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CONTROL AND COST ACCOUNTING PRACTICES IN THE SPANISH ROYAL TOBACCO FACTORY

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ABSTRACT

The aim of this paper is to analyse the cost accounting system implemented in 1773 by a large Spanish tobacco company which operated as a monopolist. Drawing on data extracted from original archives, the paper examines the characteristics of the cost system within the broader context of a strict control system. The paper argues that there was a connection between the two systems. One of the main roles of the cost accounting system was to buttress a set of structural measures instituted in the RTF with the aim of minimising the scope for tobacco theft. Another aim was to impart visibility upon the various activities undertaken in the RTF. The paper also examines the role of the cost accounting practices as a disciplinary regime. A combination of physical measures, reflecting the rates and mixes of resource utilisation and monetary measures were developed to facilitate monitoring and surveillance of the activities of the factory employees. These measures were used to establish a powerful regime of calculability which rendered human accountability visible. Such calculability created an environment at the RTF in which management could compare, differentiate, hierarchaise, homogenise, and even exclude individuals.

Key Words: Accounting History, Management Accounting, Foucault, Spain.

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INTRODUCTION

The conventional orthology in accounting history has promoted a powerful thesis according to which the emergence and functioning of cost accounting practices are explained in terms of demand-response mode that is rooted in the notion of economic efficiency. At least two strands of research can be identified within that tradition. The first strand conceives competitive pressure as the demand that calls for the invention of new cost accounting procedures. Thus, Pollard (1965) found little evidence on the use of cost accounting to guide decision making in British firms during the industrial revolution and has surmised that this was due to the prevalence of high profit margins and the absence of competition (as well as, he contends, accounting's inexact calculations). Following in his footsteps, Edwards and Newell (1991) and Fleischman and Parker (1991) have suggested that intensive competition provides the stimulus for the use of cost calculations in order to improve firm efficiency and strengthen its competitive position.

The second strand within the conventional approach formulates the demand for cost accounting in terms of the absence of market prices. Thus, Johnson and Kaplan (1987) have argued that when cost accounting first appeared, its main function was to provide 'synthetic' prices to facilitate the coordination of inputs into outputs in the absence of intermediate market transactions. As long as entrepreneurs were paying market-based piece rates for the output of each worker, Johnson and Kaplan argue, they had no need for cost accounting. While not wishing to completely deny the plausibility of the demand-response mode, we argue that linking the emergence of cost accounting purely to the logic of economic rationality will at best yield only a partial explanation of the cost accounting phenomenon (see also Burchell et al, 1980).

An alternative approach, and one that informs this paper, builds on the work of Foucault (1977) to link the rise and functioning of accounting to a power/knowledge framework (e.g.

Hoskin and Macve, 1986; Miller and O'Leary, 1987; Ezzamel, Hoskin and Macve, 1990). Accounting both in the 19th and 20th centuries is seen to operate as part of a disciplinary system that instills self-surveillance and auto-regulation by organisational subjects of their own activities. Much of the business history, to which cost accounting is extricably linked, is seen in terms of two things, first an expansion of surveillance turning "everything conceivable into writing: each job has clearly defined written functions, and all are located within a chain of command which are diagrammed in organizational charts", and second "that judgement is constantly exercised through written reports and directives flowing up and down the chain of command-reports and directives which constantly demand and process information which is couched in numerical form on all aspects of the enterprise" (Hoskin and Macve, 1986, p130).

Once viewed as a set of discursive practices, as a regime of calculation and as a form of power/knowledge, interest in the emergence and functioning of cost accounting becomes more focused on examining the various forms in which accounting operates as a scheme of surveillance and how it networks with other schemes of surveillance, and its role in establishing new modes of accountability by virtue of its ability to render human activities visible thereby promoting new areas of discourse and by enabling social fields to be represented as areas of rational economic action (Hopwood, 1990; Roberts, 1990; 1991; Loft, 1993; Morgan and Willmott, 1993; Ezzamel, 1994). Pursuing such a framework of analysis leads to a different interpretation of changes in cost accounting practices that may occur contemporaneously with, or after a given time lag to, changes in the physical or organisational structure of the work place. Rather than purely advocating a demand-response argument, such accounting developments would be interpreted in terms of their discursive and disciplinary implications, and hence in terms of constituting a new power/knowledge base.

This paper seeks to contribute to the above debate by contextualising the design and implementation of cost accounting procedures in the *Real Fábrica de Tabacos de Sevilla* (Royal Tobacco Factory, RTF) in 18th century Spain. Employing more than 1,400 workers, the RTF enjoyed a monopoly over snuff and cigar production, notwithstanding regular smuggling activities. The original documents covering the control and cost systems are

contained in the *Archivo de Tabacalera, S.A.* (Archives of the Spanish Tobacco Co). After a careful examination of the Archives, we located a number of documents relating to the Instructions issued in 1744, 1761 (which were subsequently revised in 1769), 1773 and 1779 and these are the main sources of the data analysed here. A change in factory premises took place in 1758 and the paper examines the extent to which this change may be linked to changes in the design and use of the cost accounting system as a disciplinary regime. The large size of the RTF posed serious monitoring problems owing to the resulting wide span of control and/or the craft technology used in the factory. The paper examines the extent to which the quest to reduce/absorb uncertainty, caused by increased demand for tobacco, increased reliance on tobacco income by the Spanish Crown, change in factory premises and changes in production technology, was facilitated by the cost accounting system. Finally, the paper investigates the extent to which physical measures, reflecting the rates and mixes of resource utilisation, were combined with monetary measures to establish a system of performance evaluation and accountability, and considers the import of the findings reported here to the role of accounting in organisations.

The next section contains a brief description of the Spanish tobacco industry and its manufacturing technology. This is followed by an examination of the control system employed by the RTF and a discussion of the ramifications for information and cost systems. The paper then deals more specifically with the cost accounting system developed in the RTF, and examines the methods by which the operating costs of both snuff and cigars were calculated. The section also reports on the extent to which the cost system was used to inform experiments aimed at discovering more economic production activities and in deciding on make or buy scenarios. The penultimate section examines the monitoring regime used in the RTF and explores the extent to which cost accounting was implicated in that regime. The final section draws together our main conclusions.

It is crucial to acknowledge from the outset the problems that might be caused by the use of modern terminology to describe old systems and practices. Unfortunately, this is unavoidable. All that can be said is that one should be cautious in interpreting the evidence reported here. Despite this caveat, the paper argues that there was a strong connection between the cost accounting system and the control system in the RTF. One of the main

roles of the cost system was to buttress a set of structural measures instituted in the RTF with the aim of minimising the scope for tobacco theft. Another aim was to impart visibility upon several aspects of the work environment within the RTF that were deemed crucial for the improvement of factory performance. A combination of physical measures, reflecting the rates and mixes of resource utilisation and monetary measures were developed to facilitate the monitoring and surveillance of factory labour. These measures established a regime of calculability which rendered human accountability visible and created an environment at the RTF in which management could compare, differentiate, hierarchaise, homogenise, and even exclude individuals.

THE SPANISH TOBACCO INDUSTRY

The tobacco industry in Spain was initially developed in small family run workshops during the 16th and early 17th centuries. However, the need of the Spanish Crown to secure additional sources of revenue provided a powerful motivation for bringing the tobacco industry under state control, and in 1684 the sole right of tobacco production in Spain was given to the RTF by a Royal decree. Initially the RTF was located in the *Fábrica de San Pedro* (Factory of San Pedro) which produced mainly snuff and, on a small scale, cigars. Tobacco leaves were imported and transported to Spain by Compañía de la Habana (the Havana Company) and subsequently transferred to the RTF for manufacturing. Finished products (of both snuff and cigars) were entrusted to another company (Estancos) for distribution and selling. The popularity of tobacco consumption coupled with improved quality of tobacco products in the RTF brought about a sharp increase in demand. Rodríguez-Gordillo (1990) has documented an increase in tobacco sales volume during the period 1701-1740 from 1.1 to 3.9 million pounds. Also gross income sales from tobacco during the period 1730-1775 increased in absolute terms from 34.5 to 95.5 million Reales. During the same period, the proportion of total Crown income attributable to tobacco increased from 13% to 28% (Artola, 1982). Our inspection of the archives shows that this increased relative importance of tobacco income to the Crown was in part due to price increases (for example the price of a pound of snuff tobacco increased from 3 Reales per

pound in 1730 to 39 Reales per pound in 1780[1]), and in part because of an increase in the volume of tobacco sales. Taken together, these pieces of evidence have two implications of relevance to this paper. Firstly, the Crown had a vested interest in maximising tobacco income whether through promoting demand, or increasing prices, or minimising cost of production. Because of its crucial contribution to state income, the RTF was considered then the 'jewel of the Crown'.[2] Secondly, the desire to match the increase in tobacco demand by a corresponding increase in its production meant that the RTF was to accommodate significant shifts in terms of both its size and the technology of tobacco production.

The old factory premises were located in downtown Sevilla. Prior to moving to the new premises the size of the old factory was increased three fold (from 3 to 9 million varas) and a programme of technical renovations in machinery was introduced. Similarly, horses, being the only source of power in the RTF, increased in number by 98.8%. These steps, however, were to prove insufficient to cope with the increased demand for tobacco. Furthermore, the old premises were vulnerable to theft as tobacco bags used to be thrown over the old factory walls into poorly illuminated adjacent streets. Hence, it was decided to move production to the *Nuevas Fábricas* (New Factories) which had a production capacity 2½ times (22.5 varas) that of the old factory. The construction of these factories was finished in 1758 and full production was well under way by the 1760's. The New Factories were located outside the city walls in order to minimise theft, noise and smell. Three physical defences were established to minimise tobacco theft on the shopfloor, an internal pavement, a moat and a wall contained and enveloped the shopfloor. The wall itself was patrolled by armed soldiers and only one gate was used for entry to and exit from the factory. Hence, opportunities for theft, particularly during the night shifts, were reduced significantly.

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[1] The pattern of increase in tobacco prices during that period was not linear. Thus, the per pound price which was 3 Reales in 1730 increased to 15 Reales in 1731, to 32 Reales in 1740, and then to 39 Reales in 1780. It is therefore of interest to note that tobacco prices remained stable, at 32 Reales per pound, over the whole period (1760-1779) considered in this paper.

[2] When a tobacco monopoly was established in the then New Spain (present day Mexico) the building design and organisational arrangements of the new premises of the RTF were cited as the exemplar to be followed (Deans-Smith, 1986; 1990).

The new RTF was built as a symbol of the economic and organisational might of the 18th century Spanish monarchs; it was the largest civil building constructed in Spain in that century. Designed by military engineers, the premises exhibited some of the features of the military buildings of that period, in addition to having its own jail and chapel. But there was more than a physical similarity between the RTF and the military. Various military metaphors were in evidence in the RTF, the highest position was that of the superintendent, the position in charge of foremen was that of a lieutenant, and administrative staff were instructed to wear uniforms at work.[3] Also, like a military organisation, the hierarchy of the RTF was tightly centralised with clearly drawn vertical lines of communication and reporting.

The Manufacturing Process

The new premises site housed two factories, one producing cigars and the other snuff. Even though cigar production was increasing gradually, snuff production was still larger; in 1760 the weight of tobacco consumption was divided into 60% snuff and 40% cigars. However, by 1798 these percentages had changed to 38% snuff and 62% cigars (Rodríguez-Gordillo, 1990). The manufacturing process for cigars was based on handiwork. At the operating level work was highly individualised with no division of labour. Each operator carried out the entire job of rolling the tobacco leaves to make the cigars. The factory organised production on the basis of work groups of ten to fifteen skilled operators who were hired on a weekly basis. Each week a certain amount of tobacco was transformed into a given number of cigars (bundles), according to pre-determined conversion rates (see Table 1). The salary of each worker was determined by the number of cigars produced on the basis of a piece rate system. Under the piece rate system higher than average production was worthwhile only if the target level of quality could be maintained since if quality fell below that the cigars had to be taken apart. Indeed, if an operator's production was lower than the target number of cigars, he was not allowed to deliver his output to the officers, and hence

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[3] The "Board of Directors" of the RTF was known as "Plana Maior", a term that was used then to refer to Army Generals. On the differentiation of the clothing of personnel in administration compared to production workers the 1744 Regulations requested that "the doorkeepers of the Accounting office should wear decent clothing....(whereas) operators of the *Monte* quarters should wear just a sheepskin jacket".

could not be paid a wage. Thus, to ensure receiving a wage an operator had to produce as a minimum the expected number of cigars of the 'standard' quality. Table 1 shows two characteristics that were typical of cigar production in the RTF: a) a favourable 'variance' (column 6) and b) the calculation of salaries on a group basis for administrative expedience, even though in cigar production control was exercised at the level of the individual operator.

INSERT TABLE 1 HERE

The snuff factory was organised differently, particularly in terms of its labour force. As far as the operators were concerned hiring took place on a daily basis. Contrary to the cigar factory, where salaries were strictly based on output, in the snuff factory workers were paid a fixed daily wage. In general, workers in the snuff factory were unskilled as their work mainly required physical strength for operating the mills and tending to the horses. The manufacturing process of snuff powder was carried out in six stages:[4] *azotea, monte, moja and entresuelo, repaso, fermentación and distribución.* In the New Factories, the *azotea* was the terrace of the building which operated at that time as a storehouse for raw materials and it was there that the tobacco was dried. In the stage called *monte* the tobacco leaves were brought in for grinding to produce the initial snuff powder. In *moja and entresuelo* this initial snuff powder was moistened and mixed with other materials. In the *repaso* stage the product was brought in for further grinding (fine grinding) to produce a finer powder fit for public consumption. In *fermentación* the snuff was packed and finally, in *distribución* the finished product was stored. This yields the following descriptive terms: (i) drying; (ii) grinding; (iii) moistening; (iv) fine grinding; (v) packaging; and (vi) storage.

For costing purposes, the three intermediate stages (ii)-(iv) were classified under the generic noun *machinery* as production was concentrated at different types of mill. The rationalisation underlying the classification of these processes was invested with expert knowledge of factory space and production technology as reflected in both a physical dimension, for example the structure of the mills, and a technical dimension, for example quality "standards" and

[4] These were referred to by old Spanish names making four of them impossible to translate into English.

technological innovations relating to tobacco manufacturing. Each mill had a crew of "five men, a foreman, an assistant, a refiner, four horses (two for the morning shift and two for the night shift) and one extra horse for every two stables in case a horse should fall ill" (1761 Regulations, 11 and 17). The technological advance of the mills was of special concern to the management of the RTF who, as we shall see later, looked for innovations that would improve quality and increase production, for example by reducing incidents of machine breakdown or by reducing the quantity of materials used to produce a given level of output.[5] We will be suggesting later that the structure of the production process was rooted in the notions of hierarchic order and control. At the cigar factory, where manufacturing was based on handiwork and where it was impossible to control production effectively by means of direct supervision, two accounting tools of monitoring and control were used: rates for raw material consumption and targets for direct labour efficiency. In the case of the snuff factory control was exercised through the physical segmentation of the production process into various steps and also through the division of labour into a number of specified tasks.

MONITORING AND CONTROL IN THE RTF

The strength of the monopoly enjoyed by the RTF was manifest in a number of ways. One such indication was the levels of profits made; in 1773 total costs were 2,990,822 Reales and in 1775 the gross revenue was 95,538,000 Reales, that is about 32 times the level of costs in 1773. This implies that net profits were very high even though total costs as defined then did not include the cost of raw materials, allowances for depreciation of physical assets and the cost of distribution. Another indication of tobacco monopoly was the relatively high prices charged for the final products. For example, in 1780 the price of a pound of snuff tobacco was 39 Reales compared with a weekly average wage of just over 34 Reales for an operator at the snuff factory (and 60.8 Reales for an operator at the cigar factory).

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[5] In relation to the consumption of materials, even the fodder rations for the horses were pre-determined (Regulations from 1761, 59). It was established that they should be fed "four measures of barley on rest days and five measures on each working day. The veterinarian will decide how much any sick horse should be fed".

In the RTF there was much concern with costs, production, and issues of product quality. The efficiency of the process could not be measured satisfactorily by reference to profit-based calculations as the RTF still only represented one link, the product conversion link, in the Tobacco monopoly and no internal prices were set to coordinate this activity. Because of this, the management of the RTF did not have information relating to the cost of materials they received nor to the sale prices of their finished products. In this sense, the RTF was simply a work station within the tobacco industry. Its efficiency could only be evaluated in terms of its ability to meet the growing demand for tobacco whilst securing maximum revenue for the Crown. As indicated earlier, strict administrative order and discipline were observed in the RTF through the detailed and meticulous control of materials and labour.

It is worth noting that although the structural arrangements instituted in the New Factories significantly reduced the opportunities for tobacco theft (see the previous section) the incentive to beat the system remained strong; the high prices charged for tobacco made tobacco theft and illegal dealing outside the monopoly very tempting. Such temptation was reinforced to a large extent by the relatively low wages for the work force at the RTF and the poverty of most of the population of Seville at that time (Aquilar Pifial, 1989). The archives provide evidence which shows that workers used to conceal tobacco into their hats and drink bottles (which was to result later in workers being instructed to bring only crystal bottles whose inside could be seen and checked easily). It is also significant that the RTF Superintendent at the time was himself accused, but later cleared of thieving tobacco. As further deterrence, over and above the structural arrangements in the factory, accounting-based controls were used in order to help further in reducing the scope for theft. Moreover, from 1740-1779, the period under consideration here, tobacco and snuff prices within the monopoly were fairly stable and hence, any desired significant increase in profits could only be secured either through cost reductions or increased sales volume. Rigorous control procedures over both raw materials and labour were used to attenuate the chances for theft but also to facilitate the monitoring of performance in the RTF and to increase tobacco profits. These procedures were communicated and their implementation pursued through written directives and reports that transcended the RTF chain of command.

Two types of control were exercised over raw materials; one dealing with quantity and the other with issues of quality. On the quantity side, the *Labores* Manager was responsible for supervising the production process, including the sealing of packed tobacco. As indicated later, the techniques of quantity control deployed were highly coercive and were managed and sustained through the deployment of accounting-based calculations. Control of materials quantity involved weighting production and quantifying rejects in terms of the amount of wastage. The tobacco was weighted on the factory patio after each production stage, in the presence of the heads of departments, the foremen and their assistants in charge of receiving and transferring tobacco. The internal auditor and his assistant presided over the proceedings. Three separate sets of accounts were then kept, one by each of the two foremen and one by the internal auditor, and the heads of the departments concerned had to sign the relevant receipts and delivery slips. The process of re-weighting was apparently so demanding that those performing it thought it appropriate to seek financial compensation. Writing on 18 January 1774 to the RTF Superintendent on behalf of himself, his two assistants, and the foreman of the *Azoteas* and his assistant, the internal auditor said:

> "The tobacco received from La Habana and Santo Domingo has been greater this year compared to the previous year. As a result of this, we had to do a lot of re-weighing. At the same time we had to perform our usual tasks. We have not received any financial assistance. We ask you to take into account the high cost of living during last year when a pound of bread cost 1¾ Reales and we support very large families".

Individuals in charge of each stage of production carried out an inventory control of the stock. For example:

> "The Distribution Manager will classify the tobacco by quality and weight. Tobacco bundles will be ordered in piles. these piles will each have a card showing the class of tobacco and day/month of their delivery to the warehouse".
>
> (Chapter 3, 3rd article; the 1761 Regulations).

Similarly, efforts were made to minimise inventory levels:

> "Foremen of *Azoteas* (drying) will be told about the amount of tobacco to be milled in *Monte* (grinding). They will provide the exact amount of tobacco to avoid over-inventories".
>
> (Chapter 1, 12th article; the 1761 Regulations)

The emphasis here was on minimising work in progress in order to prevent theft as both stocks of raw materials and finished goods were stored in locked storehouses and therefore considered less exposed to the threat of theft. The *Labores* Manager was instructed to ensure that the exact amount of tobacco was processed at each work station. Further, in order to prevent theft under the guise of wastage, the *Labores* Manager was entrusted with issuing the final wastage certificate. Such detailed control of each stage, and the overall control of the works by the internal auditor were enshrined in an accounting procedure called "cargo and data" which was used in other industries of the time such as the Royal Coins (i.e. the Mint) Factory at Valladolid. The procedure refers to two entries, one which gathers all the cash/goods received (cargo = sources), and another which shows the usage of the cash/goods received (data = application). In the case of the RTF, the registered amounts referred exclusively to the weight of tobacco, not to its monetary value since the cost of the raw materials was not known, but this was clearly deemed sufficient for the prevention of theft.

In addition to monitoring the movement of materials, an actual count (Table 2) was undertaken which highlighted the differences between the physical (actual) inventory and the inventory to account for. Annual adjustments had to be made in those cases when the actual level of inventory was lower than it should have been. The actual inventory was calculated on an annual basis but with monthly breakdowns. Responsibility for the tobacco levels appears to have imposed a significant burden on the *Labores* Manager a relief from which, whenever possible, was to be welcomed. Thus, just before the reweighing of tobacco scheduled in February 1774, the *Labores* Manager wrote to the Superintendent on 25 January saying:

> "I beg your support for me not to be the one responsible for the waste in raw materials which will occur during the next general reweighing. The RTF is over-stocked with millions of pounds of inventory. Therefore, there will be more waste since the two million pounds of annual production are not enough to absorb the over-inventory of 13 million pounds of tobacco leaves".

INSERT TABLE 2 HERE

The *Labores* Manager was also responsible for the goodness (quality) of the tobacco produce. His job was defined in the 1761 Regulations which required that "he be knowledgeable in

tobacco and its processes", and his responsibilities involved quality control throughout the production process. In the initial stage, tobacco leaves were classified into more than 200 fine categories which were grouped into two broad categories: "exquisite" (high quality) and "fine" (good quality). The quality of tobacco leaves delivered to the RTF was checked carefully; for example, on 10 April 1774 the Superintendent of the RTF issued a document in which he stated:

> "Rolls (of tobacco) delivered to us will have to have a certificate indicating that they were completed in accordance with the weight and quality established by contract (with the Havana Company)".

As far as the control of the manufacturing process was concerned, the *Labores* Manager decided how many hours were needed for each type of tobacco to be grinded and sifted and gave instructions to operators with respect to product quality. It was also the *Labores* Manager's duty to decide upon the goodness of the finished product, and to give his seal of approval indicating that the tobacco was fit for use. If the final cigar's production did not meet the required quality, the bundles had to be untied and the cigars unrolled.

> "The quality of tobacco will be analysed in *fermentación* in order to check if it contains more additives[6] than required. If this is found to be the case, the General Manager will be notified and the relevant foremen will be held responsible for reworking this tobacco". (Chapter 5, 5th article; the 1761 Regulations)

In summary, as the tobacco market sold the products at an extremely high price, the interests of the monopoly called for a policy of product differentiation particularly in terms of quality in order to contain illegal manufacturing outside the monopoly. Product quality was controlled by the *Labores* Manager at the RTF, who had authority over the foremen. Hence, such control was carried out by an expert, and was basically qualitative in nature.

This elaborate control over raw materials was buttressed by an equally strict control over the labour force which was also of a physical type involving checks of the labour force by

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[6] In addition to tobacco, snuff powder contained some additives to improve both the smell and flavour. Sometimes, inferior quality snuff tobacco produced outside the RTF (on the black market) included ground soil to increase the weight. quality differentiation was therefore important to the RTF.

special inspectors at the works exit. The form of checks which had to be carried out was outlined by the 1761 Regulations (15-16);

> "The register will be done on a one to one basis, checking all parts of the body. If in the counterregister (when someone who had already been checked by a doorkeeper was checked again) a person is found to have tobacco, the doorkeeper will be punished by a four year sentence in an African prison....if someone is found to have tobacco it will be made known publicly to his workmates and he shall be sent to prison and the superintendent shall be informed".

Initially, only labourers were searched at the factory gate. Later, however, foremen and administrative staff were also searched. The 1779 Regulations which intensified physical checks established a picking order differentiating clearly between different levels of employees:

> "All members of the 'Board of Directors' (Plana Maior) will not be checked given the honourable positions they hold. In addition to those employees (labourers) who are strictly checked, the following personnel should also be checked: foremen of the snuff and cigar factories, the person responsible for weighing,....Nevertheless, the aforementioned individuals should deserve a better treatment than simple operators".

Even workers authorised to move between different production stages/departments were checked as they moved from one area to another. The physical check was therefore virtually comprehensive, but at the same time sensitive to hierarchical position. The men who carried out the counterregisters were the doorkeepers' assistants, and the reward for those finding stolen tobacco was promotion to the jobs vacated by imprisoned doorkeepers who had failed to find the hidden tobacco.

The quest for reductions in labour costs meant that the management of the RTF was constantly looking for means of improving the productivity per operator per day. For example, the Superintendent of the new mill, Joseph Lozada, issued the following instruction to those responsible for the *Azotea* (drying) process:

> "Operators from now on will treat bundles of tobacco leaves in a different way. Previously, operators spread the leaves on the roof very carefully. The main time-consuming task was the opening of the sacks and then the filling of these sacks after the leaves had dried. Joseph Lozada and his advisors found a way for

opening the sacks through the careful rubbing of the sack on a carved stone. This resulted in an increase in production from 6 sacks per operator per day to 19 sacks per operator per day".

Similar developments occurred in other production processes. For example, in the *Monte* (grinding) process improvements in labour efficiency made it possible for the output per operator per day to increase from 38 kilos to 68 kilos. Such significant improvement in labour productivity rendered the night shift redundant, a welcomed outcome because night shifts were associated with lower productivity, lower quality, and increased fire hazard since the factory was illuminated by oil lamps, but perhaps even more importantly they were more prone to theft.

THE COST ACCOUNTING SYSTEM

The cost accounting system developed in the RTF was instituted by the 1773 Regulations and was related to the routine tasks involved in tobacco production. The main technical focus of the system was on determining production cost, both in terms of actual procurement and cost levels permitted (expected) for specific levels of output. This section examines these costing procedures in relation to the production of both snuff and cigars. Further, the section provides some evidence on the extent to which decision making in the RTF, e.g. make or buy, was informed by cost calculations. First, however, it is worth noting that the accounting function in the RTF was headed by the Chief Accountant who had two internal auditors below him; one dealing with the snuff factory and the other with the cigar factory. Each internal auditor submitted accounting reports to the Chief Accountant and these were then compared against the accounts independently prepared by each of the heads of the production departments. Any variations between the two sets of accounts were investigated by the Chief Accountant. Responsibility for the accounts kept in each production department was traced directly to the relevant department head and each head had to sign his departmental accounts.

Operating Costs

The cost accounting system was described in the 1773 Regulations entitled: "General information on the instruments that are necessary to form the plan which calculates the cost

of each pound of snuff and cigars produced in a whole year". The Regulations did not indicate what the objectives of cost calculations and reporting were; they simply stipulated how the cost of a pound of the finished product should be calculated. However, given the monitoring and costing procedures described earlier, a number of pertinent observations can be made concerning emphasis on achieving improvements in factory performance. For example, the 1769 amendment of the 1761 Instructions stated that:

> "....the number of cigar workers is presently over 320. This number should be reduced to 240 in the future....Cigar workers will receive 6,000 pounds of tobacco leaves less every month in order to reduce the high inventory levels in the warehouses".

Further, while the administrators of the Tobacco Industry considered the physical procedures for the control of materials and workers in the RTF suitable for improving the conduct of the workers and reducing theft, they thought they were not sufficient either to enhance significantly the efficiency of the production process in terms of ensuring cost reductions and quality improvements or to prevent theft altogether. This was particularly so in the case of cigar production. In contrast to the routine activities involved in snuff production which can be monitored through the use of physical measures, the activities relating to cigar production were highly non-routine. Direct supervision of cigar production was deemed incomplete for monitoring purposes; to ensure that cigars produced were of high quality, targets for raw materials and labour were used. Moving tobacco production to the New Factories also posed additional control problems. The control procedures had to cope with a much larger factory space than previously. Moreover, there was more pressure to improve the use of that space as initial comparisons with the old factory revealed that the usage of space in the New Factories was inferior. For example, sales volume per one square varas declined from over 400 pounds in the old factory to about 140 pounds in the new factory. This lead subsequently to a new cost statistic being calculated, namely the cost of each unit produced.

With the guidance of the 1773 Regulations, the RTF calculated its costs annually, employing data from financial accounting records.[7] The cost accounting system and the financial

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[7] In its report to the Renta de Tabaco (Tobacco Income Tax Department) the RTF considered financial accounting a suitable system for reporting (see Gutierrez, 1993).

accounting system, the latter being in operation before the first, were strongly connected; for example, entries for salaries, sundry materials, etc were identical in both sets of accounts. However, it is important to note that in some cases different procedures were developed for both systems; for example, some entries relating to cash outflows were not produced for cost accounting purposes, as in the case of structural repairs of administrative offices. Cost calculations were performed separately for each of the snuff and cigar factories as each was involved in a single distinct activity.

The Production Cost of Snuff: The cost of producing snuff was classified across eight cost centres called *Casillas*. With regard to personnel cost, the characteristics of the *casillas* mirrored the distinction in the organisation structure between manufacturing and non-manufacturing departments. Direct labour and supervision costs were calculated for each of the three large production stages, *azotea, moja* and *entresuelo* and machinery. In contrast, three other cost centres were created for each of the service departments: administration, maintenance and stables. Hence, this cost was akin to some figure of value added being assigned to the cost of each pound of tobacco. In addition, two *casillas* attracted the cost of indirect materials.

The final cost of production figure did not include either the cost of raw materials (tobacco) or fixed asset depreciation, but then there is no evidence to suggest that costing system elsewhere in Spain at that time accounted for depreciation in physical assets. The main reason for excluding the cost of raw materials from production cost appears to be the ability of the management of the RTF to monitor the movement of raw materials and levels of inventory by weight and wastage statistics respectively. There were also additional reasons that rendered the calculation of the cost of raw materials either difficult or unnecessary. Raw materials were usually obtained from widely differing sources of supply covering differing destinations, and because of logistic problems the tobacco journey from the sources of supply to the RTF took a very long time. These factors combined made difficult the calculation of the cost of each incoming bundle of tobacco. When tobacco was purchased from owners of private land it was possible to calculate the cost of purchase. However, in many cases tobacco was collected by the Crown in the form of tax in kind with no financial calculations being made (i.e. tax was levied as a percentage of the volume of the crop). Finally, the

organisation of the tobacco industry meant that responsibility for the cost of tobacco was left in the hands of the Havana Company; hence the RTF had little incentive to trace out and accumulate the cost of raw materials.

The Production Cost of Cigars: Costs were traced to four *casillas* in the cigar factory. *Casilla* 1 contained the administration costs of the cigar factory; although the 1773 Regulations stipulated that the general administration cost of the whole RTF be allocated to the snuff factory, allocations of these costs were made to both factories. Similarly, the personnel cost of the ten doorkeepers employed in the RTF was allocated by assigning the cost of four doorkeepers to the cigar factory and the remaining six to the snuff factory in consistency with the sales proportions of both products at that time. *Casilla* 2 attracted the cost of the front line factory supervisors and *casilla* 3 attracted labour cost (which was based on fixed amounts per bundle at a strict piece rate). Finally, *casilla* 4 attracted the cost of indirect materials.

The simplification of the cigar production process, mainly due to the use of craft technology and the lack of fine classification of labour, was consistent with the simple procedures used to calculate cigar manufacturing costs. This simplicity was facilitated further by the strict piece rate salary system which was used to monitor the highly significant cost of direct labour (approximately 90% of total cost). As in the case of the snuff factory, the cost of a pound of cigars reflected a figure of value added which was calculated for each bundle of cigars, as neither the cost of raw materials nor the depreciation of machinery and installations was included.

Production Experiments to Improve Efficiency

The quest for attaining improvements in production through the use of cost calculations, targets for production volume and permitted/expected costs etc, was a main feature of the RTF control system. This appears to have been associated with the wave of rationalism which prevailed during the second half of 18th century Spain (e.g. Carmona and Gutierrez, 1994). Efforts to improve production and performance were always sought and when successful those involved were rewarded generously. For example, in 1730 a new design for the mills permitted some significant savings, which were calculated in the archives as:

"(For) every day and night 144 horses plus their food and horseshoes, 13 housekeepers who look after them, 72 operators who had to work in the 36 mills".

What was also significant was that the man who invented the successful design of the mills received, as a reward from the King, a lifelong pension of 1,000 Escudos per year. Similarly, a system of appraisal focusing on investment in technological innovation was developed in the RTF, particularly in the case of the new mills (Rodríguez-Gordillo, 1975).[8] The benefits which seem to have emerged from this included improvements in the quality of snuff and a simplification of the production process, as well as the development of new measures such as the number of workers and horses per mill, repairs and animal fodder. With such information, the cost of operations in the two mills was measured. Given that the cost structure was similar in both cases, decisions were driven by the profitability of the installation.

To provide further concrete evidence on the emphasis placed by the management of the RTF upon improving manufacturing operations and reducing the cost of production, we examine a production experiment which took place in 1778. The experiment was designed by Francisco Portocarrero who was appointed General Inspector of the RTF by a Royal Decree dated 16 July 1777 with a specific remit to develop this experiment. By virtue of his new position, Portocarrero had full authority over the manufacturing process. The annual output capacity of the RTF when Portocarrero took his new post was six million pounds of tobacco, and the stated aim of the experiment was to explore the possibility of extending output beyond that level as indicated by the title with which the experiment was inaugurated:

"Experiment to be carried out to investigate the possibility of producing more than six million pounds of tobacco per year".

The experiment lasted for 30 working days (21 April - 25 May). It concentrated on four out of the six stages of production: *monte, moja* and *entresuelo*, *repaso* and *fermentación*. The terms of reference for those running the experiment were encapsulated in one single

[8] It is worth noting that the profitability analysis used to inform such investment appraisal decisions was already developed by 1731 (more than 40 years before the Cost Regulations of 1773 were adopted).

instruction: "to investigate whether or not production could be increased without diminishing quality". The team involved in the experiment included supervisors and foremen from each of the above four production stages, quantity and quality inspectors, and the acting accountant Manuel Vallarin.

The division of labour among members of the experiment team demonstrates Portocarrero's good awareness of some of the basic fundamentals of organising. Thus, the foremen were responsible for reporting on breakdowns in production, the times spent on each stage and whether or not those exceeded permitted times, the quality of products, and any savings in the cost of processing tobacco leaves into raw materials. The supervisors were to report on the volume of tobacco processed in each production stage, the resources used in production, and the quantity of tobacco that could have been processed, and the difference between actual and possible output volumes. The inspectors were responsible for exercising daily control over incoming materials in the *monte* and *moja* and *entresuelo* stages and over the tobacco processed in each of the production stages, and also for monitoring the quality of processed tobacco. Vallarin, the acting accountant, kept records of the experiments. Information collected by members of the team was submitted to Portocarrero on a regular basis. Figure 1 shows a report on the experiment prepared by the accountant Vallarin and submitted by the General Inspector Portocarrero to the Superintendent of the RTF in order for him to bring the outcome of the experiment to the attention of the King.

INSERT FIGURE 1 HERE

As the Figure shows, 638,717 pounds of tobacco were produced during the 30 day period which over a period of 292 working days per year translate into an annual production target of 6,216,845 pounds, well over the presumed annual factory capacity. The experiment also rendered the *entresuelo* stage unnecessary thereby resulting in its elimination in subsequent production. Significant cost savings were also made possible; the cost of production was reduced from 6 million Reales before the experiment to below 2 million Reales. Further, Portocarrero was able to discover a new way of processing waste initially valued at a little over 2 million Reales under the old production procedures into new products worth nearly 68 million Reales. Finally, as a consequence of the experiment a new Regulations was

issued in 1779 requesting that cost calculations in the RTF be made on a monthly basis and, more importantly, endorsing the new production procedures developed in the experiment.

Table 3 shows the volume of snuff produced during the period 1770-1775, the expenditure incurred and the annual cost of a pound of tobacco. The costing procedures did not simply involve the reporting of cost information to the administrators of the tobacco industry. Costs were calculated retrospectively in order to evaluate performance and to promote self discipline. In Table 3, the volume of production and the cost of production were entered for each of the years 1770-1775 and then aggregated. The aggregate volume and cost were then used to derive the expected cost of 6 million pounds of tobacco output.

INSERT TABLE 3 HERE

Experiments to Decide Whether to Make or Buy

A number of experiments, some of apparently insignificant direct financial consequences, were undertaken with the purpose of reducing production costs. For example, on 7 November 1775 the Superintendent issued a decree which reported on an experiment to check the cost of making versus buying sealing wax for tobacco tins. The cost of making 3 *arrobas* and 10 *pounds* was calculated at 62 Reales. The decree stated that:

> "....fore more than forty years we have been paying more than 900 Reales for such an amount. It (making internally) means making a substantial saving in such a small scale operation. Therefore, purchase of sealing wax should stop".

Similarly, the same document stated that consumption of ink over and above 400 Reales was not needed, thereby making a saving of 860 Reales per year.

The most financially significant make or buy experiment however related to tobacco tins. Tins with six different sizes were used for packing tobacco; six, four, two, one, one half and one quarter pound. The tins had always been bought from an external supplier. In 1778 an experiment was undertaken to produce tins for the first six months of that Year. The purpose of the experiment was to determine the cost of producing tins internally as well as the ability of internal supply to match the external demand for tins.

The experiment produced three calculations for the volume of tins produced during the period January-June 1778: (i) the total cost of producing the tins internally; (ii) the price of buying the tins from external suppliers; and (iii) the savings that would be achieved if the tins were made internally instead of being bought externally. Initial calculations show an overall saving for making over buying by an amount of 163,191 Reales, but the final figure was reduced when additional indirect costs related to tin making, such as the salary of the Trustee in charge of tin making, were taken into account. The success of the experiment in demonstrating that tin making was cheaper than buying from external sources resulted in the management of the RTF deciding to make tins internally. Not only were accounting calculations instrumental in informing what could be described in modern textbooks as a standard make/buy decision, but equally importantly, once the decision was taken to make tins internally, the cost accounting system was used to monitor tin production in the RTF. The cost per type of tin arrived at from the experiment was used as the yardstick against which the costs of successive production runs of tins were compared. The outcome of the experiment in terms of cost per unit was therefore normalised. The Trustee in charge of tin production had to submit reports comparing actual production costs against targets, that is, cost levels considered normal (*segun las relactiones*). Whenever actual costs of tin production exceeded the norm, the reasons for deviations had to be reported by the Trustee directly to the Superintendent of the RTF.

It is evident from the preceding discussion that the cost accounting system in the RTF not only evolved various procedures for the purpose of accumulating, classifying and reporting the cost of tobacco production, but it also informed the various experiments undertaken in the RTF to determine norms of performance with the aim of improving the utilisation of factory facilities and the minimisation of production cost. The procedures dealing with accounting for the cost of production reflected and reinforced the production technology used in the factory (Braverman, 1974). Thus, separate accounts were kept for both snuff and cigars. The production costs for snuff and cigars were traced to a number of costs centres (*Casillas*) that mirrored the physical production arrangements for each of the two products within the factory. Moreover, as we have seen, accumulated costs were classified into a number of categories, e.g. manufacturing and non-manufacturing; sundry materials and horse fodder, etc which facilitated more detailed cost analyses. The evolving costing

procedures were sufficiently flexible to accommodate variations in the wage systems used (piece rate for cigars and fixed wages for snuff) and to effect some allocation of common overheads between cigar and snuff production.

The detailed costing procedures used in the RTF yielded a wealth of information which made possible: (i) the calculation of the cost per unit of final product of a specific grade (quality); (ii) the tracing of cost categories to individual cost centres; and (iii) the accumulation of the total cost of specific cost categories, e.g. labour cost, across cost centres for the whole factory. Detailed cost information, both in physical and monetary terms, was therefore available and ready to be deployed for the purposes of surveillance and improving employee discipline through cost determination, performance monitoring and theft avoidance.

The significance of the two experiments discussed above (production and make/buy) and their attendant accounting implications should not be understated. While direct evidence on the use of cost information for the purposes of performance monitoring in the RTF is sparse in the archives, the two experiments were clearly intended to uncover more economic means of tobacco production and packaging. Further, the intentions were subsequently translated into 'concrete' production targets with significant cost savings. To recapitulate, the production experiment resulted in the elimination of one of the production stages, a higher production target was established as the norm for future production activities, a more efficient method for processing waste, and the reporting of costing figures over shorter intervals. The make/buy experiment had the decisive effect of internalising the supply of tins in preference to securing them from the more costly external suppliers. Moreover, the production of tins in the RTF was subjected to the rationalisation and monitoring effects of accounting. Possible savings or cost over-runs became quantifiable and were brought to the attention of management through regular accounting reports. We argue that such focus on accounting-based calculations had strong disciplinary implications in the RTF, and in the next section we examine some of these implications.

COST ACCOUNTING AS A DISCIPLINARY REGIME IN THE RTF

As we argue later, the cost accounting system used in the RTF was neither the only nor the first of its kinds to be used in 18th century Spain. Our interest in the case of the RTF is due to our desire to analyse cost accounting as a form of power/knowledge with disciplinary implications for those who were involved in designing the system, those who used it to monitor the performance of others, and finally, those lowest ranks in the RTF hierarchy whose performance was subjected to the meticulous calculation of accounting. The argument we advance in this section is that the effects of cost accounting go much further than the constituency of organisational employees who have come to be referred to in conventional academic writing as those who are the intended subjects of control. Viewing control in the context of a configuration of power relations, it is imperative to admit to the analysis the disciplinary effects of accounting upon all levels of management.

Cost Accounting and the Emergence of the Tobacco Regulations

The tobacco regulations were issued by the 'Director General de la Renta del Tabaco', or the Tobacco Agency. It appears that the RTF itself was not directly involved in lobbying the Tobacco Agency, or indeed the Crown, to bring about the formulation and promulgation of any of these regulations. The main motivation for these regulations was to secure the flow of the maximum amount of tobacco income to the Crown. Crucially, however, the cost accounting-based regulations for the tobacco industry were rooted in the technical know-how of accounting expertise within the RTF. These regulations were identical to the procedures of the cost accounting system of the RTF designed by a man called Vallarin.

> "It (The Regulations) is a copy of the original and novel work of Mr Manuel Vallarin who designed a system of cost calculation, the cost of a pound of snuff and cigars produced in the factories". (The 1773 Regulations).

It is not clear from the Archives which parts of the cost accounting system that Vallarin designed were the direct outcome of his own inspiration and which parts were adaptations of costing systems used in the factories of the time. Given the many similarities exhibited by these and earlier systems (see below), it is very likely that Vallarin owes some debt to their designers. More crucially, the Archives do not reveal which precise discontinuity

compelled Vallarin to design the cost accounting system. Any of a number of contesting claims for the motivation of the design of system, including clearly the demand-response and the power/knowledge framework. Evidently, being a monopoly, the economic context in which the tobacco industry operated did not exhibit the competitive pressure identified by some scholars (e.g. Pollard, 1965; Fleischman and Parker, 1991) as providing the antecedent condition for cost accounting to emerge. However, it could be argued that cost accounting emerged to provide 'synthetic' prices for labour, i.e. piece rates, along the lines suggested by Johnson and Kaplan (1987) except that such an argument does not explain why the cost system emerged only in 1773, nearly ninety years after the establishment of the RTF.

Rather than advocate a demand-response thesis we prefer to explain the cost accounting practices in the RTF via the power/knowledge framework. Although it is difficult to privilege this approach over others when considering the emergence of the cost accounting system, given the lack of direct evidence in the archives, the disciplinary link is much easier to establish with respect to the functioning of the system. Once the cost accounting system was invented, a new base of power/knowledge in the tobacco industry was established with ramifications extending beyond the factory. Thus, as soon as the system was developed by Vallarin, the Tobacco Agency formalised its use in the RTF, through the writing of new regulations, thereby providing a means of surveillance, discipline and monitoring of top management at a distance of the RTF. Similarly, written reports produced by the cost accounting system were brought to the attention of the King, as in the case of the production experiment, providing yet another chain of accountability and discipline for the Superintendent and his senior colleagues. Within the RTF itself, we argue in more detail below that the cost accounting system provided an invisible technology of surveillance and discipline which worked alongside the more visible technologies of surveillance such as physical search.

It is plausible to suggest that although the power to initiate and promulgate tobacco regulations resided in the hands of the Tobacco Agency, the RTF participated in checking the calculations which underlined the emergence of such regulations. The impact of the accounting power/knowledge in constituting disciplinary regulations was therefore evident

even at that stage. The Tobacco Agency had to rely on experts invested with technical accounting knowledge, such as Vallarin, to define and generate accounting calculations which were then used in formulating the tobacco costing regulations. These included detailed calculations of the costs of different kinds of materials, allowances of food quantities for horses, cost of human labour, etc.

From a disciplinary perspective, three important arguments emerge from the RTF case. Firstly, the state, through its bureaucratic organs, had a strong motivation to bring the tobacco industry under its disciplinary gaze; this was triggered by the desire to maximise tobacco income for the Crown. There may have been other motives, for example, protecting ailing and poorly managed crucial industries as exemplified by the takeover of the textile factory at Ezcaray, which is discussed further below. Secondly, the constitutive role of accounting as a power/knowledge regime in defining the nature and extent of state regulations, but at the same time the role played by state regulations in rendering more visible and powerful the effects of accounting calculations, point to a mutual dependency relationship between accounting and the state (Miller, 1990; Ezzamel, 1993a; 1993b). Thirdly, the participation by the management of the RTF, through its access to specialised knowledge of the micro-technology of accounting, in determining the calculations which informed the tobacco regulations points to management's awareness of the significance of accounting as a calculative regime.

Before moving on to examine the disciplinary role of the cost accounting system in the RTF it is of interest to reflect on the career of the man who pioneered the system, Manuel Vallarin. In 1773, Vallarin was an Assistant Accountant with a salary of 833 Reales per month. In 1774, Clement de Castro, the Chief Accountant and Vallarin's superior, was appointed Acting Superintendent of the RTF. The post of Chief Accountant was among the most senior and prestigious occupations in the RTF, for example, the Chief Accountant deputised for the Superintendent of the RTF when the latter was absent. Because the tradition of the RTF at that time was for the post of Chief Accountant to be restricted to members of the Knighthood and because Vallarin did not belong to the upper crust of Spanish society, he was initially appointed in 1774 as Acting Chief Accountant but with the same salary of 833 Reales per month that he was paid previously instead of the salary of 1,583

Reales paid to his predecessor. In 1776, in his new capacity as Acting Chief Accountant, Vallarin applied the 1773 costing procedures backwards to the period 1770-1775 to perform post-hoc cost calculations. These calculations were instrumental in establishing the average cost of the production used in the experiment initiated by Portocarrero in 1778. Vallarin, it should be noted, was one of the principal actors involved in the production experiment. His technical accounting expertise was brought to bear on the successful running of the experiment.

In 1780, after the production experiment was deemed successful, Vallarin was appointed Chief Accountant with a salary of 2,000 Reales, more than twice his previous salary and 417 Reales higher than the salary of his predecessor. To appreciate the extent of Vallarin's financial reward, it is relevant to compare his salary history to that of the General Inspector Portocarrero. In 1778, when the production experiment was conducted, Portocarrero's salary was 4,166 Reales per month, more than two and a half times the salary of the Chief Accountant at that point in time. In 1779, while Vallarin was Acting Chief Accountant at a salary of 833 Reales, Portocarrero's salary was reduced to 2,500 Reales. Once Portocarrero left his post later on in 1779, the salary of General Inspector was reduced further to 1,666 Reales, exactly twice as much as Vallarin's salary in that year. In 1780, the year when Vallarin was appointed Chief Accountant, the salary of General Inspector was down to a mere 833 Reales, well under half Vallarin's salary.

The dynamics of the salary scenarios described above raise several interesting questions: Given the success of the production experiment, why was the salary of the General Inspector reduced so significantly (ultimately, to only 20% of its level in 1778)? What precise reasons lead to the elevation of the salary of Chief Accountant in 1780? Was that because of a perceived increased importance of the post of Chief Accountant? Or was the increase in salary more of a reflection of the capability of Vallarin? These, and similar questions are intriguing but the lack of evidence in the archives renders it impossible to address the questions in a meaningful manner. Yet it is clear that Vallarin was handsomely rewarded both financially and in terms of career progression. Further, it is worth recalling that Vallarin's contribution to the design and further development of the cost accounting system culminated in the breakdown of a tradition according to which only Knights were appointed

Chief Accountants. If there was ever an accounting hero in the case of the RTF, then Vallarin must be the one. Quite simply, Vallarin's personal fortunes, and those of the post of Chief Accountant, rose with the emergence and rise of cost accounting within the RTF.

The Disciplinary Role of Accounting in the RTF

A number of researchers have been concerned to demonstrate how accounting can operate as a potent disciplinary regime in organisations (Hoskin and Macve, 1986; Miller and O'Leary, 1987; Ezzamel, 1994). Because of its ability to quantify human performance, accounting renders such performance visible, and the visibility encourages new areas of discourse as alternative courses of action are subjected to the accounting logic of calculation and integrated in its formal reports. Disciplinary regimes such as accounting impose compulsory visibility on those subjected to its calculation and, as Foucault (1977) has argued, it is through this visibility that their subjection is secured and sustained. In the remainder of this section we comment of the extent to which the cost accounting system in the RTF developed as a micro-technology of surveillance and discipline.

The details of the archives discussed above give some indication of the extent to which the cost accounting system as an invisible technology can network with other visible disciplinary regimes. The RTF operated with two schemes of surveillance; one architecture-based and the other system-based, both contributing to the creation of visibility of factory activities. The architecture of the new premises of the RTF created visibility in space (Foucault, 1977; see also Loft, 1993), as factory activities were now reordered and deliberately placed in locations that rendered surveillance much easier than in the old factory. The physical flow of production across different production stages became more visible. Such visibility became even more focused by means of the physical separation of the employees' inner world (the factory) from the outer world (outside the factory) established through visible architectural devices such as the internal pavement, the moat and the wall that enveloped the shopfloor. The very concept of the panopticon pioneered by Bentham (1843) and articulated by Foucault (1977) was clearly in operation in the RTF, and the panopticon thereby instituted ensured that production space was constantly under its own disciplinary gaze.

System surveillance was enshrined in the procedures of the control system in general and the cost accounting system in particular. The procedures established by the control system to monitor quantity (e.g. physical checks; matching of the actual versus the expected) and quality (meeting pre-specified targets) created a framework within which performance can be assessed and reported. Moreover, these procedures established a well specified ranking order that differentiated individuals according to rank and status (for example, the varying intensity of physical checks). And the carrot-and-stick method was also used to endow system surveillance with meaning and purpose.

But it is on that part of system surveillance relating to cost accounting that we intend to focus. The role of accounting as a system of surveillance has long been noted, for example Bentham (1843) treated bookkeeping (in its more general sense thereby incorporating the keeping of financial and non-financial books) as one of the main pillars of his system of surveillance. For Bentham, good book-keeping was the manifestation of good management. As Loft (1993, p234), paraphrasing Bentham, has noted "the book-keeping, or rather, recording enables this visibility to extend through time, in the books, events remain 'visible' and can form the basis for power to act at a later point in time". Similarly, as Braverman (1974) has noted, architecture and system procedures can mirror, and reproduce, each other; production processes are replicated in paper form before, while and after they materialise in physical form.

It can be seen that the cost accounting system in the RTF displayed the disciplinary attributes identified above. The design of the new premises, having mirrored the architectural plans in paper form, was replicated in the cost accounting system. By attracting costs to specific *casillas* the factory was reproduced in paper not as a set of architectural drawings but, more crucially, as centres of cost calculation. A new visibility was therefore created through which the factory became a financial identity. Once written, these financial translations of the factory became records that extended through time and space. For now, as we shall discuss in more detail below, express comparisons between actual achievements and targets can be drawn. Further, these accounts can be visited, and acted upon, many years later. For example, Vallarin's post-hoc analysis in 1776 of production costs for the period 1770-1775 established the costing frame of reference for the production experiment, and the prices

paid for sealing wax were traced back forty years earlier. Accounts are never 'dead' nor become a mere irrelevance just because they have been 'closed' for the period. Visibility created by accounting therefore transcends time. It also transcends space, for as a written form accounts become mobile (Latour, 1990; Robson, 1992) and therefore could be transported between different production locations and from the administrative offices to the factory and back again (Loft, 1993) therefore making their consultation at different locations possible. Such mobility makes certain factory locations visible in other locations either in the factory or in the administrative offices.

In the context of the RTF, the micro-technology of accounting combined, as we have seen, both physical and monetary measures. These measures were available as techniques of surveillance, and were operated in layers either simultaneously or sequentially. In the case of the physical measures, these reflected both quality and quantity particularly when monitoring raw materials and human labour. Each of these measures imposed a different kind of discipline. Quantity (weights) measures discipline the rate of utilisation by seeking to minimise spillages, breakages and 'unnecessary' loss of materials during transportation within the factory and during the manufacturing process itself. In contrast, quality measures discipline the mix of utilisation and the human skill with which inputs are transformed into outputs of predetermined attributes. The segmentation of each of the snuff and cigar factories into *casillas* (cost centres) that mirrored the physical flow of production and services created centres of calculation that rendered the various activities in the factories highly visible. Hence, in decomposing the organisation down into constituent parts, accounting rendered the activities in the factory visible (see also Roberts, 1990). The production technologies with their full diversity were captured by a set of accounting numbers that had the aura of being objective and concrete. Interdependences between successive stages of production were internalised in the accounting system as the flow of production volumes was quantified, both physically and in monetary terms, and documented in the accounts. The ritual of weighing production deliveries from one stage to another in a 'public' open space such as the factory patio and in the presence of representatives from each stage and the internal auditor are all manifestations of the micro-technology of accounting at work. Visibility of performance was not restricted only to entries in the accounts and reports but assumed a 'physical' presence in an open space for all to see. The presence of the internal

auditor during the weighing process as the neutral, dispassionate arbitrator invested with technical knowledge endows the whole process with legitimacy and authority. Deviations from expectations or established practices could therefore be deemed wasteful, undesirable and abnormal. By rendering spillages, breakages, loss and inferior quality abnormal, high rates of utilisation and superior mixes and skills become normalised, and, more importantly, with this comes the very normalisation of disciplinary practices in the work place. Through repeated physical checks of labourers at the RTF, by imposing heavy sanctions not only upon those who appropriate tobacco but also upon the doorkeepers who fail to detect infringements, and by promising lucrative rewards to those who uncover stolen goods, the disciplinary gaze of the micro-technology of accounting is made to transcend the whole workforce.

New areas of discourse were also encouraged by the ability of the accounting system in the RTF to quantify and render human performance visible as exemplified by the two experiments conducted in the factories. The production experiment exposed various inefficiencies in previous production arrangements and gave legitimacy to a new production scenario that resulted in the creation of higher performance targets. The post hoc cost analysis over the period 1770-1775 conducted by Vallarin established average costs of production that became the frame of reference for that experiment. Experimentations with new production levels were therefore mediated by such cost targets. Similarly, the make/buy experiments gave rise to the more economically efficient alternatives of making products internally in preference to buying from external suppliers. By encouraging such new areas of discourse in which new alternative scenarios were quantified and contrasted against 'old' ways of doing things, accounting helped to promote new work disciplines that had the aura of greater economic efficiency.

The quest for normalisation of disciplinary practices in the RTF was enhanced further by the development of financial measures of performance involving both expected and actual calculations. Not only did such measures trace the minute details relating to each cost element and production process, but they also brought the performance of those operating in different parts of the factory into direct and apparently meaningful comparisons by virtue of monetary values operating as a common denominator. Thus, in addition to emphasising

the discipline of improving the rates and mixes of utilisation of resources, we now have another form of discipline which instills cost consciousness. Deviations from normalised cost targets that result in cost over-runs can be readily seen to be reducing the profit flow from the tobacco industry to the Spanish Crown. Also, improved production targets could now be pursued more rigorously. This was reinforced further through the application of a strict piece rate salary in the cigar factory; the quantity measure (the piece) is now combined with the financial measure (the rate) to yield a new statistic (the salary) that provides a simple, yet powerful, representation with a double meaning. For the tobacco worker, it is a direct compensation for his effort, normalised across time and space in a linear fashion. The consequences of discipline are made both visible and direct; only by increasing the number of pieces produced of the right (normalised) quality can the worker earn more money. The merits of subscribing to the factory discipline, of being docile and obedient are now transparent. The implications for the RTF are also important; as part of the cost of production, wages now could be seen to reflect productivity in a most obvious manner. Any increase in the cost of production may be tolerated only if it is accompanied by a corresponding increase in tobacco output.

While developing the case for accounting's ability to render some dimensions of activities and human performance visible, it is imperative to appreciate its capacity to make other dimensions invisible. As Morgan and Willmott (1993, pp9-10) have noted recently, the visibility/invisibility dichotomy

> "suggests that accounting practices are selectives in *what* they render visible. Some things are endowed with an existence and are given attention; others go unrecognised and unrecorded. The entry of accounting practices into new areas involves a redefinition of what is important in particular contexts, contexts in which the relevance and effects of accounting discourses and practices are selectively interpreted and enacted" (original emphasis).

As a non-neutral technology susceptible to political manipulation accounting therefore plays a major role in constituting the domains of the visible and invisible. But the boundary between these two domains is not purely determined by the political sensitivity of accounting to specific interest groups in the organisation; to a large extent it is also mediated by the

technical state of accounting as a body of knowledge in terms of what it is capable/incapable of doing.

The preceding analysis reinforces the emphasis that Foucault (1977; 1980) has placed on the importance of detailed, apparently mundane, organisational practices as means of discipline and surveillance. In the context of accounting these practices form a micro-technology of power which seeks to neutralise and master any potential counter power so that resistance is subverted or minimised. This means that the disciplinary power of accounting, just like any other disciplinary power, develops strategies to prevent or overcome what Foucault calls 'anything that may establish horizontal conjunctions', such as 'agitations, revolts, spontaneous organisations, coalitions' and the like. By representing aspects of human performance through its powerful metric, either quantatively through measures such as rate of utilisation and mix of utilisation, or financially through measures such as piece rate, accounting provides a means through which those working in the organisation can be compared, differentiated, hierarchaised, and homogenised.[9] For example, with measures reflecting rate of utilisation of raw materials and labour, the management of the RTF could draw express comparisons of the productivity of every worker and of every production process. Using those, and similar measures, the management could also engage in a differentiation exercise of its work force at two levels. Firstly, workers could be differentiated by function and process, as evidenced by the development of separate targets of performance for each of the tobacco production process and also for the production of snuff as distinct from cigars. Secondly, and more crucially from a disciplinary perspective, workers could be differentiated by level of achievement so that success and failure become internalised into the subject. By measuring actual performance and then by comparing it against normalised, predetermined targets individuals could be quickly differentiated into those whose performance is normal (those meeting the targets) and those whose performance is abnormal.

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[9] The interest of the management of the RTF in comparing, differentiating, hierarchaising and homogenising employees is reflected in the clothing protocol and the physical search procedures discussed earlier.

The availability of these measures makes it possible for management to hierarchaise relationships between organisational participants in written and formalised texts. Measures of performance and reports investigating reasons for deviations from targets are submitted by lower to higher managers. Managers can act on these reports; they may reward or penalise subordinates as they see fit, they may homogenise them by subjecting them to the same accounting metric, such as the use of piece rate and compensations, and they may ostracise and exclude those who fail to meet expectations. Thus, Mena was appointed Superintendent of the RTF by a Royal Decree, dated 26 September 1776, which stated to him "....you are allowed to move or expel any employee or worker in the RTF if you consider that necessary to maintaining the correct supply of tobacco". It is through such extremely powerful, yet apparently mundane, practices that accounting makes it possible for a combination of visible accountability and hierarchical organisation to subject individuals to surveillance and discipline.

Yet, it is significant to recognise that those who are supposedly subjected to the disciplinary gaze of accounting engage in practices and scenarios that can redefine relationships with their superiors in the ongoing dynamics of power relations. The presence of surveillance and disciplining technologies such as accounting, does not guarantee full compliance. Thus, despite the installation of modes of physical checks and regular accounting reports on inventories and on production deliveries between successive production stages, those seeking to 'beat the system' were able to engineer scenarios through which it was possible to engage in 'deviant' behaviour. As indicated earlier, the archives demonstrate conclusively that tobacco theft in the RTF continued to go on, despite the installation of stricter visible and invisible monitoring procedures. As new and stricter monitoring arrangements are devised, new means of 'beating the system' are engineered, and the balance of power relations between higher and lower managers is therefore forever in a state of flux. As a concrete example, in 1765 the superintendent of the RTF noticed that despite the stringent control procedures in place, tobacco theft (by workers) continued to occur while raw tobacco was in transit from external warehouses to the factory premises. Consequently, on 23 August of the same year he issued a decree stipulating the use of two crews for tobacco transport; one to transport sealed tobacco to the factory and the other to transport it inside the factory. This procedure eliminated the loophole caused by the same operators moving in and out of the

factory. Whilst the discovery of the deviations documented in the archives can be hailed as a manifestation of the 'success' of the disciplinary regime, no doubt in addition to those less quantifiable cases where the instilled discipline inhibited further deviations, the potency of the system needs to be qualified on two accounts. Firstly, in the play off between what is rendered visible and what is left invisible, there may have been cases of deviations that went on undetected. Secondly, the fact that deviations, whether detected or undetected, continued to occur, strongly suggest that the sanctions associated with any disciplinary regime do not always attune to the personal impulses of every individual.

But the disciplinary effects on higher level managers are not restricted to shifts in power relations mediated by lower level managers. Accounting as a disciplinary regime acts directly on higher level managers. Thus, managers such as Vallarin and Portocarrero were implicated in the game of disciplinary control, for while they are the main actors who oversaw the implementation of the control procedures to discipline and monitor others, their own performances were brought under the microscope of the very same regime. They each would have needed to demonstrate to others within and outside (e.g. the King and the Tobacco Agency) the RTF the normalcy of their practices. For example, the prosecution on account of tobacco theft and subsequent clearing of someone as senior as the Superintendent (the highest rank) of the RTF carries a double significance for the potency of disciplinary procedures. Firstly, his prosecution constructs a world in which the disciplinary gaze is depicted to reach every level in the hierarchy and every corner in the organisational space; the totality of surveillance is therefore reinforced with its potential disciplinary implications for <u>all</u> organisational members. Secondly, the significance of normalised practices is reinforced as the cleared Superintendent is reinstated as an innocent normal subject. These scenarios help discipline higher level managers because for them, just as much as for those below them, their practices are given compulsory visibility by the micro-technology of accounting and they are also subjected to the normalising effects of such a disciplinary procedure.

SUMMARY, EXTENSION AND IMPLICATIONS

In this final section of the paper we first summarise our main arguments briefly refer to some other cost accounting systems used by Spanish organisations that either preceded or were contemporary to the RTF and then draw out some implications. We have noted that while the control system in the RTF was mainly focused on monitoring employees, through practices such as visual supervision, the cost accounting system provided information which contributed to the minimisation of opportunities for theft and improvement of efficiency by making it possible to subject human behaviour to modes of surveillance. The cost accounting system combined calculations such as expected costs of direct labour and material consumption for those phases of the production process which were not susceptible to effective visual supervision. The system also provided calculations of various costs, e.g. production costs, and of value added which were incorporated into the cost of one of the items of raw materials. Nevertheless, this practice tended to single out the controllable elements of cost: indirect materials and wages. Production cost was a convenient financial indicator of the performance of the RTF, as the latter was treated as one major cost centre within the tobacco industry. Historical production costs were specifically used subsequently in experiments seeking to improve production and/or contain costs. Quality was emphasised in order to maintain the factory's competitive advantage in the face of clandestine tobacco production which was cheaper but of poorer quality. Ensuring high quality production was the means by which high tobacco prices were justified and sustained by the tobacco industry over the long term. Hence, substantive issues relating to quality were taken into account before deciding on alternative technological innovations in tobacco production. Similarly, quality was a basic priority in the management of tobacco production.

The paper also provides some examples of the disciplinary effects that accounting practices can have on organisations. Operating as an invisible set of practices, accounting renders calculable and visible the activities, and hence the accountability, of individuals in the work place. This seemingly objective and uncontentious quantification of human effort and skill, through the development of measures such as the rate and mix of resource utilisation, create a new potential for those at the top of the hierarchy to engage in managerialist exercises on a much larger scale than ever before. With the aid of such measures, management can link

reward to performance in a most direct way; to both employer and employee reward becomes the outcome, indeed the celebration, of the visible delivery of human effort. Further, with these measures, management can compare, differentiate, hierarchaise, normalise and homogenise individuals. At an even more extreme level, management can isolate, exclude, and ultimately dismiss those individuals who defy the power of normalising practices. The disciplinary power of accounting reaches new heights in disciplining individuals. A Foucault (1977, p197) has pointed out:

> "Disciplinary power is exercised through its invisibility; at the same time it imposes on those it subjects a compulsory visibility. In discipline, it is the subjects who have to be seen. Their visibility assures the hold of the power that is exercised over them. It is the fact of being constantly seen that maintains the disciplined individual in his subjection".

However, power relations between subordinates and superiors are frequently redefined and reshaped through dynamic interactions between both sides of the relation. Higher level managers are also subject to similar disciplinary effects both in terms of the disciplining of the self via the normalising practices of accounting and in terms of the surveillance of their activities by still higher constituencies that is made possible by the technology of accounting.

Other Costing Systems

Our intention here is to provide a brief description of some cost accounting systems developed in other Spanish organisations that either preceded or were contemporaneous with the RTF. Our main objective in doing this is to show that the cost accounting system developed in the RTF was neither the first of its kind nor a unique system in Spain. Our own investigations, and those of other writers, lead us to suggest that the RTF episode does not represent a single isolated incidence of the use of cost accounting as a regime of calculation (see Carmona and Donoso, 1994). We suggest that there were parallel developments in Spain not only during the same period (the 18th century) but even much earlier. Thus, there is evidence of some primitive cost calculations undertaken in a coin factory (Royal Mint) in the kingdom of Aragon dating back to the 14th century (Perez, 1990). Seemingly, the aim of these calculations was to determine the a priori cost of making a florin rather than to trace the actual cost of production. Later on this interest in cost calculation was to become much keener on producing more detailed calculations. Thus, the

archives of the Seville Mint show detailed cost calculations of each stage of the production process during the late 16th and early 17th centuries. Further, in a number of cases make or buy decisions were informed by these calculations.

It is significant to note that during the 16th century accounting practices were carried out by managers who also had to perform their other managerial responsibilities. The importance of the roles of controllers, accountants, and internal auditors was widely recognised at that time and they were formally established later by state regulations in 1728. According to these regulations, the accountant had to keep several books covering various aspects of financial accounting. In addition, the accountant was required to keep records of the input of metals, the output of coins, wages, cost of materials, periodic metal inventories, and, as in the case of the RTF, to bring the inventory books up-to-date following the completion of every production cycle. Further, more refined accounting controls were also developed, as in the case of the Valladolid Mint, including the checking of metals received, accounting for waste during production, monitoring the movements of material within the factory, and matching coins produced against expected output. In a new set of regulations issued two years later, the position of the accountant in the Mint was upgraded, and was recognised as having a status higher than that of the treasurer. Further, the accountant was expected to have several important personal attributes:

> "He should have a high level of intelligence, be knowledgeable about accounting practices and bookkeeping, be capable of giving good opinions and behaving in a trustworthy manner, and be zealous and unselfish".
>
> (The 1730 Regulations)

Additional evidence on the quest for calculability 18th century Spain comes from the Royal Textile Factory at Ezcaray which was founded in 1749 (Prieto Moreno, 1991). This factory was privately run prior to being taken over by the Crown in 1785 following a long period of mismanagement and a deteriorating financial position. Subsequently, a fairly refined cost accounting system was developed in the factory. The system provided separate cost calculations for raw materials, direct labour, and other elements of production costs. Further, administrative and selling costs were accumulated and apportioned between products. Forecasts of the annual volumes of production were generated and suitable mark-ups were added to product costs before arriving at selling prices.

It is instructive to reflect further on the roles played by the cost accounting system in the Royal Textile Factory. Designed by the brother of one of the two founders of the Factory, Juan Garcia-Montenegro, who later became a joint owner following the death of his brother Manuel in 1765, the cost accounting system was systematically deployed not only to reflect the cost structure of textile production but also to generate signals that were deemed desirable by management to external parties. For example, in 1773 the company was converted into a limited liability company in order to raise more funds for the purposes of improving its growth potential. But demand for the share issue was below expectations and the company failed to raise the whole amount of new capital needed for expansion. During the period which immediately followed the unsuccessful share issue, cost calculations were produced with the purpose of demonstrating the economic viability of the factory to potential investors. Specifically, through the provision of these calculations the management of the Textile Factory constructed arguments with the aim of enticing the King to make a substantial investment (300,000 Reales) in the factory. More relevant from a performance monitoring perspective was that these calculations were used by management to demonstrate to the factory workers that they were wasteful in performing their tasks.

The manner in which these cost accounting systems were designed and put to use brings out conclusions parallel to those derived from the RTF case. The common themes shared among all these systems (including that of the RTF) are manifold. Firstly, there was clear emphasis on the financial quantification of the economic performance of production stages for the purposes of cost accumulation and on determining the cost of a product and for the purposes of pricing decisions as in the case of the Textile Factory at Ezcaray. Secondly, and relatedly, there was strong emphasis on the use of the cost accounting system as a means of monitoring employee performance, as evident from the use of a priori cost calculations and the comparison of actual against expected output and accounting for waste in production in the Valladolid Mint, and the use of cost performance to reveal the wastefulness of employees as in the case of the Textile Factory at Ezcaray. Thirdly, the cost accounting systems were designed by employees of high rank and significance within each organisation and whose carecrs and financial rewards improved even more with the rise of the status of the cost accounting function in the organisation.

Implications

Some researchers have been concerned to link the emergence and functioning of cost accounting systems to the dictates of competitive pressure (e.g. Pollard, 1965; Edwards and Newell, 1991; Fleischman and Parker, 1991) or to the need to provide 'synthetic' prices in the absence of markets (Johnson and Kaplan, 1987). These arguments are part of a demand-response research tradition; the emergence of cost accounting is seen as a response to the demands imposed by competitive pressure or absence of markets. In the absence of such demand there is little need, it would seem, for a response.

There is, however, a growing recognition of the need to examine the rise of cost accounting in other, less competitive settings (e.g. Fleischman and Parker, 1991). At the very least, such shift in emphasis signals a move away from privileging economic competition or the absence of markets as the driving force behind the rise of cost accounting if not necessarily questioning the demand-response mode of explanation. One of the contributions of this paper could be seen in terms of yielding support to this newer emphasis; in this case the emergence of cost accounting in the RTF can be linked to situations of state monopoly. This could also be seen as consistent with recent research which has contextualised the rise of accounting practices in ancient civilisations, whether those with an explicit profit motive, albeit with no evidence of competitive pressure, such as Mesopotamia (Niessen, Damerow and Englund, 1993) or those with state-owned institutions, where the very notion of profit is alien, such as ancient Egypt (Ezzamel, 1993a; 1993b; Ezzamel and Hoskin, 1994). Such contributions can be seen to undermine the obsession with looking for competitive forces to provide the sole, or most compelling, explanation for the emergence of cost accounting.

However, in our view the most significant implications of this paper relate to the consequences emanating from the intervention of accounting in organisations. Once available as a micro-technology, accounting opens up new possibilities through which work practices and power relations can be renegotiated and redefined. Accounting endows organisational activities with distinct visibility through its ability to operate as a calculative regime. By subjecting the detailed activities of the RTF to its calculative metric, human performance became more visible and once visible, it was rendered more amenable to systematic surveillance, monitoring and discipline. The intervention of accounting can also be seen to

promote new areas of discourse and to constitute areas of economic action (Hopwood, 1990; Ezzamel, 1994). The experiments conducted in the RTF (production and make/buy) were promoted, through accounting calculation, into alternative discourses of production and were constituted into areas of economic action as they were adopted in future RTF activities displacing less economically efficient alternatives. As accounting intervenes into organisational activities and domains, power relations are reconstituted. Accounting is therefore never the technically simple, mundane and neutral technology that it has come to be known.

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FIGURE 1

The 1778 Production Experiment

This statement shows that it is possible to mill and produce in 292 working days/year more than six million pounds of tobacco. This procedure was designed by Mr Francisco Portocarrero, General Inspector of these factories. The experiment took place over the period 21 April - 25 May.

Detail of 638,717 pounds of tobacco produced in the aforementioned 30 days as well as of those which might be produced in 292 days.

It was certified by Mr Juan Josef Corres, Fiel (Supervisor) of the Mills, that in the aforementioned 30 days 175,875 pounds of tobacco leaves were milled in Monte. Three capataces (foremen) certified that this is the finest work in progress produced ever in the Factory.

Corres also certified that 462,842 pounds were remilled over those 30 days in Monte. The aforementioned capataces (Manuel de Molina, Gaspar Moreno and Francisco Sanchez) certified the perfectness of this tobacco.

According to the data shows above, 638,717 pounds of tobacco were milled in the Monte mills without diminishing the quality. Due to this, it should be possible to produce 6,216,845 pounds in 292 days.

Detail of 600,000 pounds of tobacco worked. This tobacco produced 672,412 ½ pounds of exquisite and fine tobacco of the following classes:

Pedro Alonso	Guines	Madrid	Mixto	Fino	Others
114,409	112,274	21,465	180,022	244,477	765

TOTAL pounds worked to perfection: 672,412

If 672,412 pounds were worked to perfection in 30 days, 6,544,815 could be worked in 292 days/year.

According to the certifications of the supervisor and foremen of Monte and Repaso, and those of Moja, Warehouse of Fermentation and those of the inspectors who checked daily

FIGURE 1 continued

the experiment. All the file is stored in the Accounting (Contaduría) Department. Seville May, 30 1778. Manuel Vallarin

This would have been the cost of producing tobacco through the old procedure	6,176,470	 20
Actual cost through the new procedure	1,852,941	 6
Positive variation for the RTF	4,323,529	 14
I will add the value of 2,255,996 ½ which were considered as waste and put them through. Nevertheless, Francisco Portocarrero stated that these materials could be processed through the new procedure. Its value is	67,945,306	 12
Overall benefits	72,268,835	 36

… Havana y Virg.a entregada por el S.r Director de Labores a los operarios de esta Real fabrica para su construcción en tabacos de 40 y 64 Arg.s de la Havana y mixtos de adarme, en esta 2? de Enero de 1770.

TAPLE 1

Rancho 1º	Oja Havana	Ydem de Virginia	todo da tabaco Dir.r cargo de ops.	atados q.e deve producir	Los q.e produxo	Dif.a de Ydem	Ydem de mermas	Valor de Leche
Jph de Rivas								
Fran.co Cadenas	5	15	20	54	64	10		
Jph Montero	-							
Manuel de Luna	5	15	20	54	63	9		
Miguel Chamorro	8	20	28	76	94	18		
Jph de Castro	8	20	28	76	90	14		
Diego Gutierrez	5	15	20	54	63	9		
Jph Quintanilla	6	18	24	65	75	10		
Xptoval Diaz	10	20	30	82	90	8		
Fran.co de la Paz	6	18	24	65	72	7		
Jph de la Paz	5	15	20	54	60	6		
Fran.co Olmedo	4	10	14	38	40	2		
Jph Viade	10	20	30	81	93	12		
	72	186	258	699	804	105		378.

2º Rancho								
Fran.co Valderrama	12	12	24	66	82	16		
Miguel Trigo	5	15	20	54	61	7		
Mathias Benavente	6	18	24	65	73	8		
Manuel Ojeda	4	10	14	38	48	10		
Lorenzo Caro	10	20	30	82	97	15		
Ant.o Caro	10	20	30	82	97	15		
Fran.co Moreno	4	14	18	49	53	4		
Ygn.o Sanchez	10	10	20	55	68	13		
Ant.o Hidalgo	15	15	30	83	102	19		
Xptoval Gonzalez	12	12	24	66	85	19		
Ant.o Padilla	5	15	20	54	60	6		
Lorenzo Muñoz	6	20	26	71	82	11		
Salv.r Vilar	10	20	30	82	96	14		
Mig.l Rumbos	5	15	20	54	64	10		
	114	216	330	901	1068	167		502.

TABLE 2

Resumen dela Data

	Caquist.	Tino	Graso	Palillo	Total
Febr.º desde el 15 hasta 28.	d.	5.000	d.	[illegible]	[illegible]
Marzo	390375	912.00	d.	0150	1360825
Abril	1.60676	d.	d.	d.	1.60676.
Maio	1450269	d.	d.	d.	1450269
Junio	1360723	30027	10564	0200	1410514.
Julio	1410295	320.000	0797	2200	1740292
Agosto	1520180	d.	10531	0810	1540521.
Septiembre	1690640	170500	d.	0210	1870350
Octubre	1670248	610125	0240	0262	2280835
Noviembre	1170255	1460.00	30767	0306	2670328
Diciembre	900850	1530875	d.	Total	2440729
Enero de 1771	130260	2320.00	d.	d.	2750260
Febr.º desde el 1º hasta 14.	d.	970500	0077	d.	970577
	1390771	870.0927	70938	20592	22440228

. 675107 . . 510123 . d. . . d. . 11228

Resumen Gral del Cargo

	Caquist.ᵒ	Tino	Graso	Palillo	Total
Cargo en 10 hasta Marzo	8650877	9710296	d.	0347	1830012
Feb.º desde el 15. hasta 28	Saldo 1	390235	d.	d.	900236
Marzo	1350318	240406	d.	0253	2110077
Abril	890531	20257	0300	0144	920362
Maio	1140106	390051	10203	0486	1240846
Junio	1110246	150483	0756	0462	1570987
Julio	1380107	160148	10171	0764	1860190
Agosto	1530946	370207	8655	0548	1720256
Sept.re	970508	1.60325	20182	10158	2090173
Octubre	870983	1310738	20255	10291	2230267
Nov.e	110.0506	1160181	d.	d.	2260787
Dic.e	1.60302	1120642	d.	d.	2180944
Enero de 1771	1410554	1.70169	d.	d.	2510723
Febrero desde el 1º hasta 14.	610705	510123	d.	d.	1120828
Cargo	2290.8920	188.0761	80522	50353	4.1940756
Data	13.90774	8900927	70938	20592	2.2440228
Ex.ª seg.n Cuenta	990.0147	770.0.34	0584	20761	1.9830528
Ex.ª seg.n Reporo	9770107	9700770	0454	20235	1.9070586
Difer.ª de Merma	130.042	620244	0130	0526	750942

Razon del Tavaco de polvo labrado en cada uno de los 6,, años contados desde 1º de Enero de 1770 hasta fin de Diciembre de 1775.

TABLE 3

47	Libras de Tab.co labradas en cada Año...	Gastos causados en la labor	Costo de cada libra en cada Año...
el Año de 1770,, se labraron..	2.167.520,, libs. tubieron de costo	2.320.744 Rs 18 1/2 mrs	36 1/3 mrs
En el de 1771	2.262.227,,	2.298.364... 24 1/2	34 1/2
En el de 1772	2.221.698	2.270.099 16 1/2	34 3/4
En el de 1773	2.186.124	2.236.837. 30 1/2	34 3/4
En el de 1774	2.121.755	2.104.707. 2	33 3/4
En el de 1775	2.150.259	2.220.054 3 1/4	35
	13.109.583	13.450.808. 11 1/4	
		2241 8 [illegible] 13	

13.109.583. tubieron de costo 13.450.808. Rs 11 1/4 mrs y tendran... 6000000. de libs

Tendran — 6.156.172,, rs y 5 2/3 mrs

2052058 [illegible] 13