

Classical Theory and Exhaustible Natural Resources: Notes on the Current Debate

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RESUMEN. El tratamiento de los recursos naturales no reproducibles en el contexto de la Teoría Económica Clásica es objeto de un intenso debate en la actualidad. Concretamente, existen diversas opiniones sobre si es adecuado utilizar la noción de precios *naturales* o de *producción* clásicos para el análisis de los precios de estos recursos naturales (*royalties*) y también se han propuesto varios procedimientos formales para determinar estas variables distributivas. Este trabajo se propone realizar una revisión crítica de la literatura relevante así como sugerir una alternativa para el tratamiento de los *royalties* en el marco del enfoque del excedente.

La primera parte de este trabajo se concentra en modelos recientes para la determinación de *royalties* desde el punto de vista de la Teoría Económica Clásica, alcanzando la conclusión de que éstos se basan en supuestos e hipótesis que limitan sobremanera el alcance del análisis.

La segunda parte examina la relación existente entre los propietarios de los recursos y las compañías extractivas “en el mundo real”. Una breve investigación muestra que las negociaciones de los *royalties* tradicionalmente se han guiado por reglas tácitas de mútuo cumplimiento y que los valores que han alcanzado estos *royalties* han estado fuertemente influidos por una multitud de factores institucionales históricamente determinados.

A la luz de esta evidencia, se sugiere que los *royalties* sobre recursos naturales no reproducibles pueden ser determinados en el marco de la Teoría Económica Clásica, de un modo similar a la tasa natural de salarios.

KEYWORDS: *Exhaustible Resources, Royalties, Classical Theory of Distribution*

1. Introduction

The treatment of exhaustible natural resources in the context of the classical theory of value and distribution is currently the object of intense debate. As a symposium in *Metroeconomica* (vol. 52, issue 3, 2001) has clearly shown, different views are currently held as to whether the ‘normal positions’ defined by Sraffa’s equations can adequately deal with the prices for the use of exhaustible

^{*} Address for correspondence: Department of Public Economics, Via del Castro Laurenziano 9, 00161 Rome, Italy. E-mail: Fabio.Ravagnani@uniroma1.it. The considerations developed in these notes have partly been stimulated by previous research on Marx’s theory of ‘absolute rent’ and its implications for the analysis of the rent of mines (cf. Piccioni & Ravagnani, 2002 and the appendix to the present paper). The author wishes to thank A. Campus, P. Garegnani, M. Piccioni and S. Parrinello for useful comments on earlier drafts and interesting conversations on

resources (royalties). Moreover, different formal procedures have been suggested for the determination of these distributive variables. The aim of the present notes is to provide a critical appraisal of the contributions addressing these matters and to submit for discussion an alternative way of studying royalties within the classical approach.

The paper is organised as follows. Section 2 illustrates the issues that arise within the classical theory of normal prices in connection with the analysis of royalties. This is done by focusing on the case that appears to correspond best to the actual facts, i.e. the case of economies in which the availability of exhaustible resources largely exceeds the immediate requirements of industry. Section 3 examines the recent models aimed at determining royalties in a classical framework, which essentially consist of distinct adaptations of the theory of rent on land. It is argued that these formal contributions rely crucially on unwarranted assumptions that considerably reduce the scope of the analysis. Section 4 then goes on to examine the economic interaction between resource owners and extraction companies in real-world mining industries. It emerges from a brief historical overview that negotiations over royalties have traditionally been regulated by stable conventional arrangements that are not easily reconciled with a basic behavioural hypothesis put forward in the formal contributions. It is also shown that the observed levels of royalty rates have been strongly influenced by a whole range of historically changing institutional factors. In the light of these findings and recalling that the analysis of the variable social conventions and institutions influencing distribution plays a fundamental role in the issues raised by exhaustible resources. Financial support from the Italian Ministry for

the surplus approach, we finally submit in section 5 that royalties on exhaustible resources might be appropriately determined within classical theory by means of a method analogous to the one adopted for the ‘natural’ wage rate.

2. The issues raised by exhaustible natural resources

The analytical issues raised by exhaustible resources in the context of the classical theory of normal prices can be illustrated by focusing on a simplified example.

Consider a competitive economy in which n distinct commodities are produced in yearly cycles by n single-product industries and make the following assumptions. First, the set of means of production employed includes a single exhaustible resource that can be extracted from the ground at negligible cost. Second, the exhaustible resource enters into production processes as a circulating capital good while maintaining all of its physical properties over time if it is not used in production. Third, the existing deposits of the resource are private property. Fourth, the following conditions obtain in the economy over a time interval embracing several production cycles:

- (a) the produced quantity of each commodity remains fairly stable, with slight fluctuations around a definite central level;
- (b) a single production method is known and constantly adopted in each industry;
- (c) the basket of goods that constitutes the real wage rate also remains fairly stable;

(d) the exhaustible resource is *overabundant*, in the sense that, at the beginning of each cycle, the available quantity of the resource continues to be largely in excess of the overall requirements by the productive sector.

Condition (d) appears to be wholly realistic in view of the great availability of mineral resources registered so far.¹ Note, however, that it refers strictly to the time interval under consideration and does not rule out the possibility of the resource becoming 'scarce' in some future state of the economy.

Now imagine that we wish to determine the normal position of the economy under the conditions (a)-(d) listed above. It is clear that we could easily identify the appropriate specification of the 'independent variables', i.e. the normal outputs, the normal wage rate and the dominant production methods. A problem would immediately arise, however, as regards the determination of the price for the use of the exhaustible resource, i.e. the royalty, in terms of any produced commodity. If the resource re-emerged intact from production processes, one might indeed argue along the same line as Ricardo and conclude, in view of condition (d), that competition among owners will cause its price to tend to zero. As the resource is completely used up once it has been employed in production, however, it is doubtful that competitive bidding on the part of owners would generally drive its price towards zero. Why should a generic owner be willing to sell in the present at an arbitrarily low price, if there is a possibility that in the future the repetition of production processes will make the resource 'scarce' and

¹ For example, the available data indicate that the world's 'proved reserves' of mineral resources – defined as the stocks *in situ* that are susceptible of being economically recovered – have by

therefore susceptible of being sold at a considerably higher price?² It thus appears that only a limited conclusion can be drawn on the basis of the usual 'data' of classical theory and the hypothesis of competition, i.e. that the royalty on an overabundant exhaustible resource will tend to *some* strictly positive level.

A further issue was pointed out by Parrinello (1982, pp. 204-207; 1983, pp. 194-196), who argued that competition among owners would not drive the price for the use of the resource toward a *persistent* level but would rather engender a tendency of the royalty to grow over time at a rate equal to the ruling rate of profits (interest). The logic of the argument is simple. Assume that owners can freely decide upon the time allocation of their endowments of the resource and aim at securing themselves the optimal flow of income. If the royalty were constant over two consecutive 'years' t and $t+1$, each owner would then have an incentive to supply his whole endowment in year t , and invest the proceeds at the going rate of profits (interest) rather than selling in $t+1$. As a result, competition would tend to reduce the royalty in t until it equals the discounted value of the royalty in $t+1$. It should be noted that this argument denying the persistence of the royalty means that the prices of the commodities into which the resource enters directly or indirectly would themselves tend to change from one 'year' to

and large been rising constantly over the last few decades (cf. Krautkraemer, 1998, p. 2070; Neumayer, 2000, p. 318).

² A precise argument can be put forward to show that the price for the use of an overabundant exhaustible resource will generally be 'bounded away from zero'. We need only assume that the generic owner realizes that, with the repetition of production processes, at *some* future date the available quantity of the resource *may* become lower than (equal to) that required by the productive sector, thereby allowing the agents who own the resource at that date to reap a positive (and possibly high) price. If the current price for the use of the resource were to be set at zero, any rational owner would leave himself the possibility of being one of the suppliers of the resource at that future date, and would accordingly store his whole endowment of the resource. The total supply of the resource would thus amount to zero, and the resulting excess demand

the next, thereby casting doubt on the applicability of the method of normal positions.

The above considerations may help to explain why the treatment of royalties on exhaustible resources is often regarded as a 'challenge' for the classical theory of normal prices (cf., in particular, Kurz & Salvadori, 1995, ch. 12; Bidard & Erreygers, 2001; Bidard, 2004, ch. 23). In the next section we shall examine the contributions tackling this question.

3. The formal determination of royalties in a classical framework

The determination of royalties in a classical framework has been recently addressed by a number of formal contributions. We shall not enter into a detailed discussion of the available models here but confine ourselves to concise assessment of the main analytical procedures that have been put forward. In this perspective, it must be said first of all that research in this field has generally focused on economies where the ownership of exhaustible resources is divided among many private proprietors and competitive conditions prevail in all markets. As regards the determination of royalties, however, two different routes can be broadly distinguished.

The first can be illustrated through reference to the contribution of Bidard & Erreygers (2001). These authors emphasise the argument outlined in the previous section, with the resulting tendency to steady revaluation of royalties, and maintain that in the presence of exhaustible resources the method of normal positions should be abandoned in favour of a dynamic analysis that models the

would raise the current price to a positive level. (Note that this argument does not require *definite*

evolution of the relative prices over a sequence of interrelated time periods. Starting from this premise, they focus on the intertemporal path of an economy with a single exhaustible resource and a single produced commodity and determine the sequence of 'dated' royalty rates as follows. It is first assumed that, at a given future date T , the resource is about to be exhausted and for this reason the industry of the produced commodity combines one method using the resource with another that does not (the 'backstop method'). Under the postulated combination of methods, the royalty at T is determined through simple adaptation of the theory of differential rent, and the royalties at all dates from $T-1$ to the present are then reckoned by discounting the royalty at T on the basis of the given and constant rate of profits (interest) that is assumed to rule in the economy. It should be noted that this intertemporal determination relies on a tacit assumption ensuring that the theoretical sequence of royalty rates can be seen as the outcome of a competitive process, namely the assumption that, at the initial date $t = 0$, the resource owners (i) correctly predict the date at which the backstop method will have to be introduced, as well as the royalty obtainable at that moment in time in view of the ensuing coexistence of methods, and furthermore (ii) expect profit and royalty rates for the future dates up to $T-1$ that coincide with those identified by the model.³ To clarify this point, consider a specification of the model where the date of introduction of the backstop method

expectations about the date of exhaustion.)

³ This assumption is not formulated in detail by the authors, who simply state that their intertemporal construction 'presumes a perfect expectation of events that will happen in a distant future' (Bidard & Erreygers, 2001, p. 245) and especially of the date at which the impending exhaustion of the resource will stimulate the introduction of the backstop method (Bidard & Erreygers, 2002, p. 4). The precise formulation has emerged, however, in the course of the discussion originated by their model (cf., in particular, Parrinello, 2001, p. 309).

is for simplicity $T^* = 2$, the constant profit rate is r^* and the endogenously determined royalty rates for dates 0, 1, 2 are ρ_0^* , ρ_1^* , ρ_2^* , with $\rho_t^* = (1+r^*)^{-1}\rho_{t+1}^*$ ($t = 0, 1$). Now suppose that the above-mentioned assumption about owners' forecasts is fulfilled, so that $T^e = T^* = 2$, $r_1^e = r^*$, $\rho_t^e = \rho_t^*$ for $t = 1, 2$, and note that this implies $\rho_0^* = (1+r^*)^{-1}\rho_1^e$, $\rho_1^* = (1+r_1^e)^{-1}\rho_2^e$. It can then be contended that at $t = 0$ the royalty will tend to ρ_0^* , because if it were initially set at a rate ρ_0' such that $\rho_0' > \rho_0^* = (1+r^*)^{-1}\rho_1^e$, owners would have an incentive to supply their whole resource endowments in the present and competition among them would force the royalty downwards; and if it were set at a rate ρ_0'' such that $\rho_0'' < \rho_0^* = (1+r^*)^{-1}\rho_1^e$, owners would prefer to supply their whole endowments in the future and competition among the producers demanding the resource would drive the royalty up. On the same grounds, one could further contend that at $t = 1$ the royalty will tend toward its theoretical level ρ_1^* , and finally conclude that at $t = T^* = 2$, with the adoption of the backstop method, competition will drive the royalty towards ρ_2^* . By contrast, in the absence of correct forecasts on the part of owners, it cannot be presumed that competition will tend to enforce the theoretical path of royalties. For example, if at the initial date the resource owners expected the backstop method to be introduced at $t = 1$ instead of $T^* = 2$, and calculated the royalty obtainable at $t = 1$ on the basis of that belief, one would have to presume that at $t = 0$ the royalty would tend toward a rate *higher* than ρ_0^* .⁴

⁴ The determination of royalties based on the future introduction of a backstop method, backward

A different route, and one which has the considerable advantage of not requiring perfect foresight of future events, has been explored by S. Parrinello in a series of papers, the most recent of which is taken as our point of reference here. Parrinello (2004) focuses on a multi-commodity economy with a single exhaustible resource ' R ', that is exclusively employed in industry ' n ', and models the evolution of the economy through a sequence of theoretical positions related to successive periods of time. Each position is formally represented by a system of equations of production that autonomously determines the (normal) prices of the commodities produced and the royalty on R for the corresponding period.⁵ More precisely, in specifying the system of equations for the generic period t , Parrinello assumes that the total flow of R made available by the resource owners, G_t , enters the equations as an 'independent variable' that is added to the usual data of classical theory. He also assumes that the supplied quantity G_t is so limited that two distinct methods using the resource are jointly operated in industry n . Under the postulated coexistence of methods, the equations of production for the generic period t become formally equivalent to Sraffa's equations with land of uniform quality, and the royalty ρ_t can be accordingly determined as if it were an intensive rent. Finally, to complete his model, Parrinello (2004, p. 317) assumes that the path of the G_t s taken as given in the sequence of theoretical positions is not arbitrary, but reflects the tendency of

discounting and perfect foresight is also adopted by Kurz & Salvadori (1995, 1997, 2000). It was, however, first examined by Schefold (1989, pp. 218-231), who pointed out that, in a multi-commodity setting, the requirement of perfect foresight can hardly be reconciled with the intricate price changes engendered by the assumed revaluation of the exhaustible resource (cf. also Schefold, 2001, p. 319).

owners to distribute their endowments of the exhaustible resource over different time periods so as to maximise the expected discounted value of the stream of royalties.⁶

We can now comment briefly on the alternative routes outlined above. To begin with, it should be clear that formal determination of royalties along the lines of Bidard & Erreygers, in so far as it presupposes that owners have precise expectations as to the date at which the imminent exhaustion of the resource will prompt the introduction of the backstop method, is incapable of dealing with the case from which our discussion started and which seems most relevant in practice, i.e. the case of 'overabundant' resources for which no definite date of exhaustion is in sight.⁷ As to Parrinello's model, it can be pointed out that the key assumption allowing for the determination of royalties, i.e. that two methods employing the exhaustible resource are constantly used side by side in industry n , depends in turn on a special set of conditions. Suppose, for simplicity, that in the generic period t only methods α and β are available for the production of commodity n , the latter being more productive in the sense that it requires a smaller quantity of the resource per unit of output. By analogy with Sraffa's

⁵ In point of fact, Parrinello (2004, pp. 314, 318) makes it clear that the theoretical prices determined by each system of equations have *averages* of observable market prices as empirical correlates.

⁶ In this connection, Parrinello (2004, p. 317) argues that the generic flow G_t could be appropriately called the *effective supply* of the resource for period t , as it corresponds to the quantity that the resource owners wish to make available at the normal prices and incomes of that period, given their long-term expectations.

⁷ For example, who could form a precise expectation about the exhaustion date of coal given that, according to recent estimates, the proved reserves of that mineral would last for more than a century at the current rates of growth of demand? (For these estimates, cf. Neumayer, 2000, p. 320, Fig. 3.)

theory of intensive rent on land⁸ we realise that those methods will be jointly used only if (1) the profit rate r_t is such that method β proves more costly than the other, and moreover (2) the quantity of R supplied by owners, G_t , is such that industry n could not meet the effectual demand for its product by using method α alone. There seems to be no reason, however, why both necessary conditions should be generally fulfilled in the economy. In particular, even assuming that the available methods and the flow G_t comply with condition (2), why should the profit rate be automatically fixed at a level compatible with condition (1)? On the other hand, if the latter condition did not obtain, it is clear that only the more productive method β would be used and we would be back at the case of an ‘overabundant’ exhaustible resource discussed in section 2, with the associated problem concerning the determination of the royalty.

It can therefore be said that the formal treatments of royalties based on adaptations of the classical theory of rent on land ultimately rest on unwarranted assumptions that severely limit their analytical scope. We shall highlight a further problematic aspect in the remaining portion of these notes, i.e. the distance between a basic behavioural hypothesis put forward by the formal models and the evidence concerning negotiations over royalties. We shall also point out that the historical evidence suggests a possible alternative way of analysing royalties within the surplus approach.

4. Some historical evidence about royalties

⁸ Sraffa (1960, pp. 75-76). Cf. also Montani (1975, pp. 80-93) for a precise introductory exposition and Kurz & Salvadori (1995, ch. 10) for an advanced treatment.

In this section we shall examine the essential features of the economic interplay between resource owners and extraction companies in real-world mineral industries. We shall first focus on the important case of the US oil industry, which lends itself quite well to comparison with the formal models under discussion, and then move on to consideration of the mineral industries in general.

4.1. The 'customary' royalty rates in the US oil industry

The production of petroleum in the USA began in 1859 and soon developed into an organised industry (Williamson & Daum, 1959, p. 343). Extraction levels remained comparatively limited for the first four decades, when oil was mainly used for lighting, and then started to grow dramatically due to the increase in the demand for fuel brought about by large-scale introduction of the internal combustion engine (Uren, 1950, pp. 18-19; McDivitt & Jeffery, 1976, p. 11).

As regards the economic relationships between the agents involved in extraction, two aspects are particularly interesting for our purposes. The first is that the acquisition of oil-bearing land by extraction companies has taken place historically within a system of property rights and a market structure that are fully consistent with the assumptions of the models reviewed in section 3. On the one hand, US legislation states that the owner of a tract of land also holds the property rights on the underlying mineral deposits, and for this reason the ownership of most prospective oil acreage has been traditionally fragmented among a myriad of private owners competing with one another in negotiations with companies (Uren, 1950, pp. 184, 185; Mommer, 2002, pp. 55, 201). On the other, in the absence of significant barriers to entry, oil extraction has constantly

involved thousands of small 'independent' companies (De Chazeau & Kahn, 1959, p. 12; Davidson, 1963, p. 86, n. 1; McKie, 1964, pp. 569-571; Mommer, 2002, p. 56).

The second aspect to be noted is that the bargaining between landowners and oil companies led very quickly to conventional contractual arrangements whose structure has remained essentially unchanged up to the present. Let us examine those arrangements in some detail.

In the USA, the traditional method of securing the privilege of producing oil from privately owned lands is by leasing the oil rights and leaving surface rights to the owners for agricultural, grazing or other purposes. The typical lease contract is often signed after some preliminary surface examination on the part of the extraction company, but always before exploratory drilling takes place⁹ (Uren, 1950, p. 161; Campbell, 1964, p. 115, n. 3). Moreover, it is a *long-term* contract granting the lessee the right to enter the land, conduct explorations for oil, and produce and sell it freely for as long as such operations may prove profitable. In return for those privileges, the lessee is normally required to pay the landowner a royalty consisting of a *fixed percentage* of the crude oil produced, or of its gross value, possibly complemented by an initial 'signature bonus' and by fixed annual rentals for the period in which the land remains non-productive (Uren, 1950, p. 163; Mommer, 2002, pp. 12-13).

With regard to the historical evolution of contractual rules, experts report that in the 1860s, when oil was believed to exist only in a small part of the

⁹ As explained by Crandall, Glanville & Cookenboo (1964, pp. 227-229), more precise examination is prevented by the strong competition among companies that characterizes the phase of oil-lease acquisition.

country and landowners were therefore in a strong bargaining position, most leases ran for a limited period of time and included provisions that granted the lessors considerable advantages at the moment of negotiating renewal.¹⁰ Moreover, royalty rates as high as 50% were the norm in those years (Mommer, 2002, p. 51). But as soon as it became clear that oil could be found in many regions and the introduction of long-distance pipelines facilitated the transport of crude, competition among landowners increased markedly and the terms of lease contracts became more favourable to extraction companies. Backed by court rulings that prevented landowners from taking advantage of reversions,¹¹ companies succeeded in imposing an indefinite period of tenure as well as securing substantial reductions in royalty payments. By the end of the 1880s, a royalty rate of 12.5% was thus almost universally requested in new unexplored areas, while higher rates (plus significant initial bonuses and annual rentals) were paid in properties where the presence of deposits appeared to be guaranteed by surrounding development (Uren, 1950, p. 170; Williamson & Daum, 1959, p. 374; Mommer, 2002, p. 52). Since then, the 12.5% royalty rate has established itself as the 'customary' minimum and, more generally, the whole range of observed royalty rates has shown considerable rigidity over time (McKie & McDonald, 1962, p. 108, n. 5; Mommer, 2002, pp. 51, 98). Substantial deviations from the

¹⁰ In particular, the early contracts prohibited the lessee from removing any machinery or equipment from the land on the expiry of the period of tenure. In the event of disagreement over the terms of renewal, the tenant would therefore lose all the physical capital invested in the oilfield (Mommer, 2002, p. 53).

¹¹ 'The courts held that all machinery, as well as the casing of the wells, were [...] removable by the lessee [...] Therefore [...] the lessee might [...] remove all fixtures and well cases, and leave the property in such a condition that the lessor would have to grant a second lease of the premises on terms approximately the same as if the wells had not been drilled' (Williamson & Daum, 1959, p. 762).

usual standards have occurred only under exceptional circumstances capable of significantly altering the owners' bargaining strength, e.g. during the oil embargo of the 1970s, when American landowners were able to obtain extraordinarily high royalties on new leases (Pierce *et al.*, 1998, p. 288, n. 2).

It therefore appears that negotiations over royalties have been regulated throughout the existence of the US oil industry by conventional arrangements entitling landowners to a pre-established share of the (value of the) oil extracted, with a customary minimum proportion. A straightforward consequence of the long-term character of the conventional contracts is that the royalty rate paid *on average* on oil-producing land is modified only gradually by the continuous acquisition of new leases and surrender of old ones, and can therefore be regarded as a *persistent* share of the selling price of crude oil. But the presence of those 'institutional arrangements for paying for the use of oil lands' (Davidson, 1963, p. 103) prompts two deeper considerations.

The first is that the observed interaction between resource owners and extraction companies, as shaped by the conventional lease contracts, appears to clash with the situation depicted by the formal contributions examined in section 3. Consider in particular the behaviour of the owners of oilfields. Contrary to the situation hypothesised in those models, we do not observe them taking autonomous decisions on the time allocation of their resource endowments with the aim of achieving the preferred flow of income. We find instead that they delegate to companies all decisions as regards the timing and intensity of extraction, under contractual rules concerning royalty payments that cannot

generally give rise to appreciation of the royalty at a speed equal to the rate of profit.¹²

The second consideration is that contractual arrangements displaying such remarkable stability over time call for an economic explanation. According to specialists in the field, some hints in that direction emerge on examination of the preliminary stage of the oil industry in which the deposits of the resource are 'produced', i.e. discovered and prepared for extraction. To begin with, experts point out that the search for oil-bearing lands requires huge investment, not least in view of the uncertainty involved in ascertaining the actual presence of oil in any given site.¹³ And since the initial outlay can be repaid only gradually out of the receipts from successful ventures, it can be plausibly argued (following Mommer, 2002, p. 17) that only long-term contracts permitting free exploitation of oil reservoirs offer companies sufficient incentive to engage in exploration. Moreover, when an oil pool has finally been located, considerable uncertainty remains with regard not only to the quantity of the resource available for extraction but also to its quality (Uren, 1950, p. 10; McKie & McDonald, 1962, p. 109). Together with the obvious difficulty of predicting the future course of oil prices, this means that hypothetical lease contracts requiring royalties to be paid as a fixed sum per barrel would be greatly exposed to the risk of litigation and costly re-negotiation. By contrast, experts argue, the conventional contracts

¹² Note that it is only in the presence of such a steady appreciation of the royalty that the delegation of extraction decisions does not necessarily contradict the logic of the formal models, since in that particular case the resource owners could in principle be indifferent as to the time distribution of royalty payments.

¹³ Cf. McKie (1960) for an account of the mistakes that even the best-equipped companies have frequently made in their evaluation of potential oil-bearing acreage. This paper also illustrates the various methods used by the small 'independent' companies to finance the costs of prospecting.

based on percentage royalties have the advantage of reducing that risk, as the payments due to the resource owners are automatically adjusted with respect to differences in quality and the trend of oil prices (cf., for example, Mommer, 2002, p. 32). These remarks by specialists thus suggest that the justification for the conventional rules regulating US oil leases may lie in the fact that they provide an effective way of fostering the regular course of extraction.

4.2. Further evidence about royalties in the mineral industries

The ‘institutional arrangements’ that developed in the US out of bargaining between private landowners and oil companies are by no means a historical exception. There is, for example, clear evidence that those long-term arrangements based on percentage royalties (possibly complemented by an initial bonus) provided the model of reference not only for the leasing of federally-owned oil acreage in the States but also for most oil extraction industries in the rest of the world.¹⁴

As we broaden our perspective beyond the borders of the USA, however, a significant difference emerges as regards the legal status of oil and mineral resources in general. While US law allows for the private ownership of mineral deposits, in practically all other legal systems the government is the sole owner of the minerals to be found in the earth, regardless of whether the surface belongs to the government itself or has been transferred to other agents (Ely, 1964, p. 112). The legal principle assigning exclusive ownership of subterranean resources to the government was indeed established almost universally in the

17th and 18th centuries, due to the prevailing conviction that fragmentation of private landed property would prevent the efficient exploitation of the nation's mineral deposits (Ely, 1964, pp. 85-88; Rouhani, 1971, pp. 53-54, 217; Mommer, 2002, pp. 9-11).

In the vast majority of countries, access to mineral-bearing lands has therefore been granted to extraction companies by government, traditionally in the form of concessions. For the purposes of our discussion, it can be noted that the contractual norms regulating relations between the legal owners of mineral resources and extraction companies in those countries are quite close to those prevailing in the US oil industry. The fact that the resource owners are bodies with the aim of serving the general interest of their respective countries does, however, make a difference in so far as it adds specific institutional elements to the set of factors that have historically influenced the level of royalty rates.

As regards the first aspect, the observed mineral concessions are typically long-term contracts to be stipulated before the characteristics (if not the presence) of underground deposits can be accurately estimated, which allow companies to decide freely on the timing of extraction.¹⁵ Moreover, most concessions stipulate that royalties are to be collected as a specified percentage of production, either in kind or in cash as the government prefers, although

¹⁴ In particular, Mommer (2002, ch. 4) documents the significant influence of the North American model in both Venezuela and the Middle East.

¹⁵ This element of similarity with US lease contracts is not really surprising, given that high sunk costs and uncertainty in the stage of mineral-deposit 'production' are a common feature of *all branches* of the mining industry (cf. Behre & Arbiter, 1964, p. 54; Tyler, 1964, p. 171; Butler & Kruger, 1964, p. 579).

sometimes they are paid in fixed amounts per ton of extracted mineral (Issawi & Yeganeh, 1962, p. 105; Ely, 1964, p. 119).

As regards the second aspect, i.e. the forces that have contributed to shape the path of royalty rates, the available historical accounts suggest the need to distinguish between two cases. The first is that of developing countries where, by necessity, the extraction of mineral resources has been assigned to foreign companies. In this case, the major changes in the level of royalties are usually related to changes in the bargaining position of the government-landowner, which are in turn often linked to developments in the system of international relations. A relevant example is offered by studies on the Middle East oil industry over the period 1930-70, when the negotiations on concessions took place between the legal owners of the resource and a group of Western companies supported by their respective governments. In these studies the observed trend in royalty rates is commonly explained as the outcome of discontinuous shifts in the balance of power in favour of the resource owners, which are in turn primarily attributed to changes in the energy policy of leading Western countries, e.g. the decision to implement the steady replacement of coal with oil throughout Europe at the end of World War II (cf., for example, Mikdashi, 1966; Luciani, 1976; Rustow & Mugno, 1976; Roncaglia, 1985).

The second case regards developed countries that do not depend vitally on foreign investments for the exploitation of their mineral resources. In these countries the institutional factor influencing royalties manifests itself more directly, because the 'management' of royalty rates is commonly used by national governments as a tool of economic policy. It is worth noting in this connection

that the general interest of the country may induce the government-landowner to take decisions on royalty payments that could hardly be expected under the private ownership of exhaustible resources. A telling example is the gradual reduction to zero of the royalties on both coal and North Sea oil that British governments promoted during the 1980s and 1990s with the aim of strengthening the domestic energy industry (cf. Mommer, 2002, pp. 48, 184-192).

5. Implications for the analysis of royalties within the classical approach

The foregoing historical account provides the basis for richer assessment of the formal models aimed at determining royalties in a classical framework. Section 3 highlighted the analytical limitations of those contributions stemming from the fact that they rely on unwarranted assumptions concerning the predictive capability of the resource owners or the set of production methods in use. Now we also realise that, in real-world extraction industries, contractual arrangements are traditionally observed that appear to clash with a basic element of the formal models, i.e. the hypothesis that the owners of exhaustible resources autonomously distribute their resource endowments over different time periods in such a way as to attain the preferred stream of royalties. The evidence shows in fact that the owners of mineral deposits are normally willing to sign conventional contracts that make the flow of royalty payments dependent on the extraction schedule freely chosen by companies. And although specialists have suggested that the traditional arrangements might be seen as an effective way of fostering the regular working of the extraction industry, deeper investigation into the rationale of the conventional contracts certainly appears needed in order to clarify

the reason for this discrepancy between the observed behaviour of resource owners and the behaviour assumed in the formal contributions.

On the other hand, in the present situation of open debate as to the most appropriate way of dealing with royalties within the classical approach, it is important to note that the evidence reported also indicates a possible alternative to the formal analyses upon which discussion has been exclusively focused. Let us recapitulate the essential findings of our brief inquiry. We first pointed out that, in the highly competitive environment of the US oil extraction industry, the negotiations between private owners of oil acreage and extraction companies have taken place within the framework of a stable system of norms that reflects the bargaining strength achieved by the two parties over the historical past (cf. the formation during the 1880s of 'customary' royalty rates with a well-established minimum). We also noted that the major deviations of royalty rates from accepted standards can be traced back to substantial changes in the relative bargaining position of the resource owners, which in turn have been favoured by a historically variable set of institutional circumstances (cf. the intervention of the courts that contributed to weaken their position in the 1880s, or the OPEC embargo that strengthened it in the 1970s). Finally, with regard to the countries where mineral resources are state owned, we pointed out that the observed path of royalty rates has been strongly influenced by changes in the state of international relations capable of altering the bargaining power of the government-landowner (as in the case of Middle East oil) or directly by changes in the government's policy (as in the case of British oil and coal).

In the light of this evidence, it must be recalled that the distinctive feature of the classical approach — as opposed to the approach based on abstract supply and demand functions — is precisely that of assigning a central role, in the analysis of distribution, to the variety of socio-institutional circumstances that can operate as constraints on the actions of the parties competing for shares of the product and can, in more general terms, contribute to determining their relative bargaining power (cf., for example, Garegnani 1990, 2000, 2003). This typical feature is clearly exemplified by the determination of the ‘natural’ wage rate on the part of the old classical economists and Marx. As is well known, that determination largely rests on analysis of the variable social conventions setting limits to competitive bidding in the labour market (e.g., those concerning subsistence consumption) and of the changeable institutional factors affecting the workers’ bargaining position (e.g. labour legislation), and is accordingly carried out separately from the study of the relative prices by means of more inductive methods. Moreover, this characteristic feature emerges not only from Sraffa’s (1960, p. 33) remark that it might be the rate of profits that is determined ‘outside the system of production’ by the level of interest rates governed by monetary authorities, but also from his explicit aversion (documented in Pivetti, 2000) to ‘mechanical’ theories conveying the idea that distribution ultimately depends on natural or technical circumstances. And when this openness of the classical theory of distribution to the influence of historically determined socio-institutional factors is acknowledged, it seems natural that the separate and primarily inductive procedure adopted for the determination of the ‘natural’ wage rate

should be extended to other variables on which that influence proves dominant, as appears to be the case with royalties.

We therefore submit for discussion, as a constructive contribution to the current debate, the view that royalties on exhaustible resources could be appropriately encompassed within the logical structure of the classical theory of value and distribution as separately determined 'independent variables'. In this connection it should be noted that the conventional arrangements based on percentage royalties could be accommodated with no difficulty in the theoretical positions defined by Sraffa's equations by taking the share of the resource price attributed to landowners as a 'given' coefficient reflecting the (persistent) share paid on average in the actual economy.

Appendix

Here we shall point out that the view submitted in the text with regard to the analysis of royalties is not entirely new, as elements of a separate and primarily inductive determination of those distributive variables can be found in Marx's treatment of a particular kind of rent. To substantiate this assertion we shall briefly refer to the textual analysis put forward in Piccioni & Ravagnani (2002, sections 3-5).

As is well known, Marx criticises Ricardo's claim that rent 'is always the difference between the produce obtained by the employment of two equal quantities of capital and labour' (Ricardo [1821], p. 71). According to Marx, a second kind of rent is normally paid in capitalist economies, which originates in

the power of landowners to withdraw their estates from exploitation (Marx [1894], p. 891) and which he calls ‘absolute rent’. It is also well known that, in both the *Theories of Surplus Value* and the third volume of *Capital*, the theory of absolute rent is primarily illustrated with reference to agricultural land. As noted by Piccioni & Ravagnani, however, Marx ([1894], p. 752) states that for the purpose of analysis ‘instead of agriculture, we might equally well have taken mining, since the laws are the same’, thereby making it clear that the theory also applies to mineral deposits. Moreover, he explicitly states in some passages that absolute rent plays a particularly important role in extractive industries (cf., for example, Marx [1894], p. 906).

As regards the determination of the ‘absolute rent’ to be paid on tillable land or on mines, Piccioni & Ravagnani point out that Marx draws a revealing analogy between bargaining over absolute rent, where capitalists are opposed to landowners, and bargaining over wages, where workers are opposed to capitalists. In particular they quote the following passage, where an ideal landowner addresses an ideal capitalist:

‘*Just as your ownership* of one condition of production — capital, materialized labour — enables you to appropriate a certain quantity of unpaid labour from the workers, *so my ownership* of the other condition of production, the land etc., enables me to intercept and divert away from you [...] part of the unpaid labour [...] Can you manufacture land [...] *or mines or coal pits?* Certainly not.’ (Marx [1862-63], p. 41, emphases added).

The analogy drawn in this passage suggests that, in Marx's view, the absolute rent on 'land or mines or coal pits' should be determined in essentially the same way as wages, i.e. by analysing the economic and socio-institutional factors that, under the given historical circumstances, contribute to determine the bargaining position of the parties competing for shares of the product. As argued by Piccioni & Ravagnani, this interpretation appears to be borne out by the fact that Marx ([1894], p. 892) provides a *classification* of the variable circumstances capable of limiting the bargaining strength of landowners and therefore the level of absolute rent. (In particular, he states that absolute rent is limited by the possibility of investing additional capital in the old leaseholds, by competition of foreign products, by competition among the landlords themselves, and finally by the 'effectual demand' of the consumers.)

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