister Jacques Necker in August 1776; the silk guild was already a representative of the emerging ‘new corporatism’, in which it acted to improve the exchange of information, products, and equipment, help emulation of talented producers, and register (through drawings and models) and regulate innovation, striking a balance between private initiatives and collective responsibility.116

This system promoted a pattern of invention based on highly skilled designers and machine inventors bent on replicating and improving each other’s devices. Both legitimate imitation and fraudulent copying were


integrated into the municipality and guild’s public policy. This ‘economy of imitation’ was essential for the emergence of technology as a distinctive field of analysis. Economic practices taking place in an old regime town and a guild system rooted in commercial capitalism supplied the matrix of a new conceptualisation of techniques.

However, the collective management of innovation in Lyon also fostered conflict between masters, municipality and merchants over profit and praise. These tensions gave rise to growing pressure to improve registration of inventions. Registration helped both to share new knowledge and to establish inventors’ claims to a fair reward; but the harshness of negotiations between artisan-inventors and the authorities shows that some inventors could view the reward system as a source of dependence and as a kind of public pre-emption over their genius. Open technique policy was not necessarily or always consensual.

Public and private interests may have achieved a better balance after the Revolution. The Napoleonic era inherited the collective management of innovation in Lyon and combined this legacy with the recognition of individual Human Rights. A Conservatoire des Arts was created in Lyon in 1802 with the aim of collecting all kinds of work (designs, samples, paintings, antiques, sculptures, and technical models) in aid of teaching, demonstration, and the support of invention. Designs and samples were systematically registered, first by the Conseil des Prud’hommes, then, after the copyright’s expiry, by the Conservatoire des Arts, as stipulated by the law on copyright devised for Lyon in 1806.117

Continuity with the Ancien Regime was even stronger for technical inventions. The combination of inherited collective practices and new individual rights generated an original system for managing patents. The Chamber of Commerce, re-established in 1802, rewarded inventors who could not pay for a patent and who chose to transfer their inventions to the public domain. From 1828 profits from the public assay of silk (Condition des Soies) were earmarked for the encouragement of invention and the welfare of the silk trade.118 The Chamber of Commerce examined numerous requests from inventors, and even bought patents from artisans who were unable to exploit their inventions.119 The system allowed inventors

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117 Previously, public access to the collections of samples may have been less easy; in 1742, the Conseil des Prud’hommes advised that samples be displayed correctly in ledgers (AML, 784 WP 6).
119 Benoît Allais benefited from the public purchase of his patent for a new tulle-loom in 1820, but he was also allowed to carry on collecting licence fees from users for the patent’s duration. The model was deposited in the Palais des Arts (formerly Conservatoire des Arts); samples were kept in the town hall. The Conseil des Prud’hommes
to utilise different resources according to the state of their business. Rewards by the Chamber of Commerce could be used as an alternative to patenting, since all inventors were registered and could establish priority in the face of rival patents. Inventions were quickly publicised by the deposition of models at the Conservatoire des Arts and from 1833, at the La Martinière technical school; inventors were also issued La Martinière certificates. The Chamber of Commerce kept the drawings. The Conseil des Prud’hommes was in charge of enforcement and could issue approvals, as could the local society for industrial encouragement, the Société des Amis des Arts. The prefect of the Rhône gave final approval to funding. Despite the change of rules, this institutional pluralism offers a strong reminder of arrangements under the Ancien Régime.

Last but not least, the nineteenth century shared with the guild era a persistent difficulty in dealing with unusually inventive artisans. The collective encouragement of invention was still viewed as a form of public pre-emption, especially by inventors who were too poor to apply for patents. The most salient example of this was Jacquard, who, although described as a great benefactor, was never granted an individual patent for his loom. The municipality may have forced him to stay in Lyon to prevent him from selling the invention to outside competitors. Jacquard was also punished because his work did not fit with the expectations of the municipality. In 1813 after he had lost his pension and his dwellings in the Palais Saint-Pierre, Jacquard complained that in principle his arrangement with the town allowed him to collect 50 francs per loom but that, lacking a patent, the machine was copied and he received no income. As he put it, ‘I could have had exclusive rights on my machine and sold it collected user fees on the inventor’s behalf (AML, 784 WP 13; Chambre de Commerce de Lyon: Reports, 1813–1827, no. 103 bis).

120 In 1847, Jean Marin, a mechanic, professor in the La Martinière school, and curator of the repository of models in the school requested that his newly invented ‘Chinese’ unwinding mill be transferred to the public domain to prevent anyone from registering a patent (Chambre de Commerce de Lyon: Condition des soies; box 10 folio 10).
121 Jacquard was granted two other patents: one in 1800 for his first loom that abolished the use of draw girls, based on one by Ponson, which was rewarded at the Paris exhibition the same year; the second issued in 1805 for a fishing net loom, in response to the competition launched by the Société d’Encouragement pour l’Industrie nationale in 1801. When Jacquard went to Paris to demonstrate his invention in 1802, he worked in the newly founded Conservatoire des Arts et Métiers. There he rediscovered Vaucanson’s loom that inspired him to develop his famous device. A. Cottereau, “L’invention du métier Jacquard et la fabrique collective: une régulation prud’homale à redécouvrir”, in François Robert et Pierre Vernus eds., Histoire d’une juridiction d’exception: les prud’hommes (XIXe–XXe siècles) (Lyon: Presses universitaires de Lyon, 2008)
122 Cayez, Métiers jacquard, 106.
to all the silk-makers in town, and even to all manufactures in France, whereas as things stand the town of Lyon is the only beneficiary. The public management of innovation was once again under trial – but the conflict was veiled by the myth of the inventor devoted to the public good.

124 AML, 784 WP 13.