

## **Manuel Ferreira da Câmara and the Cameralism: Natural Sciences and Economic Ideas in the Portuguese Enlightened Reformism<sup>1</sup>**

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### **Resumo**

O pensamento e a ação dos homens de ciências a serviço das nações marcadas pelo reformismo ilustrado no final do século XVIII na Europa foram responsáveis dinamizar a pesquisa com fins de produzir conhecimento útil, o que teve implicações profundas no desenvolvimento das ideias econômicas nesses países. Este artigo explora essas questões, com particular ênfase sobre a importância do cameralismo como uma base de conhecimentos dedicada a aumentar o poder econômico do estado, mas ao mesmo tempo, fortemente ligada aos avanços nas ciências naturais, em particular na metalurgia, química e mineração ciências. Em larga medida, o cameralismo teve uma decisiva, mas ainda pouco estudada, influência sobre o pensamento econômico Ibérico. Na nossa perspectiva, como será apresentado no texto, é a estrutura conceitual do reformismo iluminado que oferece a chave para a compreensão dessa influência no pensamento econômico Português.

A preocupação subjacente aqui é refletir sobre a importância que a ideia de se produzir conhecimento útil sobre o mundo natural teve sobre o tipo de análise econômica realizada pelos autores cameralistas e os influenciados por eles. Esta preocupação é basicamente expressa em nossa exploração das ligações entre a produção de conhecimentos úteis sobre o mundo natural (ciência natural em si e também aplicações técnicas) e cameralismo, tratando isto não como uma aproximação de diferentes áreas do conhecimento, mas como uma perspectiva específica de produção do conhecimento econômico.

No entanto, um lugar central neste trabalho é reservado a um interessante estudo de caso de particular interesse para o estudo da história econômica de Minas Gerais e das ideias relacionadas com a reforma da administração de mineração no Império Português. O artigo focaliza a trajetória do mineiro Manuel Ferreira da Câmara, o Intendente Câmara, que, juntamente com dois colegas de outros realizaram um longo período de estudos e viagens científicas (com duração de quase uma década) no final do século XVIII, às expensas do Governo Português, tendo como destino principal de uma emblemática instituição cameralista: a Academia de Mineração (*Bergakademie*) de Freiberg. O estudo de sua trajetória pessoal, apoiado por uma diversas fontes primárias, incluindo as memórias viagens e relatórios produzidos por eles, oferece uma referência decisiva na compreensão da realidade multifacetada da influência germânica no pensamento econômico Português no contexto do reformismo ilustrado. Mais do que isso, é de particular interesse para os estudos sobre Minas Gerais, a conexão entre os textos produzidos por Câmara, nesse momento, especificamente sua “Nota sobre a extração das minas do Principado da Transilvânia” e do famoso Alvará de 13 de maio de 1803, que propôs uma reforma profunda na estrutura da administração de mineração em Minas Gerais.

**Palavras-chave:** Cameralismo, Manuel Ferreira da Câmara, Reformismo Ilustrado, Alvará de 1803.

### **Área Temática 1: História Econômica e Demografia Histórica**

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# Manuel Ferreira da Câmara and the Cameralism: Natural Sciences and Economic Ideas in the Portuguese Enlightened Reformism

This is a working paper. **Please do not quote.** Comments are welcome.

## Introduction

The thought and action of men of sciences at service of nations marked by the enlightened reformism in late eighteenth century Europe were responsible for motivating a search for the production of useful knowledge that had profound implications in the development of economic ideas in these countries. This paper explores these issues, with particular emphasis on the importance of cameralism as a base of knowledge dedicated to increasing the economic power of the state, but at the same time, strongly connected to the advances in the natural sciences, particularly in metallurgy, chemistry and mining sciences. In fact, cameralism had a decisive, but still scarcely studied, influence upon the Iberian economic thought. In large extent the conceptual framework of the enlightened reformism offers a key to recover some of the relevant dimensions of the influence of cameralism in the Portuguese economic thought.

The underlying concern here is to reflect upon the importance the idea of producing useful knowledge about the natural world had on the type of economic analysis performed by the cameralist authors and the ones influenced by them. This concern is basically expressed in our exploration of the connections between the production of useful knowledge about the natural world (natural science itself and also technical applications) and cameralism, not as an approximation to different areas of knowledge, but as a specific perspective of producing economic knowledge.

Science, technology, economy and state affairs administration were combined in an interesting perspective in the space of some advanced centers of knowledge production in the eighteenth-century Germanic world, as is the case of the *Bergakademie* of Freiberg. That can be followed, for example, with regard to the articulation produced in some of those centers among the areas of chemistry, metallurgy and mining (as well as the entire scope of technical knowledge associated within the activity), and the dynamics of the administration of mineral districts, the fiscal interests of the state, and the cameralist knowledge. In those states where the fiscal structure was closely connected to the mining activities, many cameralist authors were in tune with the advances in the natural sciences, particularly in metallurgy, chemistry and mining sciences.

This paper, though, explores the importance of cameralism – in fact one of the major currents that influenced economic thought in continental Europe in the eighteenth century – as a knowledge base that aimed to produce useful knowledge of nature and produce technical means for the increasing of the economic power of the states. The fundamental association to be explored here is, however, between cameralism and the technical and scientific ground of the mining activities, exploring the way that these ideas, developed in the Germanic world, made in the Portuguese enlightened reformism.

## Enlightened Reformism and Cameralism

The process of international diffusion of economic ideas in the eighteenth century is the essential background for the discussion presented here. Our main concern is connected to processes of transmission and reception, and because of it cameralism is treated here more in terms of a matrix of ideas shared with variations among many countries and less as a specific experience of a particular national context. Therefore, cameralism here is not an equivalent term for German mercantilism, as for example in the studies of Eli F. Heckscher (1935), being understood essentially as a field of ideas that since the seventeenth century, but mainly in the eighteenth, received and exercised influence over other traditions of thought. Cameralism, in this perspective, became progressively a fundamental key to understanding some aspects of the relationship between economic ideas and natural sciences, essentially in those regions where cameralism had more space and influence in the university and academy structures. This connection within the educational structure is in fact one of the basic references in the understanding of cameralism. According Keith Tribe, in a more incisive perspective, we can see cameralism basically as a form of academic pedagogy oriented for the training of the future officials of the administration in the eighteenth-century German territorial states (Tribe, 2008: 525).

Tribe (1988 and 1995) tends to delimitate the area of direct influence of cameralism to a well-defined territorial space, sharply marked by linguistic and cultural unity. Nevertheless, he also points out how the influence area of this phenomenon is quite wide, extending from the Baltic to the Atlantic and from Amsterdam to Königsberg, as well as reaching the southern domains of the Austrian Empire (Tribe, 2008, p.526). Other authors, however, have shown a picture much wider for the influence area of the cameralistic ideas, covering the entire boundary of continental Europe, although, obviously, in different terms and often in an influence dynamic much more indirect than direct. The studies of Ernest Lluch (1996), concerning the influence of cameralism in Spain, are the key reference to this perspective. His approach has opened in fact a perspective to understand the points of contact of this important set of ideas with many other places such as the Italian peninsula under the influence of the Habsburgs (the Kingdom of Naples, the Kingdom of Sardinia and the Duchy of Milan), as well as Portugal – and by extension, Brazil (Cunha, 2011).

The understanding of this influence in Portugal is, nevertheless, very complex to be effectively demonstrated, demanding a framework of not only direct but also indirect sources of influence. However, it is possible to recover some pathways of this influence at different times throughout the second half of the eighteenth century, since an emblematic starting point: the period spent by Sebastião José de Carvalho e Melo (the future Marquis of Pombal) as the Portuguese ambassador to the court of Vienna. In many aspects it is possible to read the reforms carried out by him some years later, in the post-Lisbon earthquake of 1755, in connection with the cameralistic principles, with particular attention to police matters, and strictly close to the cameralist idea of *Polizei* (Cunha, 2010b and 2011).

The concept of enlightened reformism serves well to make sense of a more or less vigorous process of updating and reform the *Ancien Régime*'s structures that took form in different European monarchies in the late eighteenth century, particularly after the French Revolution. The phenomenon has a substantive impact on various European monarchies and important consequences, among others, on the colonial issues (see Paquette, 2008). The enlightened reformism, however, is also closely related to another

phenomenon well-established in the historiography: the enlightened absolutism, that from mid-eighteenth-century onwards also marked a common experience for different monarchies in terms of the progressive entrance, albeit under strict control, of the enlightened ideas in the conduction of the state affairs. For the particular articulation of issues that interest us here, it makes sense to align enlightened reformism and enlightened absolutism. In the same way, we can also align the Portuguese governmental action since mid-century, from the time of the Marquis of Pombal, the emblematic figure of enlightened despotism in Portugal, to the 1790s, when the spots would be on D. Rodrigo de Souza Coutinho, the minister responsible for carrying out a comprehensive set of reforms in an attempt to renew the Portuguese administration, with particular attention to the strategic importance of Brazil in the economic dynamics of the Portuguese empire (see Cardoso and Cunha, 2011).

It is within this context that the cameralistic contents progressively gain importance, particularly the ones regarding the centralization of state finances or the opening to the notion of useful knowledge of the natural world. This is also articulated to a reformation program in the university structure and to the importance of the studies developed within the Academy of Sciences of Lisbon, with particular implications for colonial affairs. Obviously, all those processes have direct implications for the production and absorption of new economic ideas, on a path that goes from Pombal to D. Rodrigo, combining in a very peculiar way a certain mercantilist perspective, the cameralistic themes, and the progressive absorption of the contents of Smithian political economy (see Cardoso and Cunha, 2012).

### **Cameralism, mining sciences and the *Bergakademie***

The cameralistic doctrines found a way of systematization and expansion of its influence from the mid-eighteenth century onwards. However, it is in fact a phenomenon that lasts more than a century, either going back to its origins in the seventeenth century or verifying its influence until the nineteenth century, and that involves, even in the narrower sense of the term, different national contexts. More than that, if we took as reference the systematization of the cameralism contents produced by Johann Heinrich Gottlob von Justi, and even the very course of studies and writings produced by this author, it is clear that cameralism is more a combination of knowledge, a multidisciplinary amalgam, than something possible to be understood solely under economic terms. On the other hand, there is a marked convergence of interests of all fields of knowledge that conform cameralism in terms of a production of a modern state apparatus, and it is this focus that allows one to put emphasis on the economic dimension of the phenomenon and use it to articulate the several areas of this multidisciplinary amalgam. Within this economic point of view, it is possible to understand different dimensions of the connections between state economy (*Staatswirtschaft*), statecraft (*Staatskunst*), science of the police (*Polizeiwissenschaft*), public finance and taxation issues, as well as a series of useful knowledge (in particular because of fiscal possibilities), which includes chemistry, mineralogy, mining, etc.

It should be noted to make clear our argument that is possible read the mining sciences as part of cameralism in this context, but obviously it does not give to the mining issues any kind of prominence in the theoretical background of the area. The importance of mining sciences to cameralism is more practical than theoretical, and it is related to the importance of taxation associated with this technical knowledge,

particularly in contexts where the revenues and fiscal possibilities of the territorial state were closely linked to mining activities.

The main improvements and advances in the scientific field, oriented towards practical applications in mining activities and the increasing of state revenues, came from traditional mining areas of the Holy Roman Empire. The materialization of the process that supported these improvements and advances is related, among other aspects, to the establishment of mining schools, which were not only technical institutions, but also important centers of production and dissemination of cameralistic ideas, especially in Saxony, Prussia, Hungary and Bohemia.

The proximity of this context with the Portuguese case can be singled out without difficulty. The importance of mining activities on state revenues and the concern on the relationship between economic knowledge and practical knowledge of nature were decisive issues for the eighteenth-century Portuguese state in which the wealth of the kingdom was a direct result of the gold mines (and diamonds) from Brazil. This is, above all, an indispensable element for a reflection about the influence of cameralism in the Portuguese economic thought. In particular, it is possible to insist that mining sciences were not one more, but one of the major focuses of interest in the transmission of cameralistic contents into the Portuguese world.

There is a clear proximity between cameralism and the idea of useful knowledge of the natural sciences, especially chemistry and mineralogy. This is done not by the side of what we would now call fundamental (or pure) science, but predominantly by the side of applied scientific knowledge. The sciences of mining and metallurgy in the context of cameralism are essentially characterized by the junction of the practical and applied contents of chemistry and mineralogy (among others), but also put in parallel the knowledge concerning the operation and administration of the mines, from the machinery and inputs to taxation aspects and state regulations. What took shape in the second half of the eighteenth century, and was reflected by the establishment of institutions such as the *Bergakademie* of Freiberg, is exactly this peculiar type of knowledge gathering, in which the advancements in natural sciences are put together with a certain set of fiscal concepts and specific ideas about the administration and the improvement of state economy.

It is possible, in this sense, following the ideas of Wakefield (2007 and 2009), to make a parallel between the establishment of the University of Göttingen and the *Bergakademie* of Freiberg. For this author, the creation of these two institutions is part of the same movement, in which the production of academic knowledge was seen as part of a fiscal logic and as a strategy to generate state revenue, including even the ones generated by the attraction of wealthy foreign students to the cities in which these institutions were located.

The *Bergakademie* was created in 1765 as part of a reorganization project for Saxony's mining administration proposed by Friedrich Anton von Heynitz. The creation of the Mining Academy had the explicit ambition of providing training for the Saxon nobility for careers in the upper echelons of local mining administration. But in the same way, the academy also meant to attract foreign investment and the wealthy students for the not so profitable silver mines of the Erz Mountains. It is the deliberate concern of Heynitz, in preparing the local elite to assume central functions in the state finance administration that determines the nature of knowledge that would be produced and disseminated within the institution, explicitly linking the fields of chemistry, mineralogy and montanistic studies with cameralistic contents. This combination of

subjects, in particular, more than a formal education of ‘mining engineers’, that in fact constituted the original purpose of the mining academy (Wakefield, 2007: 279).

Several cameralist authors were among the most prominent promoters of the creation of mining academies, even well before the foundation of the *Bergakademie* of Freiberg. Justi, for example, at the time that he was appointed as Councilor for Mines and Police Director in Göttingen, stressed the strategic importance of mining academies, as can be read in his *Grundsätze der Policey-Wissenschaft* from 1756. Even before, in the material produced for his cameralistic lectures at the *Theresianum* in Vienna, he explicitly proposed the creation of a separate academy for administrative practice, including cameralism, commerce and mining. In Justi’s terms a relevant ground for the government of the state economy should be a combination of “politics (*Staatskunst*), *Polizei*, commerce, mines, Cameralism, and finance, together with the art of householding of oeconomy” (Tribe, 1988: 61). Another prestigious cameralist author, Daniel Gottfried Schreber, was particularly interested in the mining activities, even proposing plans for the creation of academies in mining and cameral sciences. Schreber put forward his ideas in form of an academy, because in his view the traditional structure of the universities was inadequate for a proper teaching of these subjects. In 1763 he published a plan for the creation of an academy of economic sciences that is probably the direct source of inspiration for the *Bergakademie*. In Schreber’s plan, the academy should have professors in: a) cameralistic sciences or *Oeconomics*; b) mathematics and physics; c) natural history; d) mineralogy and chemistry, which should be responsibly for the lessons in physical chemistry, but also in “economic chemistry”, and in mining sciences (*Bergwerkswissenschaften*); and d) manufactures, factories, and commerce (Schreber, 1763: 420-1, 428). Schreber would not personally pursue the plans for creating such an institution and in 1764 would be appointed as a professor at the University of Leipzig. However, right in 1765, his good friend Anton Friedrich von Heynitz would be the one responsible for the establishment plan of the *Bergakademie* (Wakefield, 2007: 279-80 and 2009: 41 / Tribe, 1988: 92-3)

The creation of the Freiberg *Bergakademie* would be quickly imitated in Berlin and in Schemnitz, witnessing similar interests in training qualified professionals not for the subaltern work in the mines, but for the high management positions of this important area of the state finance. Prussia faced at that moment the challenge of improving the administration of its mineral districts, with particular concern for the training of skilled officials for those functions. The first government measure was an attempt to reform the Prussian universities to include lessons in mining sciences, but the effort quickly went in the direction of the foundation of a specific academy. According to the report of Ludwig von Hagen, one of the most powerful officials of Frederick the Great, Prussia desperately needed a better training process for its officials, who were basically “idiots and ignoramuses”, lacking the essential knowledge for a good *oeconomist* or mining official: “physics – especially the practical part – mineralogy and metallurgy, applied mathematics, forestry” (Wakefield, 2009: 42).

Another famous example is the academy created in the city of Schemnitz<sup>2</sup>, the heart of most important Habsburg silver mining district, located in the Kingdom of Hungary and in many aspects with a similar path with the *Bergakademie* of Freiberg. As Freiberg, Schemnitz has a long history in the mining of silver ores, which also included an ancient process of labor training. But it was specifically in the second half of the eighteenth century that took form there an academic institution with a character that

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<sup>2</sup> The city of Schemnitz is today known as Banská Štiavnica and is located in central Slovakia.

goes beyond the limits of the mining sciences in itself and put it in connection with the cameralistic knowledge, in a direct response to the strategic interests in the formation of highly qualified mining officers to the Austrian Empire. Christoph Traugott Delius, half brother of Justi, is responsible for writing the first textbook for Maria Theresa's imperial mining academy in Schemnitz. The textbook includes a treatise in *Berg-Kammeralwissenschaft*, which more explicitly than any other document illustrates this solid connection between mining sciences and cameralism. In his definition for the term, "mining-cameral-science is the knowledge, in lands blessed with ore-bearing rock, of how one makes mining prosper, and keeps it prosperous, through wise principles and ordinances, and for the benefit of the state" (quoted in Wakefield, 2009:42).

It is in this context, in short, that would be produced a particular reading of the role of applied scientific knowledge (of technology, in other words) in economic development. The cameralism therefore is the first moment in the history of economic ideas in which these links between the technological dynamic and the economic improvements were explicitly established from a theoretical standpoint. Wakefield reflects on this issue asking:

why so many of the most prominent figures in German science and literature – Leibniz, Goethe, Novalis, Abraham Gottlob Werner and Alexander von Humboldt – were seriously involved with mines and mining; or why "scientific forestry" took root in these same places (Saxony, Hannover, and Prussia); or why alchemy and metallurgical chemistry thrived there too; or why "technology" as an academic subject originated in Hannover. And so on. My point is simply this: the fiscal structure of the German territories, whether backward or not, was a hothouse for certain kinds of knowledge. Silver mining, long a backbone of the state finances in Saxony and Hannover, provided support for a whole array of chemical and earth sciences. State forests and farms provided laboratories for certain kinds of botany and agriculture. German universities and academies, which were also expected to generate revenue for the state, engaged in a grand eighteenth-century scheme to sell the science. In a word, the fiscal logic of the Holy Roman Empire, whether backward or not, was certainly not neutral or universal. It was an extractive logic, attuned to the particularity of local places and populations. It was also a creative logic, producing knowledge even as it yielded revenue (Wakefield, 2009, p. 24-5).

This combination of cameralism within the fields of scientific knowledge in geognosy (historical geology), oryctognosy (descriptive mineralogy), art and technique of mining and metallurgy, and furthermore all the economic and administrative aspects of those activities is of great interest here because it allows us to understand under a new light some issues of great interest to the debate about the specific conditions of production of the Luso-Brazilian economic ideas in the context of the enlightened reformism.

In particular, we can use this specific perception of the multilayered nature of cameralist knowledge to analyze, within the Portuguese context, the trajectory of men of science that for some reasons had direct ties to the German academic environment and that in the course of their scientific trajectories became strongly involved to the administration of the Portuguese state affairs. More specifically, we are making reference to the trajectory of men such as Manuel Ferreira da Câmara or José Bonifácio de Andrada, as will be presented here in the following pages, and assuming that that kind of character should not be understood only within the boundaries of the typical man of science of the enlightened reformism, but also as a cameralist official.

## Manuel Ferreira da Câmara and the cameralism

Manuel Ferreira da Câmara Bettencourt e Sá was born in Minas Gerais, Brazil, around 1764. He made his preparatory studies in his homeland and in 1783 went to Europe, enrolling at the University of Coimbra in the Law course. In following year he also started the philosophy course, where he became familiar with the fields of the natural sciences. The Coimbra's Faculty of Philosophy were at that time a direct result of the educational reforms carried out by Sebastião José de Carvalho e Melo from 1772, functioning as a center for disseminating the scientific knowledge focused on the practical implementation and progress of economic activities. There, Câmara was mainly influenced by an important scientist, the Paduan naturalist and chemist Domenico Vandelli (Mendonça, 1933 and Varela, 2007, 2008 and 2010).

Vandelli was one of the founders of the Academy of Sciences of Lisbon and a member of many scientific academies in Europe. He was the author of several works on natural history and economy in which we can deduce elements of physiocracy, but in a broader sense, his intellectual background also suggests connections with the civilian economy of Antonio Genovesi or with cameralist literature. However, among the direct sources of inspiration of his work the name of the Swedish botanist Carl Linnaeus, occupies the central place. From 1759, in the beginning of his career in Italy, until his early days in Portugal, 1773, Vandelli and Linnaeus would exchange numerous letters (Scarano, 2008; Cardoso, 1986 and 2003).

Linnaeus advocated an economic strategy for Sweden based not on the colonial conquest of markets and the development of international trade, but in a kind of import substitution policy, in which scientific knowledge in the processes of adaptation and acclimatization of species were essential. This perspective was one of which most clearly have influenced the writings of Vandelli. And we can also say that this picture, put in evidence the role of the cameralistic doctrines in Sweden at this period and its importance to the understanding of Linnaeus' economic propositions (Koerner, 1999).

After completing the course in Coimbra, Câmara was admitted to the Academy of Sciences of Lisbon, the central institution for producing and disseminating the ideas of the Portuguese enlightened reformism. In this period it is already possible to see in broad terms the presence of ideas related to cameralism in Camera's reflections. This is in fact because of the eclectic perspective that marks the debate on economic reforms, colonial policy and the exploitation of the natural world, and that was disseminated in the memoirs that are being written and published by members of the academy at that time. In a study entitled *Memória de Observações Físico-Económicas acerca da extracção do ouro do Brasil* (Memoir on Physical-economical Observations on the extraction of gold from Brazil), presented in 1789, Câmara properly describes the framework of barriers in developing the exploitation of gold mines in Brazil, mainly in Minas Gerais, and highlights the need to create mining schools for the dissemination of modern knowledge about the activity. Aiming to the examples of the Germanic world, Câmara supports the centralization of mining activity in the hands of the state, criticizing aspects of the system currently in use and defending tax improvements and actions in the field of police matters that in several aspects can be pointed as signals of the proximity between the cameralist perspective and the mining sciences.

Nevertheless, Câmara's effective knowledge of cameralistic reality was still to have its principal moment. In 1790 the Portuguese government sent him along with two fellows, the Brazilian born José Bonifácio de Andrada and the Portuguese born Joaquim Pedro Fragoso, for a long studying trip throughout the European continent. A detailed



instruction for the trip was produced and with this document we can verify the list of the sites that should be to be visited and the studies that should be performed (see Mendonça, 1933).

The first destination of the trip was France. They had been in Paris for over a year and attended the chemistry course given by Fourcroy. They should have also attended the course of Le Sage, the distinguished name of docimastic mineralogy, but the course ended up being taught by Guillot Duhamel, from the Mining School of Paris, which basically consisted of a more conventional course on the art of mining and metallurgy.

After France, they briefly passed by the Netherlands and then set their way to the main destination of the trip, as stated by the Portuguese government instruction: Freiberg, in Saxony, where they should be enrolled in the *Bergakademie*. There they took the course of geognosy (historical geology) and oryctognosy (descriptive mineralogy) taught by Professor Abraham Gottlob Werner, whose teachings strongly influenced their careers. Câmara published two articles in the prestigious *Bergmannisches Journal* on experiments with obsidian in which he shows its affiliation to Werner's neptunistic theory (Varela, 2007; Câmara, 1794a and 1794b). The basic idea here is that the Portuguese envoys had there not only direct contact with advanced studies in mineralogy and mining, but also a systemic overview of the cameralistic doctrine, which were indeed one of the central elements in the way that the studies were organized in the *Bergakademie* (Wakefield, 2009, p. 26-48).

Fragoso stayed a few more years in Freiberg. Câmara and Andrada, however, would be traveling again in 1796 to different areas of Central Europe. The former visited the mines of Transylvania and Bannat and the latter Upper Hungary. Before their return to Portugal they both would still visit mining districts in Sweden, Norway and Denmark. Câmara would also visit mining areas in England.

Câmara returned to Portugal in 1798 and Andrada in 1800. Both of them immediately took part in the inner circle of the powerful minister D. Rodrigo de Sousa Coutinho and started to occupy prominent functions in the central administration of the mining activities in Portugal and Brazil. Several documents of the period attest their technical expertise in the area after the long journey of studies and the strategic role intended to them in the administration of the empire. These numerous reports, memoirs, letters and other documents attest well the profound connection between their acquired scientific knowledge in the practice of mining activities and a sharp sensibility to the fiscal and administrative demands (see Mendoza, 1933 and Mansuy-Diniz Silva, 2006).

One direct example of this can be read in a key document for the reforming of the administration of mining activity in the nucleus of the gold production of the Portuguese Empire: Minas Gerais, Brazil. The document is a Royal Decree containing a new regiment for the mining activities in Minas Gerais, and it was published in 1803. Câmara, then nominated to the position of General Superintendent of Mines in Minas Gerais, would be the responsible of putting in practice this reform in the activities and fiscal regulations in his return to his homeland after several years away. The document deals with numerous technical and economic issues, for example: rules for the abolition of the circulation of gold powder and the establishment of a local Mint, the introduction of technical improvements in gold mining, the encouragement for the exploration of other metals, or the establishment of mineralogical and metallurgical schools in the area. The propositions of the document were certainly very ambitious and would eventually be impaired due to the unwillingness of a crown with financial problems at

the beginning of the nineteenth century and the large amount of money that should be invested in the recovering of the mining activities, even that with the lure of the promise of future earnings.

### **The mines of Transylvania and the Royal Decree of 1803**

Even with its sources craved in the previous decades and continuing to have effect after the turn of the century, it was in fact in the 1790s that the enlightened reformism in Portugal effectively had course. The interlude of this decade basically corresponds to the duration of the study tour of Câmara, Andrada and Frago. This decade corresponds also to a period of vivid interest from the Portuguese state in constructing an approximation in the fields of science and technology with the Germanic world. The last years of the decade and the beginning of the nineteenth century would witness an acceleration in this process, and the exultant reception, mainly by D. Rodrigo, of the news sent by the naturalists even before returning to Lisbon, is a good example of this.

The action that the Portuguese diplomacy in the international system of the late eighteenth and early nineteenth centuries sought to establish with the monarchy of the Hohenzollerns (and because of it the expected role of the Portuguese Legation in Berlin) differed substantially from that of other diplomatic missions of the country. The focus was not the traditional goals of political rapprochement or expansion of trade (Cruz, 2008, p. 89-90). The main interest was essentially the technological approximation, with particular attention to mining and metallurgic issues. The objective, ultimately, was strengthening the industrial capacities of Portugal especially in the manufacturing of weapons.

In this context would be produced an interesting set of documents, including several memories and, in particular, the correspondence between the three scholars and government officials in Lisbon, in order to reveal the scenery of the mining activities in the Germanic states and other advanced centers in the Central Europe, supporting the reforming action to this sector within the Portuguese empire.

These documents present many detailed reflections on the technical aspects of mining activity, but in particular are concerned to regulatory, administrative and economic issues of the sector. In this sense, they are sufficient to understand the direct connection established between the accuracy of technical and scientific knowledge and the economy of the state administration, which is indeed a facet of elementary cameralistic precepts that influenced the creation of the *Bergakademie* and marks a fundamental dimension of the training that these naturalists had during these years of study and travel.

It was in fact a deliberated attempt in approaching the most advanced ideas in these strategic areas in which the Germanic states were in the avant-garde, and the mining and metallurgy were definitely a central focus of interest, but in a context that also counted the specificity of the military reasoning.

This diplomatic approach, in turn, was not confined to the contacts established by these naturalists. The Portuguese legation in Berlin played a direct and active role in this process. This resulted, for example, in sending from Germany to the Department of Foreign Affairs in Lisbon original documents translated from German dealing with

detailed aspects of the Prussian administration in certain specific sectors that Portugal was interested. This more than an administrative interest also represents an approach to a certain set of ideas. A sample of that kind of documentation is a diplomatic correspondence sent in October 1799 with a translation of a German document dealing with one of the favorite cameralistic issues, directly connected to the fiscal matters and the administration of mines: the cutting and selling of trees from the woods of Prussian Crown. Translations of other decisions and documents of the Prussian state to encourage and promote industry and agriculture were also included in the same mail.<sup>3</sup>

One of the most interesting cases that can be presented here, as an example of the application of cameralistic principles, is the set of documents that were intended to support the reform in the structure and regulation of the mining sector in the Portuguese empire, specifically in relation to the extraction of gold and diamonds in Brazil. The necessity of a reformation in this sector, which was facing year by year the decrease of the level of production, was one of the most essential reformation themes in the eyes of central government, urging measures for reversing the contraction of the tax gains in the area.

One text in particular holds great interest for this analysis, the “Note on the mining extraction in the Principality of Transylvania”, written by Câmara in 1796 and which would be essential for the future conception and writing of the Royal Decree of 13 May 1803, which contains the full text of a Regiment responsible for reforming the whole system of administration of gold and diamond mines in Brazil. This regiment represents the centerpiece in the transformations in the Portuguese administration to this sector and has been studied by several authors. The legal document was officially presented to the Sovereign (who signed the Decree) by his minister D. Rodrigo de Sousa Coutinho, but the original text, which suffered some minors modifications in the final drafting of the law, was in fact written by Câmara, as has been amply demonstrated and documented by Mendonça (1933).<sup>4</sup>

The text of the legal document closely follows, in several parts, the text of the “Note on the mining extraction in the Principality of Transylvania” and more than that actually tries to translate and convey the general logic of the administration and organization of mining gold in Transylvania to the reality of Minas Gerais and other mining areas in Brazil.

This is not the place for a detailed account and collate of the two documents, but it is important to insist on some aspects of the documents that are clearly associated with the cameralistic agenda.

The fundamental problem that at many times over the second half of the eighteenth century was presented by the local colonial government, as well as echoed in the central government, but without actually advancing to a solution, was the necessity of the abolition of the circulation of gold powder as currency in Minas Gerais, and the necessity of the creation of a system to replace this gold powder for an official currency, which should be accomplished by the concourse of exchange houses (*casas de permuta*) (see Cunha, 2010). For this issue (and also for many others) Câmara would find in the

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<sup>3</sup> Arquivo Nacional da Torre do Tombo, Lisbon: Secretaria dos Negócios Estrangeiros, Legação de Berlin, Letter (19 October 1799) to Luiz Pinto de Sousa.

<sup>4</sup> Nevertheless, it should be noted here that in one of the few references to this question published in English, there is a clear mistake of the Brazilian historian Junia Ferreira Furtado in a weak and unsuccessful effort of demonstration that it was José Vieira Couto the author of the document (Furtado, 2010: 207-8).

example of the gold mines of the Principality of Transylvania a model that could be copied.

Câmara make a detailed account of the procedures by which gold was obtained in Transylvania in comparison with the specificity of mining activity in Minas Gerais, pointing to the common problem that the native gold was found in different carats, varying its title from one region to another, which brings an additional problem for the payment of a standard amount for the mined metal. Câmara describes meticulously the method performed in Transylvania by the group of officials responsible for the receipt of gold powder and currency exchange, mentioning that he personally visited these officials in their fieldwork to better understand all the process. He also describes specific tests adopted by these officials to check the purity of the gold in order to make the payment. In the case that these officials effectively verified some kind of forgery the document also describes the penalties, which could be pecuniary or by physical punishment (Câmara quoted in Varela, 2010: 195).

The organization of these groups of officials directly inspired the proposition of the exchange houses in the Decree of 1803 on aspects such as their organization, the general procedures and methods for the test of gold powder, and even in the similarity of the penalties in case of fraud, with differences of pecuniary penalty or physical punishment depending on the condition of free/freedmen or slaves (Ferreira, 1884: 56).

The document about Transylvania provides many details on the organization of fiscal administration of the gold mining and this is certainly interesting as a gateway to interpret aspects of cameralistic mining administration. Câmara starts detailing that “every great country, or mining district, is administered by a Board headed by the Sovereign. The Council is ordinarily composed by a general or particular intendant, some councilors or advisers, some jurists instructed in the art of mining, a director of montanistic work, another for the forging works, and also subaltern officials”(Câmara quoted in Varela, 2010: 190). After that he continues with the description of all the other instances of the organization system. In the Decree of 1803, in turn, the way that would assume the superior board in Minas Gerais, called “Administrative Board of mining and mintage” would keep a direct relationship with the model described in 1796. The governor would be the head, as president, then there would be the general superintendent of mines, two jurists, the provider of the mint, two other senior members skilled in mineralogy, one or two mining engineers, and also two experienced miners (Ferreira, 1884, p. 49).

This superior board, or *Kammer* as described by Câmara in respect to the administration of the mines in Transylvania, was closely imitated in the proposed organization presented in the Decree of 1803. Its essential function was also the same: to promote a centralization of the administration of the mining revenues in the context of the finance administration of the kingdom. This centralization is consistent with efforts already in course in the central administration in Lisbon since the creation of the Royal Treasury (*Erário Régio*) in 1761. Câmara explains that in the mines of the Austrian and German states, all mine bodies are independent of any political or civil jurisdiction other than the High Council of Finance, which is in charge of the inspection of mines, remembering that this inspection is done by councilors who “not only had learned the art mines and montanistic economy but had worked as chiefs in the mining districts” (Câmara quoted in Varela, 2010: 191).

Among several other observations on the Transylvania model that would appear in the Decree of 1803 translating this cameralistic accent in the conduction of the

mining administration, and more broadly speaking to the fiscal structure of the Portuguese state, it is possible to cite, for example: the establishing of a clear relationship between the mining administration of the woods and waters, or the creation of joint stock companies, closely following the model adopted to enterprises of this kind of activity “in most of the mining countries of Europe” (Ferreira, 1884, p. 63 ). Also a special reference is made to the question of the necessity of providing a specific and complete education, in order to prepare skilled men to operate not only parts, but the activity as a whole, combining technical skills with scientific, economic and administrative knowledge. On this topic, the Decree determines the establishment in Minas Gerais of “mineralogical and metallurgical schools, similar to the ones of Freiberg and Schemnitz, and that have resulted in great and marked advantages for their countries” (Ferreira, 1884, p. 49).

Jose Bonifácio de Andrada would be another great enthusiast of the issue of establishing “montanistic academies” and in a letter to D. Lourenço de Lima, written in Vienna also in 1796, offers a detailed account of his planned institution. The description is essentially of a cameralistic academy, and works here additional evidence of these transmission processes of cameralistic ideas from the Germanic world to the Portuguese economic thought. Andrada suggests:

The academies or schools of montanistic studies should be composed of the following professors: one for simple math, geometry, underground architecture, and that, besides these lessons, would be responsible also for fixing and examining private montanistic maps and preparing them for the general use; one for docimastic and metallurgy, which teaches the principles of physics and chemistry in general; one for oryctognosy, geognosy and art of mining; one for drawing and montanistic perspective; one for forestry, the science and management of forests and woodlands with the same tasks in his branch that the one of geometry and montanistic architecture; and finally one for jurisprudence, chancery and controllership. These professors must always be updated with the theory and practice and, in any case, each academy would have three public collections, one of books for each trade, one of minerals, and one with all the necessary models, maps and drawings. In addition there will be a public laboratory in chemistry, for the lessons and the necessary experiments. The deputy councilors, the underground surveyor and some officials may occupy these chairs for financial reasons. There will be two schools or academies, one in Portugal, one in Brazil. In these schools will be formed the servants for the various jobs in mines, from which three or four of the ablest ones will leave from time to time to travel on behalf of His Majesty to the main mining areas in Europe in a trip that could last for four years (Andrada quoted in Mansuy-Diniz Silva, p. 449-50).

A few words more can be said in order to emphasize the deep connection that the reflections of these men, of Câmara in particular, reveal about the technical and scientific issues of mining and metallurgy as well as about fiscal issues and about the administration of the state economy. In this sense, contradicting what some experts pointed out on the reading of the trajectories of Câmara or Andrada, there is not a gap between their positions as men of science and its subsequent trajectory in the state administration and in the political life – both occupied important positions in the administration of the Portuguese state affairs, but also, later, superior political positions in Brazil after de Independency, being Andrada even considered one of the Brazilian’s founding fathers. In the course of the argumentation presented here, it is easy to see the trajectory of these men as ones of typical cameralists, in which the knowledge of the natural world is an instrument and not an end for his job, primarily related to the concern of the practical application of their knowledge in the administration and increase of the incomes of the state.

## References

- Câmara, Manuel Ferreira da. 1794a. Über das Verhalten des Obsidians vor dem Löthrohre, von Hr. Da Camera. (Aus dem französischen übersetzt). Freiberg, *Bergmannisches Journal*, v.6, n.1: 280-5.
- Câmara, Manuel Ferreira da. 1794b. Schreibes von Herrn da Camera de Bethencourt an Herrn Hawkins einige Versuche mit dem Obsidiane betreffend. Freiberg, *Bergmannisches Journal*, v.6, n.2: 239-49, 1794
- Cardoso, José Luís. 1986. Os escritos económicos e financeiros de Domingos Vandelli. *Ler História*. 13: 31-51.
- Cardoso, José Luís. 2003. A história natural, o Império Luso-Brasileiro e a economia política na obra de Domingos Vandelli. *Anais do V Congresso Brasileiro de História Econômica e 6ª Conferência Internacional de História de Empresas*. São Paulo. ABPHE.
- Cardoso, José Luís; Cunha, Alexandre Mendes. 2011. Discurso Econômico e Política Colonial no Império Luso-Brasileiro (1750-1808). *Tempo*. vol.16, n.31.
- Cardoso, José Luís; Cunha, Alexandre Mendes. 2012. Enlightened reforms and economic discourse in the Portuguese-Brazilian Empire (1750-1808). *History of Political Economy* (forthcoming)
- Cruz, Miguel Alexandre Dantas da. 2008. *Portugal perante o sistema internacional dos finais do século XVIII 1792- 1807*. Lisboa. ISCTE. (Dissertação de Mestrado).
- Cunha, Alexandre Mendes. 2010a. A Junta da Fazenda em Minas Gerais e seu diálogo com o Erário Régio na metrópole em fins do século XVIII: reflexão sobre os limites às reformas econômicas na colônia dentro da administração fazendária portuguesa. *Anais do 38º Encontro Nacional de Economia*. Salvador. ANPEC.
- Cunha, Alexandre Mendes. 2010b. Police Science and Cameralism in Portuguese Enlightened Reformism: economic ideas and the administration of the State during the second half of the 18th century. *e-Journal of Portuguese History*. vol. 8.
- Cunha, Alexandre Mendes. 2011. Polizei and the System of public finance: tracing the impact of Cameralism in 18th century Portugal In Kurz, Heinz; Nishizawa, Tamotsu; Tribe, Keith (eds.). *The dissemination of economic ideas*. Cheltenham. Edward Elgar
- Ferreira, Francisco Ignacio (org.). 1884. *Repertorio juridico do mineiro: consolidação alfabética e cronológica de todas as disposições sobre minas, compreendendo a legislação antiga e moderna de Portugal e do Brasil*. Rio de Janeiro. Typ. Nacional.
- Furtado, Júnia Ferreira. 2010. Enlightenment Science and Iconoclasm: The Brazilian Naturalist José Vieira Couto. *Osiris*. 25: 189-212.
- Heckscher, Eli F. 1935. *Mercantilism*. London. Allen & Unwin.
- Justi, Johann Heinrich Gottlob von. 1756. *Grundsätze der Policy-Wissenschaft*. Göttingen: Vandenhoeck.
- Koerner, Lisbet. 1999. *Linnaeus: Nature and Nation*. Cambridge, MA. Harvard University Press.
- Laudan, Rachel. 1987. *From Mineralogy to Geology: the foundations of a Science, 1650-1830*. Chicago: University of Chicago Press.
- Lluch, Ernest. 1996. El Cameralismo más allá del mundo germánico. *Revista de economía aplicada*, 4(10): 163-175.
- Mansuy-Diniz Silva, André. 2006. *Portrait d'un homme d'État: D. Rodrigo de Sousa Coutinho, Comte de Linhares – 1755-1812*. Vol. II: L'homme d'État. 1796-1812. Paris. Centre Culturel Calouste Gulbenkian.
- Maxwell, Kenneth. 1973. The Generation of the 1790s and the Idea of the Luso-Brazilian Empire In Alden, D. (ed.). *The Colonial Roots of Moderns Brazil*. Berkeley. University of California Press.
- Mendonça, Marcos Carneiro de. 1933. *O Intendente Câmara: Manoel Ferreira da Câmara Bethencourt, e Sá – Intendente Geral das Minas e dos Diamantes (1764-1835)*. Rio de Janeiro. Imprensa nacional.
- Paquette, Gabriel B. (ed.). 2009. *Enlightened Reform in Southern Europe and its Atlantic Colonies, c. 1750-1830*. Farnham. Ashgate.
- Paquette, Gabriel B. 2008. *Enlightenment, Governance and Reform in Spain and its Empire, 1759-1808*. Basingstoke & New York. Palgrave Macmillan.
- Scarano, Fabio Rubio. 2008. Compartilhando uma revolução científica: as correspondências entre Lineu e Vandelli In: *O Gabinete de Curiosidades de Domenico Vandelli*. Rio de Janeiro. Editora Dantes. 2 vols.
- Schreber, Daniel Gottfried. 1763. *Sammlung verschiedener Schriften, welche in die ökonomischen, Policy- und Cameral- auch andere Wissenschaften einschlagen*. vol. 10. Halle: Curts

- Tribe, Keith. 1988. *Governing Economy. The Reformation of German Economic Discourse 1750-1840*. Cambridge. Cambridge University Press.
- Tribe, Keith. 1995. *Strategies of economic order: German economic discourse, 1750-1950*, Cambridge. Cambridge University Press.
- Tribe, Keith. 2006. Cameralism and the sciences of the state In: Goldie, Mark; Wokler, Robert (eds.) *The Cambridge History of Eighteenth-Century Political Thought*. Cambridge. Cambridge University Press.
- Varela, Alex Gonçalves. 2007. A trajetória do ilustrado Manuel Ferreira da Câmara em sua "fase européia" (1783-1800). *Tempo*. vol.12, n.23.
- Varela, Alex Gonçalves. 2008. Atividades Científicas no Império Português: um Estudo da Obra do Metalurgista de Profissão Manuel Ferreira da Câmara (1783-1820). *História, Ciências, Saúde-Manguinhos*. v. 15: 1201-1208.
- Varela, Alex Gonçalves. 2008. Textos em Contexto: comentários às experiências de Manuel Ferreira da Câmara com a obsidiana da Ilha de Kandia. *Revista Brasileira de História da Ciência*. v. 1: 57-70.
- Varela, Alex Gonçalves. 2009. A "Viagem de Aperfeiçoamento Técnico" de José Bonifácio e Manuel Ferreira da Câmara Pelas Regiões Mineiras da Europa Central e Setentrional (1790-1800). *Tempos Históricos (EDUNIOESTE)*. v. 13: 75-102.
- Varela, Alex Gonçalves. 2009. Um manuscrito inédito do naturalista José Bonifácio de Andrada e Silva: Memória Sobre a Administração Pública das Minas no Eleitorado de Saxônia. *Revista da Sociedade Brasileira de História da Ciência*. v. 2: 259-267.
- Varela, Alex Gonçalves. 2010. Ciência e Patronagem: análise da trajetória do naturalista e intendente das minas Manuel Ferreira da Câmara (1808-1822). *Revista do Instituto Histórico e Geográfico Brasileiro*. v. 446: 67-92.
- Varela, Alex Gonçalves. 2010. Um Manuscrito Inédito do Naturalista Manuel Ferreira da Câmara: "Nota Sobre a Extração das Minas do Principado da Transilvânia" (1796). *História, Ciências, Saúde-Manguinhos*. v. 17: 185-202.
- Wakefield, André. 2005. Books, Bureaus, and the Historiography of Cameralism. *European Journal of Law and Economics*. vol. 19: 311-320.
- Wakefield, André. 2007. The Fiscal Logic of the Enlightened German Science. In: Smith, P. H., Schmidt, B.. *Making knowledge in early modern Europe: practices, objects, and texts, 1400-1800*. Chicago: The University of Chicago Press.
- Wakefield, André. 2009. *The Disordered Police State: German Cameralism as Science and Practice*. Chicago. University Of Chicago Press.