Trading Effort for Freedom:
Workday Credits in the Soviet Camp System

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Abstract

In this paper we focus on the economics of forced labor during Stalinism. We show that, despite the regime's ability to apply massive coercion, the camp system administrators used various incentives to raise labor productivity. The particular incentive system examined in this paper is the so-called workday credit system. Workday credits used reduced sentences for plan fulfillment and overfulfillment to motivate prisoners. An analysis of the economic implications of this instrument enables us to gain insights into the economic goals the camp system administrators pursued. By using a simple choice model to explain the regime's decision process with respect to the workday credit institution, we find that profitability was a major issue of concern for the administrators of the Stalinist prison camp system.

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I. Introduction: The labor economics of the Soviet camp system[1] – open questions, unsolved problems, possible approaches

In her recent history of the Soviet camp system, Anne Applebaum states: "Work was the central function of most Soviet camps. It was the main occupation of prisoners, and the main preoccupation of their administration."[2] Indeed, hard physical labor was the distinguishing feature of Soviet camps from mid 1930s to mid 1950s, where hundreds of thousands of political prisoners were detained along with an even larger number of "ordinary" convicts[3]. Against this background it is striking, that most publications on the Stalinist camp system that have appeared since the opening of the former Soviet archives do not specifically address the working arrangements by which the forced labor of prisoners was organized.[4] Yet study of the economics of forced labor is indispensable to deepen our understanding of the *raison d'être* of the camp system, while understanding that camps did not exist for economic reasons alone. Without the whole complex of factors studied in detail, the assessment of the role of the camp system will remain highly dependent on both political attitudes and methodological divergences.[5] The need for studying the economics of forced labor is also underscored by the fact that most researchers, even prior to the declassification of archival material, appeared to accept the outstanding significance of the economic role of the Soviet camp system.[6]

In this context, Abram Bergson's approach to the study of Soviet resource allocation provides a useful model. Bergson focused on the quest for the concrete material ends sought after by the system's directors, and on the subsequent discussion of

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[1] For purpose of simplification, we will refer to the system of "corrective labor camps" and "corrective labor colonies", existing throughout the period of Stalinism, as "camp system".

[2] Applebaum (2003), p. 217.

[3] The classification „ordinary" prisoner in this context has to be handled with care in so far as, besides a still significant fraction consisting of serious criminals, a large part of the prisoners sentenced for „non-political" charges during Stalinism fell victim to erratic and unusually harsh waves of punishment measures directed at petty law offenders. Thus the judgment that the Soviet state basically created its enemies itself in order to punish them subsequently (Beyrau (2000), p. 167) can certainly be applied not only to political, but also to many of those arrests which neither really nor allegedly were politically motivated.

[4] A certain exemption makes the forthcoming publication by Gregory / Lazarev (2003).

[5] Beyrau (2000), p. 166.

[6] Bacon (1994), p. 49.

observable forms of economic conduct with regard to economical rationality.[7] Indeed, if the concept of the *planners' preferences* proved constructive in Bergson's attempt to assess the entire Soviet planning system, its application to the economy of forced labor seems even more justified: While in the "normal", civilian sector one must allow, even in a socialist economy, for a certain remaining impact of consumers' preferences on the choices of economic alternatives made by the political leadership,[8] this factor can widely be ruled out with regard to the working arrangements of prison camps.

Accordingly, the investigation of the economics of the camp system could be organized according to the following questions: What was forced labor's function within the specific framework of the Soviet economic and political system? Which means and policies were implemented to put these plans and expectations into practice? What was the real outcome achieved? To find answers, one has to examine the way forced labor concretely was handled by the Soviet leadership and administration, as well as the results observable in reality. Despite the existence of massive volumes of official and secret documents containing definitions and statements about the aims of the Soviet "corrective labor policy", adverting to these sources alone would not identify the real intentions that stood behind, and the strategies that determined the policy of the large scale exploitation of forced labor. An inductive approach, i.e. the examination of concrete actions, which aimed to shape this enormously complex institution over a period of more than two decades, is a much more promising and accurate method for gauging intent.

We should probably begin with the manner in which the political leadership controlled the camp system. If we ask who determined the usage of forced labor during the period of Stalinism, the decisive role of the dictator is the first answer that springs to mind. Indeed, as to both the waves of terror and the shape of the "ordinary" Soviet Penal policy throughout the decades of his rule, Stalin's pivotal role is beyond any doubt.[9] Moreover, it was not only the dynamics and numbers of arrests that he hence determined with his moves – it was also Stalin himself who approved the fundamental choice about the large-scale exploitation of forced labor which initiated the development of the camp

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[7] Bergson (1964), p. 11.
[8] Ibid., p.8.
[9] Conquest (1990), Solomon (1996).

system,[10] and who repeatedly took part in decision-making processes on the application of forced labor in specific economic projects.[11]

On the other hand, the bulk of decisions relating to the camp system were taken by the appropriate administrative organs, above all, by the People's Commissariat (since 1946: Ministry) for Internal Affairs (hereafter: NKVD/MVD), including its embodied "Chief Administration of corrective labor camps and colonies", better known under the acronym "GULAG". Although the exact distribution of responsibilities between the various administrators of the camp system remains an open area to investigation, the GULAG had to implement government policy on forced labor, while having distinct latitude as to its design and shape. And even if it lacked authority to make groundbreaking decisions, the GULAG, as a major department of the NKVD, was well positioned to achieve its own aims with support from the NKVD minister. Although there were strong and direct links between the dictator (Stalin and the persons in his immediate surroundings, to whom, unquestionably, belonged Berija), and the GULAG, those two entities were not as congruent as outside observers may have expected. Specifically there is strong archival evidence that at no time did the GULAG (or the NKVD / MVD, executing the GULAG's interests) actively influence Soviet penal policy to affect the number of arrests.[12] The mass purges in late 1930's found the chiefs of the GULAG virtually unprepared.[13] Hence the inflows of prisoners from the GULAG's perspective represented an exogenously given parameter. In this research, therefore, our attention is directed to the GULAG's behavior, as it accounted for both the administration of prison camps and the exploitation of exogenously given forced labor.

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[10] See according documents from 1929, signed by Stalin, in: International Fund "Demokratija" (2000), pp. 62. However, the question who initiated and fostered this policy shift is object of ongoing debates. A short resume of the different views can be found at Applebaum, who herself is inclined to see a rather active role of Stalin in that matter: Applebaum (2002), pp. 50-53.

[11] See, for instance, Ertz (2003), p. 132.

[12] For an example of documents, providing such evidence, see State Archive of Russian Federation (hereafter: GARF) Fund 9414. Opis' 1. Delo 1140. List 38, 130 (for late 1930s); D. 334. L. 191—193. (for late 1940s).

[13] Gregory / Lazarev (2003), pp. 1 – 21, here: p. 4. The following attempts to allocate the crowds of new camp inmates over existing and hastily established new camps led to organizational problems and an overall severe drop in productivity, while mortality rates more than doubled (in 1939 face to 1938).

The welter and sheer mass of quantitative and qualitative material awaiting to be utilized on the Soviet camp system residing in the archives entails extensive as well as painstaking research, while the strict functional character and the poor organization of most documents alongside with numerous source issues makes any attempt to work on labor issues extremely challenging.

Given these problems and the length of the general research agenda, this paper seeks to shed some light on the intentions that stood behind the usage of forced labor by addressing a very specific, though fundamental problem – the motivation of prisoners through the application of special incentives, called workday credits, which granted prisoners a reduction in sentence for high economic performance. This topic is closely related to and part of the issue of the productivity of forced labor. Hence, analyzing the policies implemented by the Soviet leadership and by the camp administration with respect to this problem at different periods may provide conclusions about the preferences the Soviet leadership had, and, possibly, the development of these preferences.

The remainder of this paper is organized as follows. In section II we will examine the main features of the workday credit system, simultaneously summarizing the main stages of its application and evolution over time. Against this background, section III evaluates the GULAG's moves in this matter from an economic point of view and uses the results to test several hypotheses about economic strategies pursued by the prison camp administration. Section IV concludes and points out limitations and variations of the findings' explanatory force. Section V provides a simple mathematical model, which can serve to illustrate the underlying problems and to substantiate the analysis and evaluation of the camp system administrators' actions.

II.   Freedom for performance – work incentives for prisoners

Among all types of incentives used by Soviet camp administrators to increase labor productivity, the system of workday credits (*zachety rabochikh dnej*) was

particularly customized to the conditions of forced labor.[14] Its principle was that prisoners who fulfilled or even overfulfilled production targets (and, in addition, complied with disciplinary rules) were to be rewarded by a reduction in effective term of confinement. For instance, a prisoner who continuously overfulfilled production targets to a certain extent required for receiving one workday credit (one day less confinement) for each working day could theoretically reduce his entire sentence by nearly one half – since non-working days were not to be included into this calculation. [15]

The application of workday credits in the Stalinist camp system can be divided into three different periods. The first starts with the establishment of workday credits in the so-called "corrective-labor" camps operated by the Soviet Unified State Political Administration (OGPU) in the early 1930s[16], which represented the dominant type of prisons by 1933.[17] After the introduction of workday credits in one of the OGPU's projects in remote Northern territories[18], similar arrangements spread to other camps. During the construction of the White-Sea Channel from 1931 to early 1933, one of the

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[14] Earlier remarks on this topic can be found in Khlevnyuk (2003), pp. 49, 55 and Borodkin / Ertz (2003), pp. 92-95.

[15] This impact was limited, though – due to the generally small number of days off prisoners were granted.

[16] For the sake of scrutiny, there has to be added that the origins of the workday credit system actually dated back to a period prior to the development of both the Soviet camp system in late 1920s and the foundation of the GULAG as its main administration in 1930/31: The "Corrective Labor Code" of the Federative Russian Socialist Soviet Republic which came into effect on 16th October 1924, provided for the premature release of outstandingly productive prisoners (though with the restriction to such "… from the sphere of workers…"), according to a credit ratio of three days sentence reduction for two days of work. (Article 199 w. Published in: International Fund „Demokratija" (2000) p. 51.) For prisoners, working in fields of "outstanding significance", the new Corrective Labor Code, enacted on 1st August 1933, modified this ratio to two days for one. Yet these regulations referred to another category of places of confinement – for the colonies, which until 1934 were subordinated to the Republican Ministries. Indeed, the transferal of the idea of workday credits from the 1924's Code into the emerging camp system more in early 1930s, has to be considered a qualitative shift, since the new camps differed from the colonies not only in terms of administrative subordination. In contrast to the existing prison system, they were set up following a distinct economic, political and social concept, which was particularly determined by the endeavor to reduce maintenance costs. (See GARF. F. 5446. Op. 11a. D. 555. LL. 5, 32, 34-36. D. 725. LL. 3, 10.) During the 1930s and 1940s, however, the differences between camps and colonies in several respects tended to fade away – due to a convergence of the colonies towards the camps in terms of living conditions and economic and political functions.

[17] Smirnov, Sigachaev, Shkapov (1998), p. 34.

[18] GARF. F. 9414. Op. 1. D. 369. L. 45.; Scientific-Educational Center „Memorial", GARF (1998), pp. 179-180.

earliest large-scale production projects of the GULAG, which was accomplished exclusively by prisoners and under extreme time pressure generated by Stalin himself, workday credits were widely applied to motivate the masses of forced laborers.[19] Shortly thereafter, workday credits were established in virtually all remaining prison camps.[20] Unfortunately, the possibilities to gauge the effect and the efficiency of this institution with regard to prisoners' motivation are limited, as we lack broad empirical evidence on this matter. One the one hand, some documents expose serious problems in the implementation of workday credits in various camps, stemming from corruption and poor control at lower administrative levels. In such cases, workday credits typically were allotted to shirking prisoners from criminal groups whereas industrious workers sometimes did not receive any. Several decrees issued by the GULAG in 1933 and 1934, imposing sanctions on violations of the regulations on the allotment of workday credits, and the failure of reports on similar irregularities to appear in subsequent years, suggest that such problems could be brought under control.[21] By the same token, those steps taken by the leadership of the GULAG clearly underline its strong interest in the correct implementation of workday credits, which were considered, as almost all documents explicitly witness, as crucial for raising productivity. In addition, the workday credit system was referred to as a useful and necessary means to increase productivity in the GULAG's camps in several discourses taking place both within the NKVD and between it and other people's commissariats in late 1930s.[22]

A turning point in the GULAG's practice of applying workday credits was brought about in 1939. Lavrentij Berija, the new People's Commissioner of the Interior, in April 1939 launched an initiative, which abolished the workday credit system.[23] The decree No. 34, issued by the USSR Supreme Council on June 15, 1939, stated: "Any

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[19] Morukov (2003), p. 161.

[20] GARF. F. 9414. Op. 1. D. 369. L. 46.

[21] See the order of the chief of GULAG No. 47/10 of January 30, 1933 (GARF. F. 9414. Op. 1. D. 3. L. 39ob.); decree of the chief of GULAG No. 50, from 10 September 1934, GARF. F. 9414. Op. 1. D. 8. L. 46.

[22] See, for instance, the joint initiative launched by Yagoda and Vyshinskij on the abolishment of premature releases of prisoners under conditions independent from the workday credit system in 1935, in which the importance of the preservation of the latter is emphasized: GARF. F. 5446. Op. 16?. D. 1253. L. 1.

[23] Letter from People's Commissioner Berija to Molotov, head of Council of Ministers of April 9, 1939 (GARF. F. 5446. Op. 23?. D. 121. LL. 9).

convicted person … has to serve his sentence stipulated by the court completely". In order to replace the rescinded workday credits by other incentives the decree mentions material rewards for well-performing prisoners such as improved nutrition or housing conditions (incentives which, however, had already existed before), but also specified harsher sanctions against shirkers. [24]

It is not surprising that, during wartime, the question of workday credits was not raised. Given that prisoners were men in the overwhelming majority, most aged 20 to 50, it is clear that the only alternatives were either to remain in detention or to be sent to the front.[25] In the postwar period, however, it did not take long for new discussions of work credits to resume within the NKVD, and, especially, the GULAG. Documents from this time contain judgments like "Currently, and especially after the abolition of workday credits ... the incentives [for the motivation of prisoners' labor – *authors' remark*] are utterly insufficient and do not yield the necessary results".[26] Consequently, workday credits were soon reintroduced to the camp system. Yet this time, the camp administration had a rather hesitant attitude toward the widespread application of workday credits. This is reflected in the fact that at first workday credits were introduced only in a couple of special MVD construction sites,[27] at some of them triggering a reported twofold rise in the number of prisoners who fulfilled production targets by more than 125% to more than 50% of all workers.[28] Workday credits were again suspended in March of 1948.[29] However, this step was merely an intermezzo and was revised within a two-month period. In May 1948, workday credits were established in the camps of

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[24] GARF. F. 7523. Op. 67. D. 2. LL. 10-12. Document has been published in: International Fund "Demokratija" (2000), p. 116.

[25] The measures the "war cabinet", the State Committee of Defense, took with regard to the prison camp population reflected the general endeavor of absolute mobilization of all resources for the war effort: In 1941 alone more than 400.000 prisoners from camps and colonies were prematurely freed and assigned to the Red Army (GARF. F. 9414. Op. 1. D. 66. LL. 1—61, document also published in: International Fund "Demokratija" (2000), pp. 272—296, here: p. 275), whereas for those remaining the working time was officially augmented to 12 hours a day with – at maximum – two days off a month (GARF. F. 9414. Op. 1. D. 1156. L. 226).

[26] GARF. F. 9414. Op. 1. D. 334. L. 194. See also Ibid., L. 23.

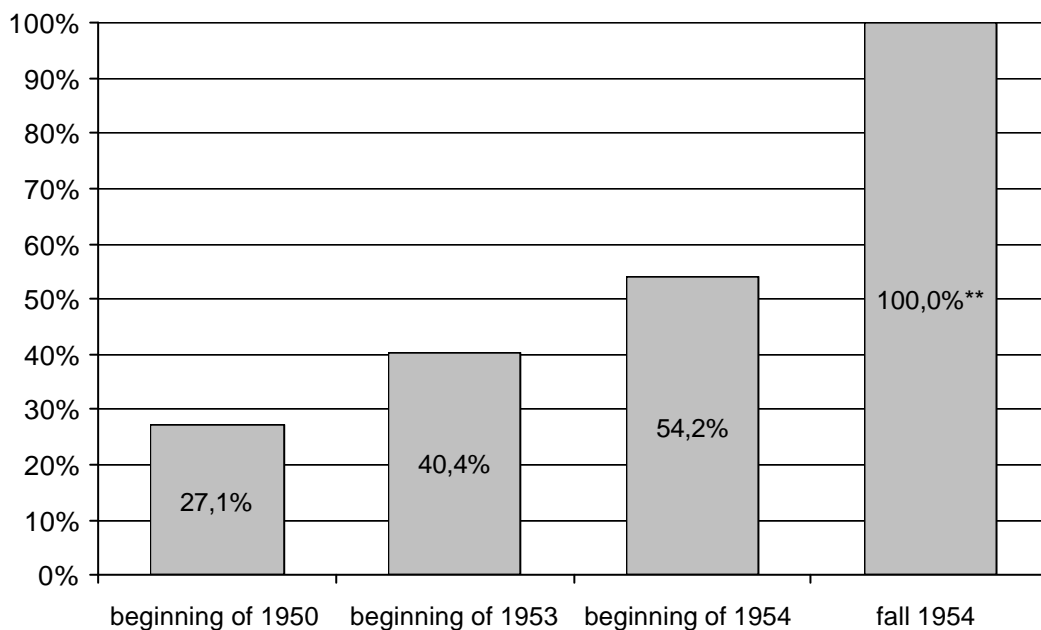[27] GARF. F. 9414. Op. 1. D. 369. L. 46.

[28] GARF. F. 9414. Op. 1. D. 368. L. 402.

[29] Council of Ministers' decree No. 823-264s, issued on 20. March 1948. GARF. F. 9414. Op. 1. D. 369. L. 45.

"Dal'stroj"[30], which conducted gold mining and a wide range of other colonizing activities in the Far East and with a labor force of more than 100.000 prisoners.[31] Thereafter, an additional 19 decrees were issued in the following two years, expanding workday credits to more and more camps.[32] But the use of workday credits remained confined to a limited number of camps. It took several years until they were applied to lower priority camps, such as forestry.[33] The ultimate decision to apply them in all camps and colonies came only after Stalin's death in mid 1954 (see Fig. 1), despite the fact that GULAG managers in official documents and in reports to the government consistently praised their positive effects on labor productivity.[34]

Fig. 1

Ratio of prisoners granted the possibility to receive workday credits to absolute number of all prisoners in MVD camps and colonies*

Sources: GARF. F. 9414. Op. 1. D. 369. L. 45; D. 507. L. 54; D. 202. LL. 24, 78.

[30] Council of Ministers' decree No. 1723-688ss, issued on 22. May 1948. Ibid. LL. 47-48. L. 47—48.

[31] Scientific-Educational Center „Memorial", GARF (1998), pp. 117-120, 307-308.

[32] GARF. F. 9414. Op. 1. D. 369. L. 48—49. Among those were, again, the camps of Glavpromstroij, the Norilsk Nickel plant, construction sites of railroad tracks in Siberia, of plants petro-chemical plants, of the Kujbishev hydro-electric power station or of the gargantuan new complex of Moscow State University. What all those camps had in common was the fact that they carried out projects that officially were classified as being of outstanding importance.

[33] GARF. F. 9414. Op. 1. D. 195. L. 62.

[34] See, for instance: Ibid. D. 369. L. 36; D. 326. LL. 6, 43, 53.

Remarks:

*These figures are based upon the numbers of prisoners in camps where workday credits were available. They do not reflect whether all prisoners in those camps really received workday credits. However, evidence from single camps suggests that a large majority of prisoners there really did.[35]

**It cannot be categorically excluded that single camps and colonies remained outside the workday credits system. Administrative documents, however, suggest that "all camps and colonies" were concerned by the second half of 1954 (See GARF. F. 9414. Op. 1. D. 202. LL. 78, 220).

The workday credit system as introduced from 1948 on differed from the rules that applied in the 1930s in several respects. The most special feature of the postwar system was an extraordinarily detailed differentiation of workday credits. Ratios could vary from half a day to up to two or, in some camps of "Dal'stroj", even three days of credit for one working day. The actual reward was determined according to special discrete scales denoting the number of credits with respect to the degree of plan overfulfilment.[36] These scales in turn were differentiated with regard to the significance of the prisoner's function in the production process (more favorable scales were applied to prisoners working in primary production rather than ancillary production), on the kind of work (higher qualified workers had higher ratios than unqualified), and, in some cases, also on the branch to which the given camp or colony belonged to (besides the differentiation caused by the fact that in some camps there were no credits at all available). This differentiation seems to have represented an incentive of its own, as we can deduce from a somewhat cynical statement of a GULAG manager: "There are many cases in which prisoners, who in former times were always seeking a "cozy" spot, somewhere in the apparatus, in a depot, as a servant and so on, are petitioning now to be moved to the primary work, complaining about not being employed according to their qualification which they used to conceal before»[37].

In the late 1940s and early 1950s the GULAG administrators took the correct implementation of workday credits at the places at least as seriously, as it did in the

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[35] For instance, in the camp occupied with the construction of the Tsymlyanskij hydro-electric power station on the Vol'ga river, which in late 1949 had approximately 10.000 inmates, practically all working prisoners were eligible for the receipt of workday credits, and about 85% of those actually received them in some amount. See GARF. F. 9414. Op. 1. D. 148. LL. 5—7; D. 1317. L. 4ob; Scientific-Educational Center „Memorial", GARF (1998), p. 507.

[36] One of these scales is reproduced in section III of this paper.

[37] GARF. F. 9414. Op. 1. D. 502. L. 222.

1930s. Alongside with their implementation in the camps, local camp administrations were required to organize various agitative activities, and every prisoner was to be provided with an individual "workday credit record book" where his personal credits were to be recorded in order to enhance transparency.[38] Accordingly, administrative documents from this period suggest that the frequency of misuses and manipulations was lower than in the 1930s,[39] whereas the measures taken against violations were severe: A circular issued by the chief of GULAG Dobrynin in June 1949 to all camp directors threatens to take to court anyone responsible for manipulations of work credits.[40]

III.   Workday credits – a clue to the GULAG's preferences?

Having outlined the history of workday credits, we now turn to two main questions: How can we explain the behavior of the GULAG to this special incentive system from an economic point of view, and which insights, if any, do we gain about the motivation and the aims of the GULAG with regard to the exploitation of forced labor in general? We attempt to better understand and to interpret what we have learned in the previous section. Why decided prison camp administrators to use workday credits throughout the 1930s, and why did they choose to suspend them in 1939? Why were they introduced again in the late 1940s, and, finally, why were these incentives designed they way they were? Or, to formulate it more strictly and according to our major question: Under which set of economic preferences would the GULAG's behavior have been rational? In seeking to answer to those questions, we first will take a closer look at the institution as such, asking under which conditions and presumptions a workday credit system would have been considered favorable from an economic point of view. We must also identify the reason for cancellation of this early release scheme in 1939 and its (somewhat hesitant) reintroduction in the late 1940s.

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[38] See, for instance, GARF. F. 9414. Op. 1. D. 195. LL. 62—63; GARF. F. 9414. Op. 1. D. 201. L. 54?.
[39] See, for instance, GARF. F. 9414. Op. 1. D. 148. L. 5—6.
[40] GARF. F. 9414. Op. 1. D. 97. L. 128.

If we want to evaluate the economic consequences of the workday credit system, we have to ask how it affected the economic performance, specifically: the development of output and profits of a camp, or, alternatively, of the camp system as a whole. The first hypothesis to be tested in the following is whether output maximization was the end the GULAG sought after by using workday credits. This conjecture seems reasonable against the background of the general primacy of pure output targets in the Soviet planning process.[41] An analysis of this hypothesis cannot be carried out without assessing the concrete figures determining the particular effects of workday credits. In Table 1 we reproduce the scale according to which workday credits were to be awarded to prisoners, working in the main field of work in those camps in which the system was introduced from 1948 on:[42]

Table 1

Scale for the calculation of workday credits, applied to ordinary prisoners

1.	2.	(3.)
Credits for one working day (c)	*For fulfillment of monthly norms (P_{wc}*)*	*(Resulting value of q*)*
0.5 day	from 100% to 110%	(0.67)
0.75	from 111% to 121%	(0.57)
1 days	from 121% to 135%	(0.5)
1.5	from 135% to 136%	(0.4)
2	151% or more	(0.33)

* Notation as used in the appendix. The value of q is calculated by the formula: $q = \dfrac{1}{1+c}$.

Source: Joint decree of MVD / General Prosecutor of the USSR No. 00683/150ss from 21. July 1948; column (3.) added by the author

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[41] Bergson (1964), pp. 133-157. However, output maximization would apply to the camp economy without modifications even if we presume investment maximization as the *ultima ratio* of economic policy during Stalinism, since an overwhelming share of the "output" produced by the camp economy was investment (construction). See Gregory (2003), pp. 19-21.

[42] This scheme represents the most general one for this period. In addition, there existed other schemes for workers in ancillary industries, which were slightly less favorable from the prisoner's perspective, but also schemes for prisoners employed in core lines of production, which were more favorable to them. Some years later the requirements were softened for all prisoners, so that the maximum number of 2 workday credits henceforward could be achieved by fulfilling the production targets by just 121%. See GARF. F. 9414. Op. 1. D. 201. L. 54?.

These figures are to be read in the following manner: A prisoner whose performance equaled at least 121% plan fulfillment could reduce his sentence twofold (or, in other words, get his sentence multiplied by the factor q, which in this case equals 0.5). We must confine our analysis to those prisoners who responded to the new incentives, i.e. who were able to increase their productivity due to the opportunity to earn workday credits. This is based on evidence that this fraction accounted for the majority of prisoners[43], but also on the consideration that for all prisoners who did not respond to these incentives, nothing changed: neither did they increase their productivity, nor were they to be released earlier. It should be mentioned, though, that there is no illusion that in the Soviet camps at certain periods a considerable number of prisoners were physically too weak, too exhausted or for other reasons failed to meet planning quotas so that their productivity was well below requirements. However, such prisoners suffered coercive measures like significant cuts in nutrition, poorer endowment with clothes and other amenities. Therefore, if these prisoners were not able to avoid coercive measures, it is most likely that they were not able to respond to incentives like workday credits either.

Under these presumptions, it is remarkable that, for all proportions for the calculation of workday credits listed in Table 1, the sentence reduction, from an economic point of view, appears disproportionately high. In fact if we assume for initial productivity a value around, or slightly below, 100% norm fulfillment[44], the loss of output the camp administration had to face due to earlier releases of prisoners was more significant than the gain incurring as a result of the increase in their productivity. With respect to the camp as a whole, this means that holding every prisoner in detention for a shorter period of time would have resulted in a decrease in the total number of prisoners. So the question arises why the camp administration fostered and, finally, introduced such an incentive system, thereby depriving itself of a significant amount of output that could have been extracted from prisoners. The mechanics of the workday credit system clarify that the above considerations on the effect of workday credits on output, while correct

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[43] See above: note 34.

[44] This assumption is based on the limitations on prisoners, who were able to show a high economic performance. As stated above, they would have faced coercive measures if failing to meet the 100% level. Moreover, one can state that in late 1940s significant deviations from the plan targets in the camp economy had become rather seldom over the camp system, and the general plan fulfillment in most camps indeed hovered around a value of 100%.

with respect to one single prisoner, do not exactly reproduce the impact on the camp economy as a whole. Specifically, we have to take into account that, when workday credits were introduced, almost all prisoners in the camps already had served a certain amount of their sentence, so that they had no chance to get their entire term of confinement diminished by the factor q – due to the fact that workday credits were not to be awarded retrospectively. Consequently, the inevitable decrease in the absolute number of prisoners did not take place immediately, but gradually.[45] Hence, the negative effect on the output, which was caused by premature releases, increased only gradually, too, reaching its final and permanent extent only after a certain, transitory period of time – whereas the rise of productivity, triggered by workday credits, appeared immediately upon their implementation, remaining thereafter on a constant level. However, given the data from the above sample, the former was bound to become dominant over the latter, so that in the mid and long run, output must have been lowered relative to its initial level, which is shown in *Fig. 2*.

Fig. 2

The dynamics of aggregate output after the introduction of workday credits
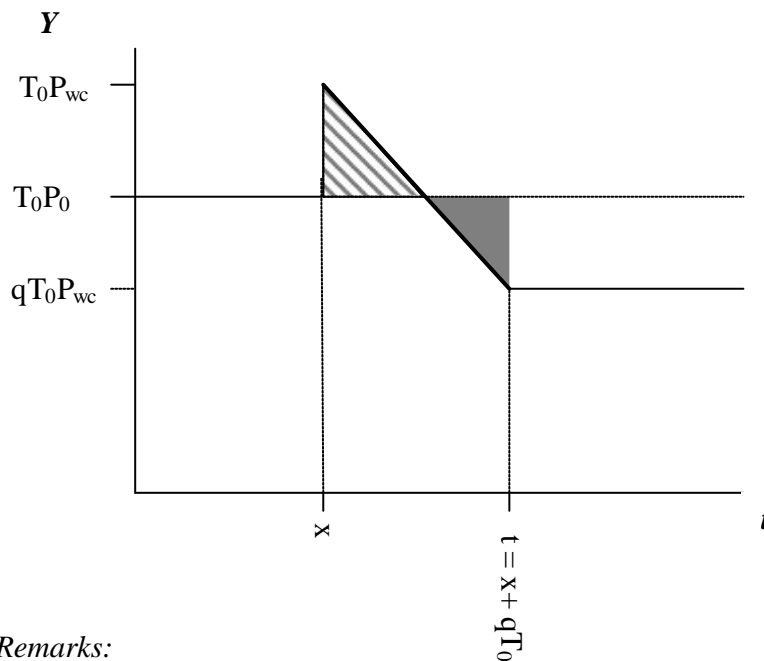
Remarks:

* Schematic Graph, not drawn to scale

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[45] For a formal derivation and a more exact discussion of this relation see Appendix, V.II.

** Notation (identical to that used throughout the Appendix): Y = aggregate output, t = time, x = moment of introduction of workday credits, T_0P_0 = initial output level, ($T_0P_{wc} - T_0P_0$) = increase in output due to workday credits, qT_0P_{wc} = aggregate output level in the long run

Figure 2 shows an initial gain in output as work credits are introduced (the hatched triangle). Output falls as prisoners are prematurely released and the gray area shows the long-term loss of output. This analysis suggests two possible explanations: Either the aim of workday credits was relative to the increase in total output (an unlikely explanation), or the short-term increase in output (hatched area) was valued higher than the long term losses incurring (gray area). Taking up the latter hypothesis, it should be clear that this could be consistent only under the condition of a positive discount rate inherent in the GULAG managers' calculations. Moreover, given the actual data on the mechanics of the workday credit system, this discount rate must have been extraordinarily high, as the absolute increase in output would occur only during the short period of one to two years, while in all subsequent years the output would drop below its initial level. [46]

The question is therefore whether the assumption of such high discount rates can be considered realistic. With regard to the political leadership, it should be more than obvious that this assumption can be ruled out, since no one could reasonably dispute that the dictator had a much longer planning perspective than just two or three years. The same applies for the GULAG, the prison camp administration, in which several departments and many individual agents were involved in the administration of forced labor. Therefore the GULAG's discount rate as an institution, given its mid- and long-term economic and political tasks, should have been quite unlikely to be influenced by discount rates of individual agents, which might have been higher. The only place in the system where high discount rates might have seemed conceivable was *actually* the level

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[46] A calculation of the critical discount rate above, which the camp administration that opted for this workday credit scheme must have had, can be carried out by using formula (15.), provided in the appendix, substituting appropriate values for T_0, P_{wc}, P_0, q and solving or approximating the resulting higher-order equation for d. To give an impression of the order of magnitude of the resulting discount rates: if assuming, for instance, an average term of confinement for all prisoners (T_0) of 10 years and referring to the approximate requirements for receiving 1 workday credit for one day of work as shown in Tab. 1 (P_{wc}=1,2, P_0 =1, q=,0.5), a *regula falsi* iteration yields a discount factor $d = 0.65447$, which implies a discount rate $r = 0.5280$ (or 52,8%).

of camp directors, who, due to the significant weight of their responsibility for economic performance, could also be referred to as camp managers. Indeed, against the background that the personnel turnover on this level was remarkably high – most Soviet camp managers stayed in their positions during Stalinism no longer than two to three years, while the average time might have been even shorter: in many camps they changed virtually every year[47] – one can infer that the average camp manager could expect not to stay at his current position for longer than a few years. Combining this relatively short planning horizon with the prospect of receiving high premiums for meeting the most emphasized of all goals – overfulfilling of output targets[48], it seems plausible that camp managers would have favored such an incentive system even if this was expected to bring about long term losses.

Although a systematic verification of assumptions on time preferences in this context is not feasible, some casual evidence might be considered to assess the hypothetical assumptions on camp managers' strategies. On the one hand, the sanctions the GULAG had to take to ensure the accurate implementation of the workday credit system both during 1930s and by the end of 1940s suggest that, with regard to many camps, the center was more eager to make these incentives work, than the local managers, which would not buttress the hypothesis of the latter using the possibility to take short term advantage from the system.[49] On the other hand, such behavior might be explained by a lack of economic rationality in the behavior of certain camp managers. Indeed, there are also examples of camp managers actively fostering workday credits, such as V.S. Zverev, in late 1940s director of the Norilsk prison camp (Noril'lag), the main supplier source of workforce for the vast Norilsk Nickel plant in North-Eastern Siberia and in late 1940s one of the largest camp complexes in the USSR. Directly after the introduction of workday credits in his camp in 1950, Zverev decided that the standard requirements for their receipt were too hard to meet, and thus inappropriate for the workers in the main branches of the plant. Therefore he lowered the scale himself, establishing as the minimum plan fulfillment for receipt of 2 workday credits instead of

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[47] See data for individual camps as compiled in: Scientific-Educational Centre „Memorial", GARF (1998)
[48] Bergson (1964), pp. 75-77.
[49] See above, pp. 7, 11.

151% (as shown in Tab. 1 above), values of 121% for the metallurgical and 136% for the mining sectors.[50] For engineers in Norilsk, the modified schemes meant that already 100% plan fulfillment would grant them one workday credit, or even two, if, additionally, technical-economic targets (unit cost, productivity, input coefficients, accident rate, etc.), were met.

If this particular action were cited as proof of camp managers having higher discount rates than the center, one might point out that Zverev, according to his argumentation, intended not to grant more generous workday credits, but just to adjust the existing ones to specific conditions. Moreover, the fact that the GULAG promptly approved Zverev's act suggests that the differences between him and the center were not significant.[51] Finally, the Norilsk camp perhaps was not a typical example: Norilsk was one of the MVD's high-priority projects, its stock of labor force was likely to be replenished irrespective of the reasons for their reduction. Hence Zverev might not have feared a reduction in the number of prisoners in future periods, so that his attitude towards an additional incentive system would have been positive under any circumstances. And yet there might be some evidence that he did not have a low discount rate when taking his decision on workday credits: Just three years later, in 1953, when he was still director of the Norilsk Nickel plant, the official account of the transfer of the Norilsk camp from the MVD to the Ministry of Justice stated: „… during 1951 and 1952 the most qualified prisoner labor force left Norilsk, [workers,] who, over many years prior to the introduction of workday credits, had been acquiring high qualifications … Among the incoming prisoners, in contrast, 80% have no qualifications and need a fairly long time for acquiring practical skills…"[52]

However, the main argument challenging the hypothesis that high discount rates explain the workday credit institution is the lack of archival evidence of camp managers lobbying for it (the incident in Norilsk appears to have been an exception). Instead, there appeared to be a broad consensus among the camp system's directors at the center during both the 1930s and late 1940s that workday credits were worthwhile. Such findings cause

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[50] GARF. F. 9414. Op. 1d. D. 151. LL. 289—290. For a more detailed account on these discussions, including the complete modified schemes, see Borodkin / Ertz (2003), pp. 93-95.
[51] GARF. F. 9414. Op. 1d. D. 151. LL. 296—300.
[52] GARF. F. 9414. Op. 1. D. 174. L. 13.

us to reject the hypothesis that the workday credit system was based on output maximization considerations, since in that case it could not have been made from a long-term planner's perspective either with or without reasonable time preferences.

Given this conclusion, we have to ask which other motivation might have driven the GULAG's policy instead. The recurring classification of workday credits as an effective means to increase the prisoners' labor productivity in the GULAG's internal documents supports the conjecture that increased labor productivity had priority over maximization of output in the objective functions of camp managers. With regard to the prison camp economy, increasing labor productivity was tantamount to raising profitability. Labor costs in Soviet camps were, in theory and perhaps in practice, constant. Each prisoner had to be supplied with the same provisions determined by orders and other administrative documents applicable to the entire camp system.[53] Furthermore, every camp was organized in departments of standardized size that had to be endowed with the same infrastructure.[54] Finally, the ratio of guards to inmates was established irrespective to camp size; hence, we could not find significant effects of scale when comparing maintenance costs of prisoners over camps of various sizes.[55] Taking this cost structure into account, any percentage increase in output induced by higher productivity from workday credits would yield a higher percentage increase in profits than in output. Given small initial profit margins of camps, even a limited expansion of output (at no additional costs) could bring about an enormous percentage upsurge in profits.[56] Such considerations should turn our attention to the issue of GULAG profits.

Unfortunately, Gulag profitability is a problematic area for research due to incomplete source data.[57] However, we do have fragmentary data. Already in late 1929, a

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[53] See, for instance, order of NKVD No. 00943 of August 14, 1939; order of MVD No. 0313 of February 11, 1952.

[54] GARF. F. 9414. Op. 1. D. 374. LL. 60-116. See also order of MVD No. 0190 of March 29, 1947.

[55] The differences that did exist in this field depended mostly on geographical factors and on the specific economic profile of the given camp.

[56] This hypothesis is stable even if we allow additional costs for other factors to incur, especially against the background of low mechanization in large parts of the prison camp economy.

[57] The main problem consists in the absence of single aggregate balance sheets for the NKVD's/MVD's prison camp economy for the entire period from 1940 to 1953 in the archives, due to the existence of several branch administrations within the People's Commissariat /

decision was taken to cover all costs with revenues in the (then) OGPU's first three prison camps.[58] This target was restated in 1930, only now revenues should be sufficient to cover costs for prisoners awaiting trial as well.[59] In March 1938, Deputy People's Commissioner for Internal Affairs (Zhukovskij) affirmed that full coverage of costs was reached for the NKVD's entire camp and prison system.[60] However, the GULAG's planned budget for 1940 showed expenses (7,864.01 million rubles) 7 percent above costs (7,375.72 million rubles) with the difference to be covered by contributions from the State budget.[61] A similar (but perhaps superior) result was reported for the late 1940s: "The maintenance of the camps and colonies is covered by the productive-economic activities of the MVD [this refers to the MVD-owned enterprises employing prisoners from these camps – *authors' remark*]. Only totally disabled prisoners as well as inmates in remand and transfer prisons are held at the State budget's expenses."[62] For 1952, the planned revenues of camps and colonies subordinated directly to the GULAG (the balance sheets for the other camps administered by specific branch administrations of the MVD were kept separately), amounted to 5,054 million rbs., but a supplementary state subsidy of 506.7 million rbs. was needed to close the gap between revenues and expenses.[63]

Thus the camp system as a whole obviously was not able to cover its full costs at any stage of its development (which is not to say that individual camps did not make profits). An instrument to increase labor productivity like the workday credit system obviously had considerable potential to alter this situation. Hence the insights into the prison camp system's profit situation and our analysis of the mechanics of the workday credit system seem to jibe. Workday credits could have been an endeavor to achieve return on costs, or even profitability in the systematic exploitation of forced labor.

Ministry, which were responsible for financial and economic affairs of most prison camps throughout this period. For other years, data are available, though often scattered and incomplete.

[58] GARF. F. 5446. Op. 11a. D. 555. L. 5.

[59] Ibid. D. 725. L. 2.

[60] Ibid. Op. 22a. D. 38. L. 92.

[61] GARF. F. 9414. Op. 1. D. 28. LL. 122-123.

[62] Ibid. D. 326. L.8. Account by Kruglov, Minister of the Interior, to Stalin, February 1948. See also analogous statement from January 1950: Ibid., L. 30.

[63] Ibid. D. 3251. LL. 6, 12.

A significant problem remains: If we assume that a profit-maximizing strategy of Gulag managers dictated the choice of workday credits, how can we explain why these incentives were rescinded in 1939. Additional archival evidence might help clarify this inconsistency. As mentioned earlier, it was Berija, People's Commissioner of Internal Affairs, who abolished the workday credit system in 1939. Hence we can presume that, in doing so, he acted according to the NKVD's, and thus the GULAG's, interests. It is notable that the main argument Berija gave in favor of the abolition of workday credits was the necessity for the Gulag system to fulfill the challenging new construction projects of the third Five-Year-Plan (which had been approved by the 18th Party congress just a few weeks before).[64] According to him, workday credits would make it more difficult for the prison camps to cope with plan assignments by causing an "exceptionally high turnover within the camp contingents".[65] However, not only did Public Prosecutor Vyshinskij argue that real figures from the camps did not permit of such a conclusion, the GULAG's internal documents also reveal that the real main motivation for Berijas initiative was a different one. On February 23rd, the heads of the GULAG's accounting and planning departments wrote a joint letter to deputy People's Commissioner of the Interior (Chernyshov), warning about a looming shortage of labor force: whereas the need for prisoners in the second quarter of 1939, calculated on the basis of the investment plan, was 1,474.5 thousand prisoners, the expected actual number of prisoners fell short of this figure by more than 130 thousand.[66] Only a few weeks later, the head of the Gulag Accounting Department updated the deficit in workforce, expected by April, to 143.000.[67] In both letters the authors proposed to cope with this scarcity through measures to enhance the prisoners' health and a strict refusal to accept additional tasks assigned to the NKVD by other People's Commissariats. They also proposed stopgaps such as the transfer of prisoners from prisons and colonies to camps of highest priority.[68] The abolition of workday credits is not explicitly mentioned as a means to overcome the bottleneck (nor can it be inferred from these documents that additional arrests were considered). However, there should be little doubt that these worrying figures – from the

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[64] GARF. F. 5446. Op. 23?. D. 121. L. 9.
[65] In a letter to Molotov of May 5, 1939. Ibid. L. 5.
[66] GARF. F. 9414. Op. 1. D. 1140. L. 130.
[67] Ibid. L. 38
[68] Ibid. LL. 39, 131.

GULAG's as well as the NKVD's standpoint – finally prompted Berija to abolish workday credits. This interpretation seems all the more likely given that the Supreme Council's resolution of June 1939 not only banned the future use of workday credits but also cancelled credits accumulated by prisoners up to that moment.[69]

Apparently, Berija's decision in 1939 was driven by the need to meet output targets. Yet this cannot be interpreted as an indicator of profitability playing a minor role in the camp system administrators' strategies. The positive effect on output from the increase in the number of prisoners, owing to the abolition of workday credits, would have been – at least partly – neutralized, if their productivity decreased. Indeed, Berija's proposal explicitly defined as its central purpose to tackle "the most serious task to ensure the maximum possible exploitation of the camps' labor force". Alongside the abolition of workday credits, Berija addressed some of the points suggested by the above-mentioned letters from GULAG managers (specifically measures to improve health by establishing more adequate nutrition norms). A twofold strategy for boosting labor productivity was promoted: other types of incentives, such as improved nutrition or housing conditions for well-performing prisoners, were to be accompanied by distinctly harsher sanctions and coercive methods against shirkers and "malicious disorganizers of camp life".[70]

In general, the GULAG's calculation, which stood behind Berija's initiative, was based upon the speculation that workday credits could be substituted by other instruments, namely by tougher repression, without productivity seriously suffering. Even if the fact that soon after the war workday credits resurfaced as incentives might suggest that this strategy prove fallacious – by no means can we conclude that the aim of high productivity as such, which, by the end of the day, meant higher profitability, was abandoned by the GULAG's directors in 1939.

On the other hand, the fact that the system in the late 1940s at first was established only in selected camps of higher priority is evidence that the resulting reduction of prisoners was considered an issue that had to be handled with care. It is entirely possible that the GULAG and the MVD, facing shortages in prisoners during this

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[69] GARF. f. 7523. Op. 67. D. 2. LL. 10-12. Document has been published in: International Fund "Demokratija" (2000), p. 116.
[70] GARF. F. 5446. Op. 23?. D. 121. LL. 9, 7-6.

period, too,[71] feared the widescale loss of prison labor resulting from the broad use of workday credits. If there were such reservations, they apparently shrank over time as coverage widened. Nonetheless, the extension of workday credits to the entire camp system had to wait until 1954, after the amnesty of political prisoners and after the transfer of most Gulag economic activities to the industrial ministries.[72]

IV.   Conclusions

In this paper, we have singled out the workday credits as a motivational instrument applied to manage forced labor. On the basis of the Gulag's own historical records we analyzed the economic outcome of this particular incentive scheme and found that it was designed to increase profitability both in the short and the long run. Given the adverse relationship between revenues and costs in the Soviet camp system, workday credits were not a sufficient means to turn the exploitation of forced labor profitable. However, even under these circumstances they must have at least reduced losses and hence state subsidies. This positive effect on profits (or reducing losses) had to be paid with the decrease in output brought about by workday credits in the long run as the size of the prison camp population was reduced by early releases. A net positive impact on total output could be observed only during a considerably short transitory period.

Our translation of camp directors' observable behavior (specifically: the creation and the implementation of workday credits) into their objective function proceeded partly from archival evidence, partly on assumptions. We have shown that output maximization being the underlying strategy would have required astronomical discount rates. Indeed, this may have been the case for camp managers who held their positions only for a short period of time. However, archival evidence reveals that workday credits were promoted no less vigorously in the camp system administration itself, that is from the heart of the political leadership, where discount rates presumably were much lower. This clearly supports the hypothesis that increases in profitability (or loss minimization) was the decisive factor in the promotion of workday credits by the GULAG management. If we

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[71] GARF. F. 9414. Op. 1. D. 334. L. 192.
[72] GARF. F. 9414. Op. 1. D. 202. LL. 56., 78.; D. 204. L. 19.

interpret the choice for or against the workday credit system as a trade-off between higher output and higher profitability, the camp managers throughout most of the covered period indeed chose profitability. The temporary abolition of workday credits in 1939 could be interpreted as an attempt to implement a new, more repressive strategy in order to combine both output and productivity targets in a context marked by an acute shortage of prisoners. In the long term, however, this attempt failed and the managers of the camp system returned to their previous strategy.

Nevertheless, although the argumentation presented in this paper has widely been buttressed by source evidence, it should also be pointed out to what extent it is based upon speculation. The main problem might be seen in the fact that we have been talking about the "camp system directors" without addressing the problem of a further fragmentation of power, responsibilities and, consequently, interests. Another problematic assumption is that GULAG policy must have had the approval of the political leadership. Indeed, several facts can be quoted in favor of this presumption, above all the direct links between the GULAG, one of the major *glavks* of the NKVD / MVD, and the state. However, it is likely that the GULAG, as any glavk, had its own interests.[73] Future research into the precise distribution of responsibilities, assigned and factual power within and around the structures that administered the Soviet camp system might clarify this point.

Furthermore, we must underscore the highly preliminary nature of our results and the small amount of research in this area. We have picked only one instrument in the GULAG's practice in managing forced labor. We are still far from providing a complete picture or even an order of priority of the determinants of the GULAG's actions. For addressing these issues, future research is needed. With regard to the large number of problems and the abundance of sources, answers will be probably a long time in coming.

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[73] For illustrative purposes only, let us demonstrate a situation with the GULAG managers having individualistic preferences, namely for complying with plan targets. Given such preferences, the GULAG managers might have speculated that a mid- and long-term decrease in prisoners resulting from the application of workday credits would have led to a downward adjustment of the amount of economic tasks and projects that would have to be carried out in subsequent periods. The resulting "foregone" output thus might have been considered problematic by the "dictator", but not by the GULAG directors, whose preference structure would have implicated them externalizing, i.e. ignoring this effect.

Nonetheless, one more conclusion can be made. In this paper we have also touched upon the issue of (microeconomic) profitability of forced labor. The story of workday credits – as well as the more general story of different types of incentives being utilized in Soviet prison camps [74] – appears also to be the history of a permanent struggle for productivity, which, although addressed throughout more than two decades, did not lead to a final solution of the fundamental economic problems, inherent in the exploitation of forced labor. It seems characteristic that if there were, though, some gradual successes in this area, they typically were achieved through the application of incentives, which, from an economic point of view, undermined the basic traits of forced labor. This conclusion refers both to workday credits – where well-performing prisoners prematurely were set free – and to the introduction of wages in late 1940s. While these measures did not imply that the general status of prisoners as such got blurred, they suggest that economically the concept of exploitation of forced labor, based on means of coercion alone, prove inferior to the usage of civilian workforce throughout the entire period of Stalinism.

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[74] See Borodkin / Ertz (2003)

V.   Appendix: Calculating the economic impact of workday credits

In this section of the paper we develop a simple model exhibiting the problematic nature underlying the usage of workday credits in the prison camp system with regard to the reaction of both output and profits. This model is intended to serve as an analytical tool for explaining our concrete research problem rather than to give emphasis to a possible generalization of this phenomenon. Therefore our assumptions will widely adopt the traits characteristic for the specific workday credit system implemented in the Soviet camps. The model will be used then to test four different camp managers' dispositions as described in section III: first we assume output maximization as the main target and analyze the decision problem for or against workday credits from a long-term planner's perspective with and without time preferences. Second we will consider the implications if we presuppose that the underlying strategy be achieving profit maximization instead (with the respective specifications).

V.I.   Output maximization without time preferences

Let us regard a simplified production function of a prison camp (which can also stand for the whole camp system), where total output is determined by the availability of a single production factor, labor, and the according factor productivity P:

(1.) $$Y = N \cdot P$$

where
Y = total output
N = number of prisoners
P = average labor productivity

Without any modifications, and without increases in either N or P, the output in this model would remain on a constant level, so that in the next step we have to make it suitable for a discussion of the problem of workday credits. In doing so we must respect the twofold impact this incentive would have on the output: on the one hand, workday credits would, if awarded, imply an increase in the level of productivity, whereas, on the other hand, they would, *ceteris paribus*, reduce the available labor resources through the shortening of the effective sentence of prisoners. Accordingly we have to specify the

expressions of both *N* and *P*. However, before proceeding, we will make some further assumptions. First, we state that prisoners enter the prison camp only by being arrested and subsequently being convicted to a certain sentence. For reasons of simplicity we will assume that all prisoners at all periods will receive the same punishment. So the duration of the sentence for all prisoners will be equal and exogenously given as T_0. Furthermore, we assume that the number of arrests is constant in any period. Our final assumption is that the only way for prisoners to leave the prison camp is through release by the end of their sentence. Thus we exclude the possibility of both mortality and escapes.[75]

N thus must depend on three factors: the numbers of arrests, the numbers of prisoners being released, and the average period of time prisoners are held in captivity. Under the above assumptions, we are able to respect all these determinants of *N* and nevertheless replace the latter by a simplified expression. First, we write the current number of prisoners at any period *t* as the difference between all arrests and all releases that have taken place in the past:

(2.) $$N_t = \sum_{i=0}^{t-1} A_i - \sum_{i=0}^{t-1} R_i \qquad \text{for any period } t = 0$$

with

A_i, R_i denoting the number of arrests/releases in any period *i*

From the above assumption of a standardized, constant term to which any prisoner is convicted we can derive that no prisoner will be in a prison camp longer than the exact duration of this term. On the grounds of this consideration we can modify equation (2.) as follows:

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[75] This assumption will appear extremely problematic against the background of the Stalinist prison camp system within which, as is generally known, significant mortality did incur. Furthermore, this assumption would represent another problem, consisting in the possibility of a camp management, which includes a high level of mortality in its calculations and pursuing the strategy to extract the maximum output from every prisoner in a short-term perspective. At a first glance such a behavior would seem likely if the average prisoner were not expected to survive the moment of his release, which also would imply that the receipt of workday credits had no real implications for him. Yet in the Soviet camp system such an approach seems not to be convincing, since many former prisoners' testimonies reveal that the highest empirical probability to die was given in the first year after the prisoner's committal to a camp and generally decreased throughout the following periods. Besides that, the far highest mortality in Stalinist camps was observed during the war period when the workday credit system officially was rescinded. During the late 1940s, when it was introduced again, the mortality approached a relatively low level.

$$(3.) \qquad N_t = \sum_{i=t-T_t}^{t-1} A_i$$

In this equation, we introduce a new expression T_t, representing, at a certain period t, the duration of the duration of the period the one prisoner who has been kept in the camp longer than any other inmate, thus being about to be released in the current period, has spent there. Hence it should be clear why, in equation (3.), we do not encounter any more expression depicting the number of releases: all prisoners who had been arrested prior to period $t - T_t$ have already been released prior to period t, whereas all prisoners arrested during the interval $(t - T_t \, ; \, t)$ will be released in future periods and currently still account for the prison camp's labor force. Remember that without any other influences, the value of T_t equals T_0 in any period. Recalling A_i being constant and normalizing it to 1 allows us to simplify this expression and to rewrite it as

$$(4.) \qquad N_t = T_t$$

Accordingly, we can rewrite equation (1.):

$$(5.) \qquad Y_t = T_t \cdot P_t$$

Having specified N, the value of P_t remains to be discussed. Since in the following we will accomplish comparative-static and dynamical analyses of Y, we will not be interested in receiving absolute values of Y_t, but only in calculating changes in its level. Therefore we shall define the initial, constant level of labor productivity as P_0. Now let us consider the introduction of workday credits for all prisoners of the given camp exhibiting an increased productivity P_{wc} (with $P_{wc} > P_0$), which will reduce the time effectively spend in detention by a factor q (with $1 > q > 0$). q accordingly equals the ratio of working days to the sum of working days and the number of workday credits granted. For the sake of simplicity the following specifications will be made: first we assume that the system offers just one alternative: either a prisoner meets the target of P_{wc} and gets his term reduced by the factor q, or he does not meet this requirement and does not receive any credit at all. Furthermore, since the workday credit system rewards prisoners meeting a precisely defined minimum standard, we assume that all prisoners willing and able to earn workday credits will show exactly the required productivity P_{wc},

but will refrain from making any effort to perform even better.[76] Finally, we assume that the system is really effectively working, i.e. all prisoners are responding to the incentive, developing a productivity of P_{wc} and accordingly receiving workday credits at all times. This assumption is not as strict as it might sound; it could be equally interpreted in such a way only the group of prisoners receiving workday credits will be considered, since for all other inmates nothing would change.

Having established the exact impact of the workday credit system in our model, we shall now examine the framework for our considerations on the preferences that stood behind the decision for or against such a system. With all prisoners taking advantage of a workday credit system from the beginning to the end of their detention, the value of T_t will be subject to a reduction by the factor q, so that in the long run $T_t = qT_0$. Consequently, the output in the long-term perspective would denote

(8.) $$Y_t^{wc} = qT_0 \cdot P_{wc}$$

and, with regard to output maximization, the question whether or not to opt for workday credits would depend on the values for q and P_{wc}. Thus, from the perspective of a long-term planner, who equally appreciates the output in all future periods, workday credits would be introduced if condition (9.) were fulfilled.

(9.) $$Y_t^{wc} = qT_0 \cdot P_{wc} > T_0 \cdot P_0 = Y_0$$

which yields

(10.) $$\frac{1}{q} < \frac{P_{wc}}{P_0}$$

The application of this formula to the data provided in Tab. 1 formally corroborates the findings formulated in section III: the inequation was not fulfilled by

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[76] This implies the assumption that prisoners are able to exactly estimate the yields of their efforts. Hereby we also exclude the possibility of prisoners being motivated by the perspective of getting workday credits but narrowly or temporarily failing to show the required productivity. Under this assumption prisoners in such cases would know in advance that they would not be able to meet the target and therefore abstain from any attempts to reach it. This is important since otherwise workday credits could serve as a stimulus, although the prisoners would not (always) be rewarded and thus the "price" the camp management would have to pay for an increase in productivity would be lower.

any of the empirical values of the scale applied in the Soviet camp system in late 1940s:

for all values listed the inequation instead denotes:[77] $\dfrac{1}{q} > \dfrac{P_{wc}}{P_0}$

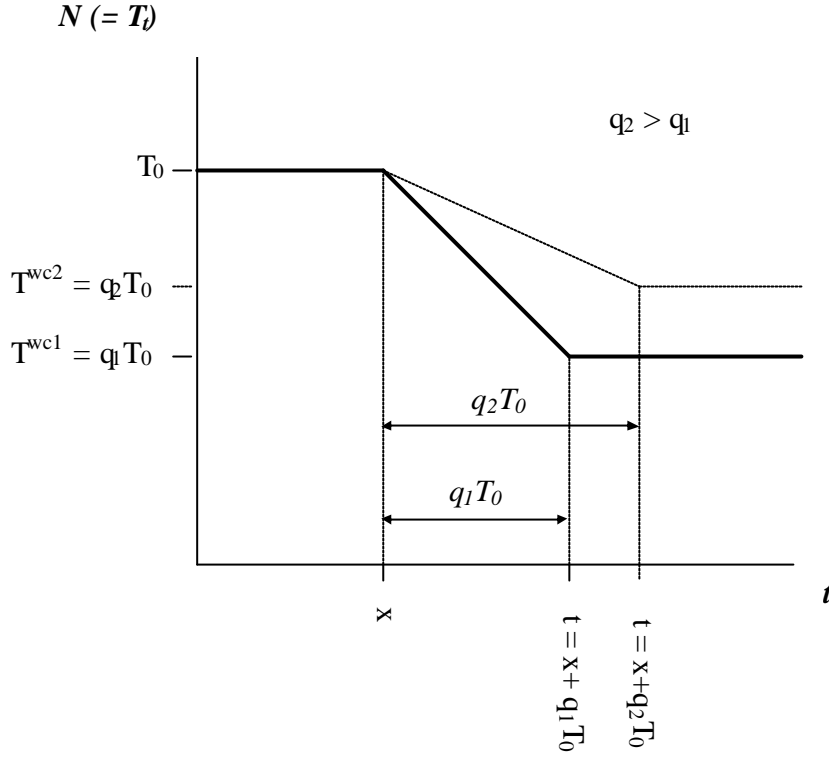## V.II. Output maximization with time preferences

As we have argued in section III already, after the introduction of workday credits the number of prisoners will decrease not immediately, but gradually during a finite number of periods. This effect can no longer remain disregarded if we turn to the discussion of the decision problem from the perspective of a planner with time preferences, who appreciates output produced in the nearer future at a higher rate. In our model, this effect implies a gradual decrease in the value of T_t, inflicted by a temporary increase in releases that will last until the last prisoner arrested prior to the introduction of workday credits will be released. Due to our assumptions of a constant inflow of prisoners with identical sentences, this decrease will be linear.[78] At the end of this period the permanent number of prisoners will have been reduced by the same factor by which the average term of confinement is actually reduced by the workday credit system, which means that no prisoner receiving workday credits will remain in the camp longer than qT_0. Interestingly, the duration of this period also equals qT_0, which implies that, the lower q (i.e. the higher the workday credits), the shorter this period will last and the sooner the full reducing effect will occur. So higher workday credits mean not only a more significant, but also a prompter reduction of labor resources (see Fig. 2).

Fig. 2:

Dynamics of the number of prisoners during the transitory period, following the introduction of workday credits (for two alternative values for q)

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[77] The same applies to scales with the requirements for workday credits in the 1930s. The main difference to those established in late 1940s was that the former were less sophisticated.

[78] This equally would apply under the assumption of a range of diverse sentences as long as the distribution of these would remain equal over time.

$N \, (= T_t)$

$q_2 > q_1$

T_0 —

$T^{wc2} = q_2 T_0$ ---

$T^{wc1} = q_1 T_0$ —

$q_2 T_0$

$q_1 T_0$

x

$t = x + q_1 T_0$

$t = x + q_2 T_0$

t

According to this effect and to our further assumptions we have to modify T_t for all periods in the wake of the implementation of workday credits in the following manner (x denotes the period in which the implementation will take place):

x = the period of implementation of workday credits

(11.) $\qquad N_t = T_t^{wc}$ $\qquad\qquad$ for all $t = x$, with:

$$T_t^{wc} = T_0 \left(q + (1-q) \frac{T_0 - \frac{1}{q}(t-x)}{T_0} \right) \quad \text{if} \quad t - x < qT_0 \quad \text{for all } t = x$$

$$T_t^{wc} = qT_0 \qquad\qquad\qquad \text{if} \quad t - x \geq qT_0$$

In this specification, the first term reflects the linear decrease of T_t over the transition period. Note that the term in brackets equals 1 in period $t = x$, i.e. at the very moment of the introduction of workday credits, whereas in any of the following periods

its value will be less than 1. Thus T_t^{wc} will be less than T_0 in any period after the introduction of workday credits (see also Fig. 1). As to the time preferences we intend to integrate in our analysis we will consider an agent (e.g. the manager of the camp system) with usual time preferences, represented by a discount factor d with $d = \dfrac{1}{1+r}$ and r depicting a certain discount rate with $0 = r$. In this case the agent would opt either for or against the introduction of workday credits depending on which of these two options would yield a higher value for the discounted future output stream. This can be denoted as follows (in the following the period of introduction of workday credits is given as x = *0*):

Without workday credits:

$$(12.) \qquad \sum_{t=0}^{\infty} d^t Y_t = \sum_{t=0}^{\infty} d^t T_0 P_0 = \frac{1}{1-d} T_0 P_0$$

With workday credits:

$$(13.) \qquad \sum_{t=0}^{\infty} d^t Y_t = \sum_{t=0}^{qT_0} d^t T_0 \left(q + (1-q)\frac{T_0 - \frac{1}{q}t}{T_0} \right) \cdot P_{wc} + \sum_{t=qT_0+1}^{\infty} d^t q T_0 P_{wc}$$

or, slightly converted:

$$(14.) \qquad \sum_{t=0}^{\infty} d^t Y_t = T_0 P_{wc} \left[\sum_{t=0}^{qT_0} d^t \left(q + (1-q)\frac{T_0 - \frac{1}{q}t}{T_0} \right) + q \frac{d^{qT_0+1}}{1-d} \right]$$

In order to determine the values of the parameters fulfilling the condition that the discounted future output flow with a workday credit system in place would represent a higher value than the discounted future output flow without, we juxtapose the expressions for those two values:

$$(15.) \qquad \frac{1}{1-d} P_0 < P_{wc} \left[\sum_{t=0}^{qT_0} d^t \left(q + (1-q)\frac{T_0 - \frac{1}{q}t}{T_0} \right) + q \frac{d^{qT_0+1}}{1-d} \right]$$

In inequation (15.), there are several parameters, which could be modified to turn this expression into a true one if it were not already fulfilled. In particular, an increase in q (i.e. the allotment of less generous workday credits) would increase the term on the right hand side. So would an increase in P_{wc}. Transferred into reality, this would lead us to the conclusion that less generous incentives alongside with stricter requirements for the prisoners being rewarded for their work would make a workday credit system more likely to lead to an increase in the value of the discounted output stream. However, this statement appears problematic: under the assumption of perfect information, a camp manager considering the introduction of a workday credit system would choose the optimal combination of P_{wc} and q from the very beginning, presumably with high values for both variables, in order to achieve the highest possible profitability for the lowest possible price. So there are plausible reasons for us to take both these values as determined by exogenous parameters. In such a case, the only remaining variable on which his decision could depend is his discount factor d. Specifically there will be a critical discount factor below which it would be optimal to opt for the introduction of workday credits.

V.III. Profit maximization without time preferences

In order to change our focus from output to profit maximization we modify our framework by assuming that there are costs incurring when using forced labor, namely constant per-unit costs, i.e. constant marginal costs.[79] This would imply the following modifications in our model, in which we now examine profits Π instead of output Y:

$$(16.) \qquad \Pi = Y - C = N(P - C)$$

or, according to the steps from equation (1.) to equation (5.):

$$(17.) \qquad \Pi_t = T_t(P_t - C)$$

Asking for the optimal choice – opting for or against the introduction of workday credits in a long-term perspective –, under the assumption that the short-term effects occurring during the transition period are ignored, we can denote instead of equation (9.):

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[79] This assumption is formulated in correspondence with the conditions in the Soviet camp system (see above).

(18.) $$\Pi_t^{wc} = qT_0 \cdot (P_{wc} - C) > T_0 \cdot (P_0 - C) = \Pi_0$$

which leads us to:

(19.) $$\frac{1}{q} < \frac{P_{wc} - C}{P_0 - C}$$

(for all $P_0 > C$, which implies that $P_{wc} > C$ is equally fulfilled)

Assuming both P_{wc} and $P_0 > C$,[80] the ratio on the right hand side in inequation (19.) is greater than that in equation (9.) for any value for $C > 0$. Therefore we can discern that the value of q could be lower than in inequation (9.) and still lead to a true expression. This means that if there are positive labor costs incurring, calculating with regard to profits instead of output makes workday credit systems in general appear more attractive from the camp manager's perspective.

V.IV. Profit maximization with time preferences

Finally we transfer the cost issue to the case in which time preferences affect the camp manager's decision. Inequation (15.) now reads as follows:

(20.) $$\frac{1}{1-d}(P_0 - C) < (P_{wc} - C)\left[\sum_{t=0}^{qT_0} d^t \left(q + (1-q)\frac{T_0 - \frac{1}{q}t}{T_0}\right) + q\frac{d^{qT_0+1}}{1-d}\right]$$

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[80] If either the nominator, or the denominator, or both of them in the fraction in inequation (19.) were negative, the inequation sign would be inverse: $\frac{1}{q} > \frac{P_{wc} - C}{P_0 - C}$. Specifically, if $P_{wc} > C > P_0$, the term on the right hand side would be negative and the inequation would be fulfilled for any value of q: the camp manager would be willing to pay every price for a workday credit system that would enable him to turn losses into profits. If $P_0, P_{wc} < C$, the term would be positive. In this case the bigger the (according to our assumptions: positive) difference $(P_{wc} - P_0)$, the higher the possible values for q for which the term would be true. This can intuitively be interpreted in such a way that if a camp manager interested only in profitability would face losses both with and without using workday credits, he would endeavor to minimize losses. Releasing prisoners quicker would constitute a possibility to avoid incurring losses. However, if the losses shrank with an increase in productivity caused by workday credits, his inclination to release prisoners as soon as possible would also decrease.

The results are similar: as the only modification consists in replacing P_0 by $(P_0 - C)$ and, respectively, P_{wc} by $(P_{wc} - C)$, we can argue that, since the ratio $(P_{wc} - C) / (P_0 - C)$ for positive values of C is greater than the ratio P_{wc} / P_0,[81] the maximization of profits instead of output makes it more likely to opt for workday credits in this case, too. We could also assume a case in which $(P_0 - C) < 0$ while $(P_{WC} - C) > 0$, i.e. in which the labor productivity of the prisoners without motivation through the workday credit system is lower than the factor price, whereas the introduction of workday credits raises the productivity above the threshold of profitability. In this case the term on the inequation's left side would be negative and the term on the right hand side would be positive for all possible values of $d > 0$ and $q > 0$, i.e. the camp manager would strictly prefer to introduce *any* workday credit system, whatever his time preferences would be.

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[81] Given P_{wc}, $P_0 > C$. For all other cases: see discussion in the previous footnote.

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