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THE AFTERMATH OF THE FIRST MITHRIDATIC WAR AND SULLA'S DICTATORSHIP – SOME PRELIMINARY HISTORICAL ANALYSES USING THE 'ROMAN REPUBLICAN DIE PROJECT'

***Abstract** – This paper is based on Richard Schaefer's archive of Roman republican coin images organized by Crawford number and die. The archive has been digitized by the American Numismatic Society (ANS) and is being released through Archer, the ANS's archival database and linked to CRRO (Coinage of the Roman Republic Online). The authors of this paper co-direct the Roman Republican Die Project (RRDP) at the ANS, which aims to make Schaefer's work publicly available and further develop his analyses. Schaefer's archive and die analyses provide our best data to date for quantifying the size of Roman republican coin issues and testing existing models for extrapolating the total number of original dies from the number of observed dies. The paper briefly introduces Schaefer's work and the partnership with the ANS to make this work publicly available before demonstrating the potential of the data in two sections focused on different problems of quantification. Section one investigates how we might find a baseline for the quantification of Roman republican issues and present estimates for the size of annual issues for years in which the identity of the college of moneyers is known (RRC 283-285, 299, 335, 350a, and RRC 360-363) or strongly presumed (RRC 382-384). Section two demonstrates how RRDP data (RRC 359/2, 367/1, 3, and 5) can be combined with our existing knowledge of Athenian New Style tetradrachms and cistophoric production in Asia after Dardanus, as well as literary testimony, in order to meaningfully quantify the scale of Sulla's resources for his reconquest of Italy.*

Introduction: Schaefer's archive and the Roman Republican Die Project

> "The practical problem is that counting all the dies used to strike during the [Roman] Republic would be the work of several lifetimes."
>
> M.H. Crawford, *Roman Republican Coinage*, p. 641

In 1974 M.H. CRAWFORD authoritatively stated the virtual impracticability of comprehensive die studies encompassing the whole Roman Republican monetary production. However, about twenty-five years ago, Richard 'Dick' Schaefer began to collect systematically images of all struck Roman Republican issues included in Crawford's *Roman Republican Coinage*. While no precise final count is available yet, it is estimated that Schaefer has docu-

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mented and analyzed some 300,000 specimens in the 'Roman Republican Die Project' (RRDP). His archive thus proves that it is indeed possible, even if extremely challenging, to create reliable quantitative data for the monetary production of the Roman Republic.

In early 2019 the ANS partnered Richard Schaefer in the Roman Republican Die Project, aiming at making available to the public what is likely to be the largest die study ever undertaken. [1] The first part of this project, supervised by the authors of this article, consisted of the digital preservation of Schaefer's archive. A specialized archivist scanned the images preserved in binders (14 binders with estimated 200 pages per binder), and photographed the 105,700 loose coin images, while preserving the original sequence. This first phase was completed in July 2019. [2]

Fig. 1 – Richard Schaefer's working station

For each issue of struck coins, Schaefer determined the die links for either obverse or reverse. Schaefer's notations on each clipping record the image source, as well as any and all information in the source such as weight, axis, diameter, and his assigned die identifier (a number or a letter). [3]

[1] Carbone & Yarrow 2019.

[2] http://numismatics.org/RRDP/

[3] For the specifics of Schaefer's collecting methods see Carbone & Yarrow 2019, p. 7-10.

Fig. 2 – A page from Richard Schaefer's binders. The specimens here collected are part of RRC *426/3, one of the issues of 56* BCE *under the name of Faustus Cornelius Sulla, son of the dictator*

The second part of the project aimed at the digital publication of Schaefer's archive on the ANS archival platform, Archer, and linked to ANS *Coinage of the Roman Republic Online* (*CRRO*).[4] As of July 2020, the binders, the largest part of Schaefer's archive, are online and available to the academic community.[5] The rest of the images will be digitized by the end of this summer.[6] The third phase will focus on linking each Crawford type and subtype included in the RRDP database to the *CRRO*.[7] This will allow all users to visually confirm observed die links and develop die counts through the images themselves.

As we, the authors of this article and co-directors of RRDP, consider how best to utilize and augment this dataset, ideally with the assistance of a larger research team supported through grants, we undertook the following preliminary studies as a means of demonstrating in concrete terms the potential and the challenges of utilizing Schaefer's archive in its present digital form to generate new historical evidence.

[4] Archer: http://numismatics.org/archives/. *CRRO*: http://numismatics.org/CRRO/

[5] http://numismatics.org/archives/ark:/53695/schaefer.RRDP.b01

[6] http://numismatics.org/archives/

[7] http://numismatics.org/CRRO/

In particular, this paper applies Esty's widely used models for estimating the original size of an issue based on the observed number of dies to the data from RRDP. [8] Esty's concept of coverage helps to bypass the problem of a high number of singletons, as definition, he says, the missing dies (implied by the high value for singletons) are also the ones which were poorly employed. To date Buttrey's die-study of the *denarii* of P. Crepusius numbered the reverse dies of this issue up to 519 and it has been a critical primary test of the accuracy of any of the proposed methods. Section one below revisits Crepusius and other numbered issues to show both the strengths and limitations of Esty's models. [9]

The output of a single obverse die, *i.e.* how many coins could be produced by each obverse die, has been a very heatedly debated issue for numismatists and economic historians. If a fixed number of coins could be expected to have been produced from a certain die, then an almost exact quantification of monetary production could be made possible. In the 1990s, two strong voices emerged in numismatic scholarship on the subject of the calculation of ancient coin production, Buttrey and Callataÿ; the former holding to a basically pessimistic position on the speculative nature of such quantification, the latter being more optimistic, arguing that the level of uncertainties is not high enough not to take advantage of that unique kind of evidence. [10] These debates culminated in two conferences with corresponding published proceedings just over a decade apart. [11] The forcefulness of the voices in the debate

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[8] Esty 2006 and 2011. In the specific, Esty's method allows to estimate, based on the number of dies observed in a sample, the number of dies probably missing in that sample, not in the complete issue, and this under two conditions:
1) that the sample may be considered as being an unbiased sample of the coins originally produced; see Esty 2011, p. 56 for his comments on the non-randomness of any modern sample, either museum collections or hoards, and his recommendation that where necessary data be appropriately smoothed to remove likely abnormalities. Moens 2017 considers the non-random nature of most hoards and the implications for the use of Esty.
2) that the output of the dies followed a purely exponential distribution, as compared to distributions used by other authors/models who/that suppose e.g. an identical output for the dies, or an output following a 'normal' (Gaussian) distribution.

The authors consider the archive of specimens assembled by R. Schaefer to be as unbiased as possible a sample of the monetary circulation at the time. It cannot be considered truly random as human agency and judgement is reflected in the choice to memorialize the specimens through photography, be that for the purpose of sale, documenting a museum collection, or scholarly. For 2. see following pages.

[9] For the limitations of Esty's model see Moens 2017, who compellingly shows the necessity of improving Esty's model by working with an exponential distribution but with the longest lifetime limited to a realistic maximum, a so-called 'truncated' exponential distribution. This emended method could explain some apparent abnormalities in the issues analyzed in the next pages.

[10] Buttrey 1993, 1994 and 2011. Callataÿ 1995 and 2011a. For the most recent overview on the state of the matter see Callataÿ *forthcoming*.

[11] A special journal issue *Annali dell'Istituto Italiano di Numismatica* 1997 and Callataÿ 2011a.

has led many to a conservative 'wait and see' perspective on using numismatic quan-tification in historical studies. Others, while optimistic, see the problem as one of processing a large enough amount of data to produce meaningful results. [12] RRDP's scale and completeness directly addresses this last point.

The most important take-away from the current state of the debate is that we know far more than we did forty years ago, and that we are likely to have even better data in the years to come, especially thanks to Schaefer and RRDP. Based on new data, Esty has revised and improved the available formulas for estimating the original number of dies, and as further studies are produced the validity of our models will continue to be tested. [13] It is very telling that Buttrey's contribution to the most recent conference was primarily a rebuttal of the assumptions behind Crawford's approach from the 1970s, not of the present state of scholarship. He is absolutely correct to highlight the danger of enshrining any one such estimation as a new historical truth. Likewise, as with many data sets, non-randomness can make the evidence look more reliable than it is, say if there are far more of one die represented because of its over-representation in a particular hoard find. Esty himself has regularly advocated for the thoughtful review of the raw data and the application of data smoothing when necessary. He also recommends that die estimates be reported alongside the 95% confidence interval – the smaller the interval, the more likely the estimate is reliable. Readers of our results need a robust measure by which to judge the evidence they are being presented.

There is always an onus on the historian to interrogate the logic behind any such estimate before integrating it into any new hypothesis. At the same time, M. Bloch famously warned that 'rationally concluded, doubt could become an instrument of knowledge'. [14] Thus, it is in this spirit that the authors undertook the following study. We aimed at providing the readers with the largest amounts of data made available to us by the RRDP archive, while admitting that a limited amount of doubt in one' s own research methodology allows for further advancement.

Our approach here is two-fold.

First, we considered the need for a comparative approach in any quantification of ancient coin production. When we estimate the absolute scale of an issue that we believe was struck for a specific historical purpose, that *absolute* estimate rarely has a precision that readily allows its further use in economic studies. Ideally, we will continue to test and refine our tools for generating such an absolute estimate, but in the *interim* comparative evidence is key to contextualizing such estimates. We can have a much higher degree of confidence when we assert that one issue or a group of issues was likely to be so much bigger or smaller than other specific known issues. The comparative

[12] Howgego 2009.

[13] Esty 2011.

[14] Bloch 1963, p. 36.

approach to such estimates allows the refinement of our understanding of mint outputs and their relationship to historical events that is not harmed by potentially inaccurate assumptions about unknown factors such as the number of coins likely struck by an ancient die.

To this end, the first section of this paper reviews the colleges of moneyers that could be most productively used for such comparisons, the limitations of the present state of RRDP research, and then treats the issues traditionally assigned to 79 BCE in detail, with an eye to how their control mark systems can help us potentially test and refine our existing models for die estimates, similar to how the Crepusius issue (*RRC* 361/1) has been used in light of Buttrey's detailed die study.

The second section integrates the data collected by R. Schaefer for *RRC* 359/2 and *RRC* 367 to revisit the scale of these two Sullan issues in contrast to Crawford's proposed estimates, but also in light of what we know from other studies about Sullan issues at Athens and cistophoric production in Asia, as well as the available literary sources. This allows us to see historical production beyond a single mint and begin to understand better the scale of the striking necessary to fund Sulla's march on Rome. This study particularly illustrates the benefit of expanding the coverage of RRDP in the future.

1. Finding a Baseline: What would a 'normal' issue look like?

There is a total of seven colleges of moneyers for which the legends on the coins themselves confirm the identities of the three members. In these seven cases we know that, when taken together, the coins signed by those moneyers likely represent all the coinage struck in a given year. Table 1 summarizes the issues in question, the moneyers and likely year of issue, as well as a summary of Crawford's dies estimates as compared with new observations and estimates based on RRDP data.

RRDP does not have robust coverage for the first four of these issues. This does not mean we cannot generate estimates of the possible number of original dies from the number of observed dies but rather than the 95% confidence interval becomes exceptionally broad, and thus the numbers represent a very approximate range that can be narrowed through further die analysis. In Table 2 the approximate issue size is calculated assuming an average of 15,000 coins per reverse die – a number that is approximate at best but likely within the range of plausibility. [15] The die counts presented reflect Schaefer's analyses as observed and confirmed by the authors. [16] Notice that for issues with lower coverage, especially *RRC* 284 and 299, the approximate size of the issue is a very wide range indeed.

[15] de Callataÿ 2011b, p. 13 and Faucher *et al.* 2009.

[16] On rare occasions we have supplemented Schaefer's analyses with additional observations from specimens not in RRDP, and even more rarely we have corrected for the purposes of these die counts any instances where a photograph labeling in RRDP might be misleading.

RRC Type	Moneyers	Year (BCE)	*RRC* Die Estimates	Observed in RRDP	Estimated using Esty
283	Q. Mar[?], C. F[?], and L. R[?] [17]	118 or 117	45 obv., 56 rev.	65 rev.	124-252 rev.
284	M. Calidius, Q. Caecilius Metellus [?], Cn. Fulvius [18]	117 or 116	170 obv., 213 rev.	142 rev.	345-619 rev.
285	Cn. Domitius, Q. Curtius, M. Silanus	*c.* 112-111 (?) [19]	250 obv., 312 rev.	Similar to Crawford, Cf. Table 3	
299	Ap. Claudius, T. Mal[?], Q. Urbinius	*c.* 102-101 (?) [20]	727 obv., 909 rev.	303 rev.	860-1,327 rev.
335	C. Publicius Malleolus (q. 80), A. Postumius Albinus, L. Metellus (pr. 71)	"late 90s" [21]	343 obv., 428 rev.	297 rev.	403-454 rev.
350a	[C.] Gar[gonius], [M.] Ver[gilius], [?]. Ogul[nius]	86	456 obv., 507 rev.	Cf. Table 4	
360-363	P. Crepusius, C. Mamilius Limetanus, L. Marcus Censorinus	82 (before 1 Nov.)	636 obv., 697 rev.	Much more than Crawford, Cf. Table 5	

Table 1 – Issues where the composition of the annual college of moneyers is certain

Fig. 3 – RRC 283/1b – 3.92 g – 20 mm (BnF REP-14245)

Fig. 4 – RRC 284/1b – 3.93 g – 18 mm (ANS 1947.2.23)

[17] The first is possibly son of Q. Marcius Rex, cos. 118 and father of cos. 68; and I might speculate the Gaius could be Fannus as the family was politically active at the time; Broughton thought the Lucius was likely to be a Roscius.

[18] Q. Caecilius Metellus may be a son or other close relative of L. Caecilius Q. f. Q. n. Metellus Diadematus; see *RRC* for other speculations on his identity; the other two men are otherwise unattested.

[19] Lockyear 2018 has shown that this issue is later in the sequence of issues than previously thought (*c.* 116-115, Crawford; 114, Mattingly 2004, p. 208). The need to rethink dating of these issues also necessitates revisiting any prosopographical considerations of the moneyers.

[20] *Ibid.*; previously assigned to 111 or 110 by Crawford, and 105 by Mattingly 2004, p. 206.

[21] So Crawford. Mattingly 2004, p. 206 proposes 91 BCE; *CRRO* (at the time of writing) has a transcription error recording the date as 96 BCE or 99-96 BCE.

Fig. 5 – RRC 285/1 – 3.86 g – 19.5 mm (ANS 2002.46.87)

Fig. 6 – RRC 299/1a 3 – 77 g – 18.2 mm (ANS 1948.19.38)

Fig. 7 – RRC 335/1a – 3.87 g – 20 mm (BnF REP-6102)

However, even if one remains skeptical about these estimates in absolute terms, they still maintain an important value for comparative purposes. Regardless of the low coverage, we can be confident that *RRC* 283 is likely half the size of *RRC* 284. Methodologically, identifying historically significant issues with less robust coverage in RRDP guide targeted expansion. Schaefer's personal archive also includes an (as yet) undigitized vast set of photo images sorted by type but not yet integrated into the die analyses. Knowing which issues hold the greatest promise for expanding our historical understanding will let us work most productively with Schaefer on future digitization efforts.

When organizing photographs of specimens by die, Schaefer's approach was to prioritize one die over the other. The choice of obverse and reverse was made based on which would prove most efficient for die identification based on characteristics of the design. In many, if not most, cases this means the reverse is more fully analyzed than the obverse in RRDP. Numismatists have long been aware that reverse die has a shorter life span than the obverse die because the die used as the punch (*i.e.* the reverse) receives the full force of the striking blow, only a portion of which is transmitted to the die embedded in the anvil (*i.e.* the obverse). If both dies are used to the point of failure, one obverse die might survive to be used with 3, 4 or more reverses. Most numismatists have tended to use the obverse die as the dominant die when attempting to use dies studies to estimate production – fewer dies to count, and a better proxy (we assume) for the number of coins originally produced because (we assume) they are less likely to erratically fail. Yet, we know that many mints, including the mint at Rome in the republican period, rarely used dies to failure and in some cases created die pairs suggesting an ideal ratio of one reverse die to every obverse die. Crawford's estimates for numbers of obverse and reverse dies for the issues listed in Table 1 above assume that the Roman mint in this period was using between 10 and 20% more reverse dies than obverse dies.

RRC Type	Coins in RRDP	Rev. dies in RRDP	of which singletons [22]	Esty die estimates and 95% confidence intervals	Esty coverage rate (%)	Approx. [23] issue size (in million)	approx. date (BCE)
283	103	65	42	176 [124-252]	59	2-4	118 or 117
284	205	142	105	462 [345-619]	49	5-9	117 or 116
285	*See table 3*				56, 63	10-16	*c.* 112-111 (?)
299	423	303	228	1,068 [860-1,327]	46	13-20	*c.* 102-101 (?)
335	972	297	118	428 [403-454]	88	6-7	"late 90s"
350a	*See table 4*				97, 12 (!)	22-98 (?)	86
360-363	*See table 5*				97, 98, 97, 61	32-45	82 (before 1 Nov.)

Table 2 – Summary of estimates of original number of dies and coverage rates using Esty's formulae and RRDP data for annual issues where the college of moneyers is certain

Table 2 brings together what we can say at present about the production of seven different colleges of Roman moneyers, but it is in the finer grained details that we learn more about the work ahead for using and expanding RRDP. Tables 3-5 are all intended to help complicate the picture by breaking down the data by the individual types within each issue. Table 3 illustrates the results based on Schaefer's analysis of the reverse die for *RRC* 385/1 and the obverse die for *RRC* 385/2. We would assume that each die counted for *RRC* 385/2 will have struck more coins than each of the individual dies counted here for *RRC* 385/1. For both types the coverage is far lower than ideal for the purposes of statistical analysis. This issue would thus be a good candidate for expansion, not only to increase coverage, but also to attempt to establish the ratio of obverse to reverse dies used. As Table 1 helps us begin to see, Crawford's estimates are sometimes very close to what we observe in RRDP, but are perhaps equally often far too low. This issue has already been discussed in our previous publication with regard to other issues, and is expanded upon in part two of this article. [24]

[22] Singletons are dies observed from only one specimen.

[23] Assuming 15,000 coins per reverse die.

[24] See Carbone & Yarrow 2019, esp. pp. 15 (*RRC* 282) and 19 with Table 8 (*RRC* 426, 424, and 430).

RRC Type	Coins in RRDP	Rev. dies in RRDP	of which singletons	Esty die estimates and 95% intervals	Esty coverage rate (%)	*RRC* die estimates
285/1 – CN. DOMI	167	113 (rev.)	74	349 [256-478]	56	81 (rev.)
285/2 – Q. CVRT M.SILA	259	160 (obv.)	97	419 [336-523]	63	185 (obv.)

Table 3 – Die estimates and coverage rates calculated using Esty's formulae and RRDP data for RRC 285 denarii.

RRC Type	Coins in RRDP	Dies in RRDP	of which singletons	Esty die estimates and 95% intervals	Esty coverage rate (%)	*RRC* die estimates
350/1a-d with control mark	326	45 (rev.)	11	52 [49-56]	97%	33 (rev.)
350/2 without control marks	149	140 (obv.)	131	2,318 [1,167-5,404]	12%(!)	456 (obv.)

Table 4 – Die estimates and coverage rates calculated using Esty's formulae and RRDP data for RRC 350a denarii; Note: estimates for RRC 350a/2 are basically meaningless given the low coverage – they are only included to demonstrate the limited state of our present knowledge.

RRC Type	Coins in RRDP	Dies in RRDP	of which singletons	Esty die estimates and 95% intervals	Esty coverage rate (%)	*RRC* die estimates
360/1a-b	666	124 (rev.)	19	152 [147-161]	97%	62 (rev.)
361/1a-c	3,365	437 (rev.)	73	502 [493-512]	98%	296 (rev.) – not estimated, but observed!
	Cf. Table 9					
362/1	1,291	204 (obv.)	34	242 [234-251]	97%	100 (obv.)
363/1a-c with control marks	178	19	1	20 [21-23]	99%	21 (obv.)
363/1d without control marks	400	306	219	1,302 [1,012-1,677]	45%	197 (obv.)

Table 5 – Die estimates and coverage rates calculated using Esty's formulae and RRDP data for issues with the college of moneyers traditionally dated to 82 BCE, as well as data from Debernardi et al. 2018, table 17 for RRC 363.

Fig. 8 – RRC 350a/1a – 3.95 g (ANS 1944.100.968)

Fig. 9 – RRC 350a/2 – 3.74 g (ANS 1899.40.2)

Fig. 10 – RRC 360/1b – 3.7 g (ANS 1896.7.6)

Fig. 11 – RRC 361/1c – 4.01 g (ANS 1944.100.557)

Fig. 12 – RRC 362/1 – 3.71 g (ANS 1937.158.1)

Fig. 13 – RRC 363/1d – 3.78 g (ANS 1948.19.113)

The main reason that certain issues have exceptionally high coverage is because of Schaefer's particular interest in issues where control marks were typically limited to one die for each control mark (ODEC) and the vast potential such issues have for helping us understand the production of the Roman mint; he conceived of ODEC as the most critical subset of RRDP and focused his attentions on achieving the highest coverage possible for these issues. The next set of tables is designed to illustrate how Schaefer's work improved upon the observations of Crawford and other scholars and how it gives us new data for interrogating the efficacy of Esty's formulae for estimating the original number of dies.

The Cinnan era issue typically assigned to 86 BCE (*RRC* 350a) only has control marks on a small portion of the issue, Crawford's 1a-e (cf. Table 4 above). Crawford created subtypes (a-e) for each of the different reverse letter configuration and noted that within each 'subtype' each control letter mark seemed to correspond to just one die. Crawford knew of a total of 29 dies; Schaefer has added 16 new dies. Crawford never assumed that each subtype was issued with all of the letters, an unlikely possibility given that Esty's formulae suggest that there should have been originally somewhere between 49 and 56 dies used to issue these coins. If Esty's formulae are accurate for this data set (and the data set is itself sufficiently representative), we are missing between 4 and 11 more dies. Looking at Table 6, no pattern seems evident with the appearance of letters on the different subtypes and it seems likely the subtypes are a red herring in our understanding of the organization of this issue. Consider that subtype

1d is only known from three dies, one with an 'O' control mark and the other two are only known from specimens where the letter is not visible. This seems like a meaningless variation not an intentional 'subtype' guiding the organization of the issue. We usually assume that when dies have letters that they were used in alphabetical order, but of course this does not need to necessarily be true. [25] The letter 'I' appears on four different dies, the letters 'D', '', and 'O' all appear on three different dies, but on average letters appear twice, both 'A' and 'L' appear within the same subtype. A reasonable hypothesis is that the die engraver(s) worked through the alphabet at least twice and began a third series. The fourth appearance of 'I' would be a duplication error in one of the sequences.

control letter	*Crawford Sub-Type*				
	1a	1b	1c	1d	1e
A		✓			
B		✓			✓
C			✓		✓
D	✓	✓	✓		
E	✓				✓
F	✓		✓		
G	✓		✓		
H	✓				✓
I	✓	✓	✓		✓
K					✓
L			✓		✓
M	✓	✓	✓		
N		✓			✓
O			✓	✓	✓
P	✓				
Q			✓		
R		✓			✓
S					✓
T	✓				
V			✓		✓
X			✓		
COUNT	**9**	**7**	**11**	**1**	**12**

Table 6 – Control letters attested in RRDP for RRC 350a by Crawford subtype

[25] Cf. *RRC* 384/1 discussed in detail below, as well as *RRC* 413/1.

How the Roman mint used control marks varied significantly from issue to issue.[26] The timeline in Table 7 summarizes by year which issues used (at least in part) control marks.[27] Issue numbers marked * indicate that apparently only one control mark was used per die, and represent 57% of all control marked issues; issue numbers marked ** indicate that obverse and reverse control marks are coordinated one with the other in some meaningful way, which is the case for only 17% of the issues. 'L' indicates the use in a given year of letters as control marks – of all 65 issues in this period, 75% use letters, 'S' indicates the use of symbols and 'N' the use of numbers. Although symbols are used in 100 BCE, most issues with symbols and all issues using number date to 92 BCE or later. After 81 BCE numbers are more popular than letters. Control marks fall out of use after 57 BCE. They never appear on all issues of the coinage and the variability of their application means that they cannot have easily fulfilled any one single purpose. We are inclined to see them as a visible indication of the care and oversight provided by the moneyer – a means of advertising diligent discharge of a duty. This view is in line with the conclusions drawn by de Callataÿ in his work on control marks on Hellenistic royal coinages. The various systems also make clear that the mint *could* track dies, but found no practical reason to do so on a consistent basis. In essence, control marks are a fashion, and a fashion that correlates strongly to eras of social unrest. As de Callataÿ has argued for Hellenistic coinages, the absence of control marks correlates to a stable administration rather than to a more rudimentary administrative system. 104-96 BCE is the period in which Marius and tribunes such as Saturninus were disrupting traditional Roman politics. The years 92-75 BCE cover the period of the Social War, the Cinnan years, as well as Sulla's dictatorship and its aftermath.[28]

This context matters when we attempt to understand what we see in the RRDP data for *RRC* 350a (Tables 5-6 above). The mint had struck coins with control marks regularly through the Social War period, but not in a way that obviously controlled the individual dies. In the aftermath of that war, C. Marcius Censorinus became the first in nearly a decade to produce a coinage with the intention of ensuring one control mark per die (*RRC* 348, likely 88 BCE). His system was a complex one involving two different symbols on many dies

[26] A thorough survey of the phenomenon and exploration of possible function can be found in Witschonke 2012 with references to earlier scholarship. He hypothesized that the control marks may have been intended to make it possible to trace a coin back to specific mint workers and perhaps specific batches of bullion.

[27] Dates assigned to issues derive from Hersh & Walker 1984, Hollstein 1990, Mattingly 2004, and Lockyear 2007 and 2018.

[28] There is temporal correlation between the fashion for control marks and the fashion for serration, another labor intensive and outwardly visible indication of the moneyers' concern to regulate the coinage, as well as literary testimony regarding anxiety over the coinage (*e.g.* Cicero, *On Duties* 3.80; Julius Paullus, *Opinions* 5.25.1); fuller discussion forthcoming in Yarrow 2020, section 1.2.2.3, with fig. 1.40.

and involving numbers, letters, and symbols. (One cannot imagine the mint workers were thrilled with that extra labor of tracking all this!) The next year (again dates are likely, rather than certain), the (presumed) brothers, Gaius and Lucius Memmius (*RRC* 349) followed suit with control marks restricted to a single die, but abandoned the complexity and opted for a letter system similar to those regularly in use in the pre-96 BCE period; this choice may have been influenced by the experience of their (presumed) father, Lucius Memmius the elder, a moneyer who used a letter control mark system in *c.* 103 BCE (*RRC* 313). These were followed by the issue(s) of Gar[gonius?], Ogul[nius?], and Ver[ginius?]. Their *denarii* seem to start with a very careful letter system before abandoning control marks in favor of swifter, more intensive striking. The rapidity of production is reflected in how haphazard the oak wreath on the obverse die is rendered. This is the final college to issue the *semis*, *triens* or *quadrans*. The sextans had not been issued (it seems) since *c.* 91 BCE and the *uncia* had been out of production since *c.* 101 BCE. Completing the die counts for *RRC* 350a/2, while a daunting task, would provide key information, about the true scale of economic resources available to the Cinnan regime.

YEAR	*RRC* REFERENCES (* = one mark per die, ** = coordinated marks on obverse and reverse, *** = both * and **)						CONTROL MARKS (L = letters, N = numbers, S = symbols)		
112	290*						L		
111									
110									
109	297*						L		
108									
107									
106									
105									
104	307*						L		
103	311*	313*	312				L		
102	314	316					L		
101	317	325	318*				L		
100	330	321**	320***				L		S
99	331***	322*					L		
98	329***	332*					L		
97	326*						L		
96	327**						L		
95									
94									
93									
92	336**						L		S
91	337						L	N	S

90	341	342**	343				L	N	S
89	343	344					L	N	S
88	346*						L	N	S
87	349*						L		
86	350a*						L		
85	352						L	N	S
84	354*	364					L		
83	357*	358					L	N	
82	360*	361*	363*	365*	367	362	L	N	S
81	366*	378***	376	377	373		L	N	S
80									
79	383*	384***	382					N	S
78	385						L		S
77	388*							N	
76	390*							N	
75	391*	392*					L	N	
74									
73									
72									
71	396							N	
70	398*	395*	400**				L	N	S
69	399**						L		S
68									
67	409*								
66									
65									
64									
63									
62									
61	408*							N	S
60	413						L		
59	412***								
58									
57	405*						L		S
56									
55									
54									
53									

Table 7 – Crawford issues with control marks arranged by year, 112-53 BCE

While our understanding of *RRC* 350a remains limited for now, RRDP has put us on much better footing for considering the last Cinnan college of moneyers, P. Crepusius, C. Mamilius Limetanus, and L. Marcus Censorinus (*RRC* 360-363). This college of moneyers has received significant recent treatment by a team of numismatists led by Pierluigi Debernardi with a special focus on *RRC* 363/1a-c. [29] They rightly observe that the massive fire on the Capitoline on 6 July 83 BCE likely disrupted mint operations. [30] Whether this college should be reassigned to this year and their experimentations in the application of control marks inspired by this stress must remain an open question. [31]

They struck one issue jointly as well as an issue each in their own names. All four issues use different control mark systems. This in and of itself shows us that this system, like the type designs, was the 'creation' of the moneyer – typically a young man from a well-to-do family attempting to climb onto the *cursus honorum*. For the joint issue, by far the smallest of the four issues for which they used a simple numbering system of Roman numerals, of the numbers I through CLI, only 23 numbers are missing (Table 8); Esty's formulae estimate that we are missing approximately 28 dies with a 95% confidence interval of the number of missing dies falling between 21 and 37 (Table 5). That the number we would 'expect' to be missing based on the control marks *in this instance* falls within that predicted by Esty's 95% confidence interval increases our confidence that Esty's models are applicable to our data in meaningful ways. However, as we shall see, this is not always the case.

I (1)	VII (7)	X (10)	XIII (13)	XXII (22)	XXVIII (28)
XXXIIII (34)	XXXXVII (47)	XXXXVIII (48)	LI (51)	LXX (70)	LXXI (71)
LXXXXIII (93)	LXXXXIIII (94)	LXXXXVII (97)	LXXXXVIII (98)	LXXXXVIII (99)	CXXI (121)
CXXXI (131)	CXXXVI (136)	CXXXVIII (138)	CXXXVIIII (139)	CXXXXII (142)	

Table 8 – Reverse control mark numbers anticipated based on the sequence for RRC 360 reverses, but not observed in RRDP

[29] Debernardi *et al.* 2018. Note that Debernardi has also utilized RRDP but at an earlier date than the digitization made in collaboration with the ANS; this likely explains any discrepancies in his observed numbers and those reported here. Debernardi is also in the process of creating a full die study of *RRC* 363/1d.

[30] On rebuilding of the temple of Moneta, perhaps on a platform over the saddle of the Capitoline, see Davies 2017, p. 190 with reference to relevant earlier scholarship.

[31] One possible issue with moving the college to 83 BCE is how to date the *RRC* 357/1 coins of C. Norbanus, presumably the son of the consul of 83 BCE. As has long been noted moneyers seem to have often been moneyer in the same year as their father's consulship; 26 known cases, Burnett 1977, p. 41, cf. Meadows & Williams 2001, p. 40. *E.g. RRC* 382/1 copies the reverse of 299/1 in the very year the moneyer of 299/1 became himself consul.

The Crepusius issue has been widely studied, most famously by Hersh and by Buttrey. RRDP significantly expands on the number of known specimens and dies and thus can help refine that earlier work. In this article only the reverse dies are treated, a full separate treatment is necessary to refine our understanding of how obverse and reverse dies were paired in light of the data in RRDP. The issue also demonstrates some of the strengths and limitations of RRDP at this present point. Buttrey was 'missing' 171 reverse die numbers; RRDP is only missing 114. However, 34 numbers observed by Buttrey are *not* currently found in RRDP.[32] At the present time of writing, only those specimens listed by Buttrey in digitized collections (15 out of the 36 coins) could be personally verified. Using RRDP data alone Esty produces estimates that are way too low, only 48-56 missing dies, whereas we would assume there at least 114 are missing (Tables 9-10). After adding in all the specimens attested by Buttrey not seen in RRDP, the disparity between Esty's predictions and what one would predict from the numbered dies shrinks: Esty's formulae predict 55-75 missing dies, as compared to 82 unobserved numerals on reverse dies between 1 and 519 (Table 10). Esty's formulae still seem to be underpredicting the number of missing dies, if to a lesser degree. It is also not clear at this time what about RRDP sampling could have produced such high coverage, but likewise so unlikely a prediction of the number of missing dies.

Source of *RRC* 361 specimens	Coins in RRDP	Dies in RRDP	of which singletons	Esty die estimates and 95% intervals	Esty coverage rate (%)
RRDP alone	3,314	404	58	460 [452-469]	98
RRDP adding Buttrey specimens	3,366	437	72	502 [493-512]	98

Table 9 – Die estimates and coverage calculated using Esty's formulae for RRC 361

	Numbers unobserved on dies between 1 and 519	Predicted number of missing dies using Esty's 95% confidence interval
RRDP alone	115	48-65
RRDP plus all Buttrey specimens	82	56-75

Table 10 – Comparison of number of unobserved die numbers and predictions of missing dies using Esty's formulae (see app. 1)

[32] See appendix below for lists of those control numbers not yet seen, as well as numbers with only a single known specimen.

For C. Mamilius Limetanus's issue of the same year the mint workers engaged in no such rigorous system of control. Instead, one letter from the moneyer's name was applied to the obverse die to look like a control mark to any casual observer. Crawford thought that only the letters of the cognomen and filiation were used. This creates a very odd distribution of observed dies (Fig. 14). One might expect some balance between the different letters of the moneyer's name assuming that the die engraver kept track by running through the name, even if just in his head. Based on RRDP data we see that control letters with high numbers of dies observed are the same letters needed to spell the moneyer's *nomen*. This makes it far more likely that the die engraver was spelling out the moneyer's full name and made no less than 13 passes through the name – perhaps as many as 16 (Fig. 15). The die engraver often skipped the filiation, and also was in the habit of skipping to a lesser extent -VS endings. Esty's formulae suggest that 13-15 passes through the name would not be an unreasonable guess (cf. Table 5).

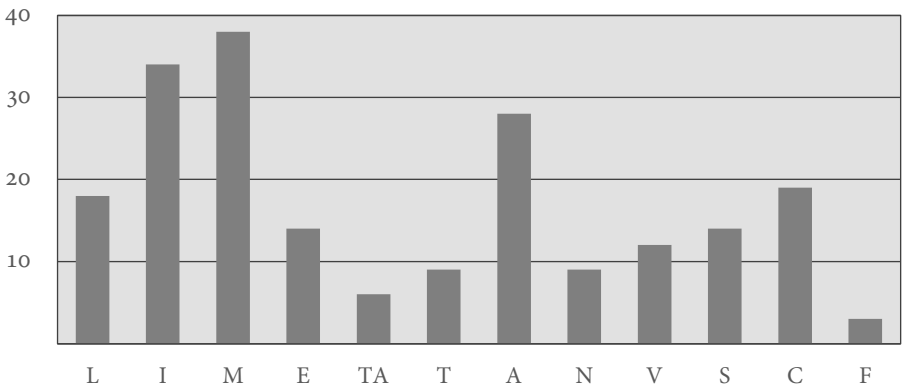

Fig. 14 – Distribution by letter of control marks on RRC 362/1, as assumed by Crawford – Mean = 17, Median = 14, Standard Deviation = 11

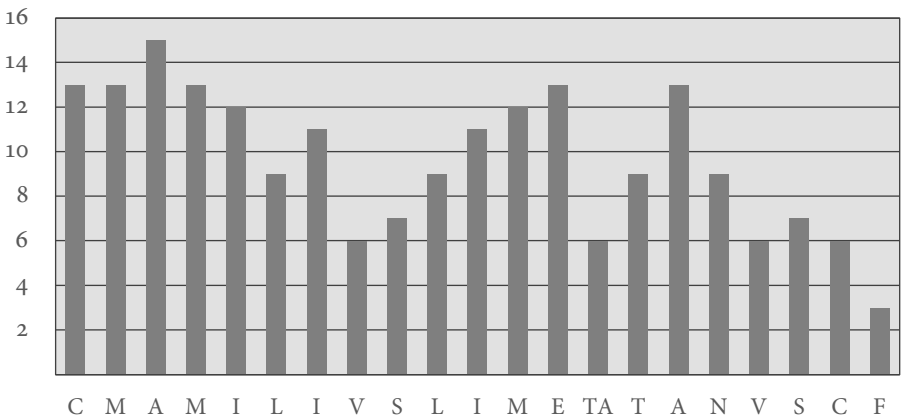

Fig. 15 – Alternative distribution by letter of control marks observed on RRC 362/1– Mean = 10, Median = 9, Standard Deviation = 3.3

For *RRC* 363, the coinage of L. Marcius Censorinus, the published and ongoing work of Debernardi obviates the need for more than a summary here (cf. Table 5). [33] He and his colleagues proposed that *RRC* 363/1a-c should be seen as one single sub-type, a point with which we strongly concur. They hypothesize that the 363/1d sub-type, the one without any control marks, was struck first, and then a control mark system was developed and tested using 363/1a-c, before being fully implemented on *RRC* 362/1, a suggestion that needs to be considered in light of the different control mark systems already in use in the preceding decade.

While no other coin issues give direct testimony regarding a complete college of moneyers, it seems dissatisfying to leave the picture with the seven years detailed in Table 2 and expanded upon in the immediately preceding discussion. None are without issues of coverage and/or dating. Thus we have decided to end this initial exploration of the potential of RRDP with a look at the presumed college of moneyers for 79 BCE, a year of particular historical significance and unfortunately with very spotty historical sources. Sulla had probably laid down his dictatorship in 80 and by 79 BCE was a private citizen. [34] This is the first test of the new constitution and a return to something like 'normalcy'. It is also the most likely year for Pompey's first triumph. [35] Meanwhile Metellus, the consul of the preceding year, went out to Spain to take up the war against Sertorius. Even with our extremely fragmentary historical record for this year we still get glimpses of fraught domestic politics: Lucullus was given a special dispensation from Sulla's brand-new age eligibility regulations for standing for office in order to allow him to be elected praetor directly after his aedileship, and Lepidus was elected to the consulship despite his outspoken criticism of Sulla. [36]

The coins suggest some degree of connection between at least one of the moneyers and one of the consuls. C. Naevius Balbus, the issuer of *RRC* 382/1, resurrects an unusual reverse type from *RRC* 299/1: Victory driving a *triga* (a team of three horses) of which the lead horse rears and turns its head toward the other two horses. One of the issuers of *RRC* 299/1 was Ap. Claudius Pulcher, consul in 79 BCE. [37]

Within this presumed college, Balbus (*RRC* 382) and Ti. Claudius Nero (*RRC* 383) both mark their issues SC, while both Nero and L. Papius (*RRC* 384) impose rigorous control mark systems. Nero uses a straightforward counting of reverse dies using Roman numerals; Papius engages in an intricate system of paired symbols that have been repeatedly studied and continues to fascinate.

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[33] See n. 25 above.

[34] See DPRR (*Digital Prosopography of the Roman Republic*, http://romanrepublic.ac.uk/) CORN1746.

[35] See DPRR POMP1976.

[36] Cic. *Acad.* 2.1, cf. Cic. *Off.* 2.57; Plut. *Pomp.* 15.1-2 and *Sull.* 34.7-8.

[37] Crawford notes the connection under *RRC* 382.

Papius is the first moneyer to use symbols exclusively as part of a control mark system in which there was only one symbol per die. A portion of Balbus' issue uses a reverse-die control mark system in which there was only one symbol per die consisting of both numbers and letters; another portion has control marks on the obverse but the letters repeat on multiple dies. Again, while there are trends within the use of control marks, it is clear that individual moneyers had wide latitude in how or if they wished to apply such systems. RRDP data has a very high coverage rate for all three issues because of their control mark systems – in part, this is why it has been selected for inclusion in this article (Table 11).

RRC Type	Coins in RRDP	Dies in RRDP	of which singletons	Esty die estimates and 95% intervals	Esty coverage rate (%)	*RRC* die estimates or observations
382/1a	519	73 (obv.)	11	85 [81-89]	98	280 obv. and 311 rev. both subtypes combined
382/1b	2,377	245 (rev.)	22	273 [268-279]	99	
383	2,241	247 (rev.)	25	278 [272-283]	99	182 rev.
384	1,894	231	11	263 [257-270]	99	observed: 211 both obv. and rev. as dies are paired

Table 11 – Die estimates and coverage calculated using Esty's formulae based on RRDP data for the college of moneyers presumed to have struck in 79 BCE

Fig. 16 – RRC 382/1b – 3.92 g (ANS 1944.100.1925)

Fig. 17 – RRC 383/1 – 4.03 g (ANS 1974.26.35)

Fig. 18 – RRC 384/1 – 4.04 g (ANS 1950.103.3)

The subtype of Balbus' issue with obverse control marks use an alphabetic system in which letters are represented by more than one die. Table 12 summarizes the number of specimens by letter and pass through number (in superscript) and the number of dies observed by Schaefer with each letter. The

distribution suggests that the die engraver worked his way through the alphabet sequentially before starting over and that the first half of the alphabet was used at least five times and the second half of the alphabet at least four times. Assuming such a distribution would predict 19 and 21 missing dies, Esty's formulae would put the number of missing dies between 16 and 18. Meaning, once again, Esty's die estimates look a little low for this issue. If we assume the die engraver was especially rigorous and the six dies with the letter C is indicative of at least five full passes through the alphabet and the beginning of a sixth pass at least to the letter C we would have to assume we are missing at least 35 dies, meaning that Esty's formulae are much further off. The authors feel the first scenario of 4.5 passes through with some mistakes is the more likely one.

A1	16	B1	15	C1	10	D1	5	E1	18	F1	4	G1	25	H1	13	I1	15	K1	7	L1	14
A2	26	B2	19	C2	4	D2	5	E2	29	F2	9	G2	22	H2	5	I2	2	K2	3	L2	12
A3	7	B3	3	C3	1	D3	2	E3	7	F3	1	G3	4	H3	4	I3	10	K3	9	L3	3
A4	6	B4	3	C4	3	D4	8	E4	1	F4	4	G5	1	*H1	10			K4	2		
		B5	2	C5	1					F5	2			*H2	6						
				C6	1																
M1	2	N1	9	O1	8	P1	5	Q1	8	R1	11	S1	8	T1	10	V1	13	X1	4		
M2	12	N2	10			P2	7	Q2	1	R2	2	S2	5	T2	3	V2	4				
M3	1	N3	5			P3	2	Q3	1			S3	1	T3	3	V3	4				
								Q4	1												

*Table 12 – Die counts by obverse control letter as observed in RRDP for RRC 382/1a (*H indicates that the dies have an additional dot, but further examination of the specimens themselves rather than photographs would be needed to make sure that it was intended as part of the control mark or design)*

The subtype of Balbus' issue with reverse control marks seems to have been primarily, but not exclusively, planned as a one control mark per die system. Roman numerals are attested in RRDP through 226, and most have only one die but numbers below 50 have a very highly likelihood of appearing on more than one die. Below we list those numbers seen at least twice. Square brackets indicate those numbers that are observed from a single die, bold indicate those observed three times, and an underline indicates dies with a number known only from a single specimen. All the numbers are known from at least one die, apart from 28 which has not (yet) been attested; number 1 is not included here as it is indistinguishable from the letter I; see below for further discussion of letters.

2, 3, 4, 5, 6, [7], 8, 9, **10**, 11, 12, 13, 14, 15, **16**, **17**, 18, 19, [20], 21, 22, 23, [24], **25**, [26], 27, 29, [30, 31], 32, 33, 34, 35, 36, 37, 38, 39, [40, 41, 42], 43, 50

The sequence here strongly suggests an intentional second reuse of these lower numbers rather than accidental repetition. The appearance of three dies marked 'X' and and another three marked 'V' and two dies marked 'L' is probably due to the use of the same symbol as both a letter and a number. The following list indicates observed and unobserved letters on the reverse control mark system; 'C' and 'I' are known from only one die each, but we would expect to be known from at least two, one for the letter sequence and one from the number sequence. A lowercase letter in square brackets indicate a letter not yet observed; * indicated a letter that appears at least twice and is also used as a number; ** indicates a letter known from only one die which we would expect to be known from at least two dies as it is both a letter and a number.

[a], B, C*, D, [e], F, G, [h], I*, [k], L**, [m, n, o, p, q, r], S, T, V*, X**

It seems a reasonable hypothesis that the die engraver intended to carve dies with all the letters of the alphabet, all the numbers 1-226 at least once, the numbers through 1-43 at least twice (and likely did so perhaps with some errors). This means 290 (= 226 + 43 + 21) should be a good ballpark estimate for the original number of dies. Once again, it seems like Esty's estimates on the original number of dies, between 268 and 279 for this subtype, might be a little low compared to that predicted by the control mark sequences.

Claudius's issue (*RRC* 383) has reverse control marks that run in two numerical systems, 1-170, and then A1-A129, suggesting that 299 is a decent estimate for the original number of dies. One more time, Esty's formulae produce an estimate that seem just a little on the low side. Control marks not observed on this series in RRDP are listed in Table 13.

VII (7)	LXIV (64)	LXXXVI (86)	CVIII (108)	CLVI (156)	ALXVI (A66)	AXCVI (A96)	ACIX (A109)
XIX (19)	LXVI (66)	XCVI (96)	CIX (109)	CLXIV (164)	ALXVII (A67)	AXCVII (A97)	ACXV (A115)
XX (20)	LXIX (69)	XCVIII (98)	CXVIII (118)	CLXVI (166)	ALXXVIII (A78)	AXCVIII (A98)	ACXVII (A117)
XXVI (26)	LXXVI (76)	CII (102)	CXXX (130)	CLXVII (167)	ALXXXI (A81)	ACII (A102)	ACXVIII (A118)
XLIII (43)	LXXXIII (83)	CIII (103)	CXXXI (131)	AI (A1)	AXCIII (A93)	ACIV (A104)	ACXXVII (A127)
LXIII (63)	LXXXV (85)	CVII (107)	CXXXII (132)	ALXV (A65)	AXCV (A95)	ACVI (A106)	ACXXVIII (A128)

Table 13 – Reverse control marks anticipated based on the sequence for RRC 360 reverses, but not observed in RRDP

Just as Crawford adopted Grueber's numbering system for Papius' control marks and only extended it to incorporate additional symbols, so RRDP adopts and continues Crawford's numbering.[38] RRDP identifies 20 symbol pairs unknown to Crawford:

[38] Crawford 1974, vol. 2, p. 785-790 with pl. 66-67.

212 – uncertain: perhaps a hoof pick and the leg of a horse; Nomos 5 (25/X/2011), lot 223 (6 specimens in RRDP)

213 – two broad brimmed hats, one with ties; photograph labelled 'Mesagne' in RRDP (1 specimen in RRDP)

214 – silphium plant and two ears of grain with crossed stems; BM inv.no. 2002,0102.3598 (4 specimens in RRDP)

215 – a tool associated with milling, probably for bolting the wheat, and a mill stone with harness to attach a horse or donkey; BM 2002,0102.3597 (4 specimens in RRDP) [39]

216 – crested helmet and Macedonian shield; *Numismatic Circular* May 1985 no. 2947 (2 specimens in RRDP)

217 – dates and fowl (likely a duck); photograph labelled 'Rompuy' in RRDP, a specimen observed in trade (1 specimen in RRDP) [40]

218 – columnar stand on a base and a two-handled hydra-like vase; Numismatica Ars Classica 63 (17/V/2012), lot 189 (1 specimen in RRDP)

219 – goblet and kylix; *Sylloge Nummorum Romanorum Milano*, no. 2549 (2 specimens in RRDP)

220 – anchor entwined with dolphin and hippocamp; photograph labelled 'Griffiths Feb 10' in RRDP, a specimen observed in trade (1 specimen in RRDP)

221 – uncertain, perhaps a (priestly) cap with feathers and a patera with handle (?); photograph from a specimen observed for sale on eBay in March 2008 (1 specimen and one brockage in RRDP)

222 – tall and short kantharos; BM 2002,0102.3593 (3 specimens in RRDP)

223 – bow and bow-case (*gorytos*), photograph from a specimen sold via electronic auction by Artemide Arte August 2017 as lot 212 (1 specimen in RRDP, as well as BnF REP-16341 which has not yet been added to the RRDP digital files) [41]

224 – two-pronged tool with open grip on handle and a wide-mouthed vessel with foot and rectangular handle for pouring (same object is depicted as the rev. symbol of Cr. 51), photograph labelled 'Jun 2002 Berk' in RRDP, a specimen observed in trade (1 specimen in RRDP)

225 – scepter and wreath (cf. rev. of *RRC* 393) and uncertain object (ear or wing shaped?), Leu 75 (1 specimen in RRDP)

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[39] Cf. the iconography on the monument of P. Nonius Zethus from Ostia (*CIL* 14.393), esp. the object hanging in upper left corner of the right panel.

[40] Cf. the iconography in a still life mosaic of food for a banquet; from a villa at Tor Marancia, near the Catacombs of Domitilla; 2nd century CE; now on display in the Roman Gallery of the Candelabra at the Vatican, and also Alpicius' recipes for fowl with dates, esp. 220-222. I thank Charles Parisot for this suggestion.

[41] I thank Myke Cole for the identification of the *gorytos*.

226 – sandal that comes over ankle and sandal with thick sole; identification of obverse symbol based on photograph labelled "Griffiths Oct 10 ex Berk" in RRDP, a specimen observed in trade (6 specimens in RRDP, as well as BnF REP-16205 which has not yet been added to the RRDP digital files)

[227] – *the photographed coin with this number in RRDP is suspect; the reverse symbol is very similar to the mask of Cr. 69 but does not appear to be a direct die match; the obverse symbol appears to be the same symbol as on Cr. 53 (the rock Saturn swallowed), but upside down. Perhaps the coin is an imitation.*

228 – conical two handled basket (woven?) and rounded bucket with foot and slight narrowed mouth (metal?); BM 2002,0102.3596 (2 specimens in RRDP)

229 – uncertain, perhaps slipper and foot?; Münzen & Medaillen 37 (23/XI/2012), lot 151 (2 specimens in RRDP, as well as BnF REP-16365 and REP-16141 which have not yet been added to the RRDP digital files).

230 – stick with flattened top, a guitar-shaped object; Lanz 125 (28/XI/2005), lot 575 (1 specimen in RRDP)

231 – narrow necked, footed vessel with 90-degree angle handle (perhaps intended to represent glass?), rounded bottom dish with one short handle at lip; BM 2002,0102.3595 (6 specimens in RRDP, as well as BnF REP-16304 which has not yet been added to the RRDP digital files)

232 – uncertain symbols, curved horn or hook-like object and disk with meander pattern; BM 2002,0102.3594 (2 specimens in RRDP, as well as BnF REP-16354 which has not yet been added to the RRDP digital files).

The only control mark pairs known to Crawford that in RRDP remain known from only one specimen are four types in the Turin collection: [42]

185 – gardening implements: a flat spade or shovel and a long-handled fork; Fava 679

186 – perhaps file and hand saw for finishing stone or wood; Fava 633

188 – snake and toad (predator, prey); Fava 477

207 – lock and key; Fava 45. [43]

One of the well-known control marks of this series has a Roman numeral, the only one in the series: CCXLVI = 246 (Cr. 178). [44] If we assumed that 246 was the last die carved and that is why it was given a number, then we would have to assume in this case that Esty's formulae produced estimates for the original number of dies that are too high, between 257 and 270 original dies. However,

[42] The present RRDP digitization does not yet contain a second image of *RRC* 187 (Fava 614), but one is known: Classical Numismatic Group E-Auction 457 (12/IV/2019), lot 233 and has been incorporated into our calculations here.

[43] This is one of three lock and key symbol pairs on the series and should not be confused with *RRC* 70 or 206.

[44] Six specimens in RRDP.

such an assumption would be just a guess. It is logical to think that *RRC* 384 included at least 246 dies, but not that that was *necessarily* the total number of dies uses.

The purpose of this section has been to begin to consider what RRDP can tell us about patterns of production in its present state and also how we might best target future analysis to increase its utility. We've certainly not established anything like a 'base-line' of normal annual production. Table 2 summarized some very approximate estimates of the number of coins that may have been produced in different years, assuming obverse dies struck about 1.2 times as many coins as reverse dies, and reverse dies might strike on average 15,000 coins. Unfortunately, for most of those issues our coverage was low. For this last college presumable to be assigned to 79 BCE, for which we have exceptionally good coverage, we could estimate that perhaps 13.5 to 14 million coins were struck. However, the vast majority of the production is marked SC and we must assume it was a further authorization to strike additional coinage above the original allocation. The breakdown would be about 4 million for the normal annual allocation of funds and some 10 million in additional striking to meet some need, perhaps rebuilding efforts in the city, or to fund the war against Sertorius, or something else entirely and now lost to the historical record. 10 million *denarii* (40 million sestertii) would have been a very large allocation for any state expenditure. For context, this is how much the Senate authorized for Pompey's extraordinary grain supply in 56 BCE, and Cato's grain distributions in late 63 or early 62 BCE cost 7.5 million *denarii*, both remembered as exceptionally large allocations. [45] Expanding the coverage for the issues discussed here would give better points of comparison going forward but even so we are able to make some generalizations such as the following. The initial amount of coin struck in 79 BCE was in the same range as high estimates for the years 118-117 BCE (*RRC* 283) and low estimates for the year 117-116 BCE (*RRC* 284), but probably slightly less than was struck in whatever year in the late 90s BCE, *RRC* 335 should be assigned to. The overall amount of coin struck in 79 BCE including SC issues is likely to be on a scale similar to low estimates for whatever year *RRC* 299 should be assigned to (*c.* 102-101 BCE?). However, it is almost certainly far less (perhaps 50%) than the two Cinnan era issues discussed. While our quantification is not precise and will never be exact, we are moving in the direction of more and more accurate relative statements of scale and estimates of production.

The other take-away is that in a number of instances Esty's estimates seem to be perhaps a little lower. This requires further investigation, especially in light of the issues raise by Jan Moens in his 2017 article in this journal, one in which RRDP can be used to look at other numerical and letter control mark system, looking in particular at the distribution of observed letter dies in the latter case.

[45] Pompey: Cic. *Q.Fr.* 2.5 with Carbone & Yarrow 2019: 16; Cato: Plut. *Caes.* 8.4, Cat. *Min.* 26.1.

2. After Chaeronea. Financing the reconquest of Italy

The second part of this paper aims at using RRDP together with other available data in order to formulate a possible answer to the question of the financing of Sulla's army in the crucial years between 83 and 82 BCE when, after the end of the First Mithridatic War, he marched through Italy and successfully defeated his adversaries. [46] Appian states that Sulla had at his disposal an army of 40,000 men, including five legions of Roman infantry, 6,000 knights, plus Greek and Macedonian *auxilia*. [47] According to the estimations of M. Speidel, each legionary was paid 225 *denarii* per year, while the *auxilia* earned the annual amount of 150 *denarii*. [48] This would in theory imply that Sulla needed to have at his disposal the equivalent of almost 10 million *denarii*. In reality, it is known that soldiers had expenses for food and equipment regularly deducted from their pay, so Sulla did not need to have at his disposal such an enormous amount of cash. At the same time, Sulla must have seemed likely to be a solvent general to the armies, since another 40 cohorts deserted the Marian-Cinnan ranks in his favor over the course of 83 BCE. [49] Since Sulla was barred from taking advantage of the enhanced monetary production of the Roman mint (already discussed in the first section of this paper), it becomes clear that he must have taken advantage of the bullion supplied by his recent victories in the East. This section thus aims at investigating the quantitative correlation between the Roman Republican issues produced by Sulla's mint in the years right after Dardanus (84-82 BCE) and their Eastern counterparts, most notably the Athenian New Style tetradrachms and the Asian *cistophori*. Schaefer's RRDP will prove fundamental in establishing a more accurate estimate of the production volume of *RRC* 359 and 367. For what concerns the production of New Style tetradrachm and Asian *cistophori*, this study relies respectively on the monumental work by M. Thompson and on the recent monograph on late *cistophori* published by one of the authors of this article. [50]

After the battle of Chaeronea in 86 BCE, Sulla found himself master of the East. [51] Plutarch provides a vivid description of the way in which he celebrated

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[46] Defeat of the consul C. Norbanus in 83 BCE: Ap. *BC* 1.84. Plut. *Sulla* 27. Defeat of the consul Scipio Asiagenus and subsequent negotiations: Cic. *Phil.* 12.27.

[47] Ap. *BC* 1.79: καὶ ὁ Σύλλας πέντε Ἰταλοῦ στρατοῦ τέλη καὶ ἱππέας ἑξακισχιλίους, ἄλλους τέ τινας ἐκ Πελοποννήσου καὶ Μακεδονίας προσλαβών, ἅπαντας ἄγων ἐς μυριάδας ἀνδρῶν τέσσαρας, ἐπί τε Πάτρας ἀπὸ τοῦ Πειραιέως καὶ ἐκ Πατρῶν ἐς Βρεντέσιον χιλίαις καὶ ἑξακοσίαις ναυσὶ διέπλει. He then started with five legions of Italian troops and 6,000 horse, to whom he added some other forces from the Peloponnesus and Macedonia, in all about 40,000 men, from the Piraeus to Patrae, and then sailed from Patrae to Brundusium in 1,600 ships (transl. H. White).

[48] Speidel 2009, p. 350-351, Tables 1-2.

[49] Plut. *Sulla* 28.1-3 and Plut. *Pomp.* 6.1.4; 7.1-8.3.

[50] Athenian New Style tetradrachms: Thompson 1961. Late *cistophori*: Carbone 2020a.

[51] On the development of the battle: Hammond 1938, p. 188-201; Keaveney 1982, p. 92-95; Brizzi 2002, p. 110-113 and 125-128; Santangelo 2006, p. 187-190.

this victory over Mithridates. [52] Sulla erected two trophies in the territory of the city of Chaeronea, where the troops of Mithridates' general Archelaus first gave way. [53] The two trophies probably refer to the battles of Orchomenus and Chaeronea, which resulted in game-changing losses for Mithridates. [54] These trophies were inscribed with the names of "Ares, Nike and Aphrodite". [55] The reasons for dedicating the trophies to Ares-Mars and Nike-Victory seem quite straightforward, as the former was the patron of warfare and the latter was the personification of Victory herself, but the presence of Aphrodite needs some further clarification. F. Santangelo convincingly correlates the goddess of Love on the trophies with the epithet that Sulla used in his correspondence with the Greeks, Ἐπαφρόδιτος, 'a favorite of Venus', to stress his strong connection to the goddess. [56] Indeed, Plutarch explicitly states that the dedication to Aphrodite on the trophies referred to Sulla's epithet. Not surprisingly, the types of Venus and the two trophies erected after the battle of Chaeronea are also present on the *aurei* and the *denarii* issued by Sulla on his way back to Italy, very likely in 84/83 BCE. [57]

Fig. 19 – RRC 359/2 – 3.81 g
(Berlin Münzkabinett 18206086)

[52] Plut. *Sull.* 19.5; cf. Plut. *mor.* 318d; Paus. 9.40.7.

[53] Mackay 2000, p. 168-177 corrects the interpretation of Camp *et al.* 1992 that a base of one of Sulla's monuments has been identified.

[54] Bahrfeldt 1923, p. 25; Thompson 1961, p. 439; Wosnik 1963, p. 60; Belloni 1993, p. 91; Catalli 2001, p. 191; Callataÿ 2004, p. 146-147.

[55] Plut. *Sull.* 19.5: διὸ καὶ τοῖς τροπαίοις ἐπέγραψεν Ἄρη καὶ Νίκην καὶ Ἀφροδίτην, ὡς οὐχ ἧττον εὐτυχίᾳ κατορθώσας ἢ δεινότητι καὶ δυνάμει τὸν πόλεμον. He therefore inscribed upon his trophies the names of Ares, Victory and Aphrodite, in the belief that his success in the war was due no less to good fortune than to military skill and strength (adapted translation by B. Perrin).

[56] Plut. *Sull.* 34.2: αὐτὸς δὲ τοῖς Ἕλλησι γράφων καὶ χρηματίζων ἑαυτὸν Ἐπαφρόδιτον ἀνηγόρευε, καὶ παρ᾽ ἡμῖν ἐν τοῖς τροπαίοις οὕτως ἀναγέγραπται·ΛΕΥΚΙΟΣ ΚΟΡΝΗΛΙΟΣ ΣΥΛΛΑΣ ΕΠΑΦΡΟΔΙΤΟΣ. But he himself, in writing to the Greeks on official business, styled himself Epaphroditus, or Favourite of Venus, and on his trophies in our country his name is thus inscribed: Lucius Cornelius Sulla Epaphroditus (transl. B. Perrin).
For the discussion of this epithet see Santangelo 2006, p. 189-190 (with bibliography).

[57] *RRC* 359/1 (*aureus*) and 359/2 (*denarius*). For the dating to 84-83 BCE of these issues: Frier 1967, p. 111; *Id.* 1969, p. 187; *Id.* 1971, p. 598-599; Crawford 1974, pp. 80, 373-374, 386-387, and 732; Ramage 1991, p. 102-104; Callataÿ 1996, p. 31; Hollstein 2000a, p. 136 and 2000b, p. 489-490; Catalli 2001, pp. 191, 217-218 and 220; Santangelo 2007, p. 204-205; Assenmaker 2013, p. 257-263.

In F. Santangelo's words, these issues "look like a perfect epitome of Sulla's ideological agenda", as they have a head of Venus and the name of Sulla on the obverse, and on the reverse the legend IMPER[ATOR] ITERV[M], accompanied by a jug and a *lituus*, two symbols that are related to the augurate and to the concept of *imperium*, and surrounded by two trophies, long recognized as the ones from Chaeronea and Orchomenus.[58] We also know from Cassius Dio that these two trophies were also used by Sulla on his personal signet ring.[59]

Fig. 20 – Athens – New Style tetradrachm with trophies – Thompson no. 1343 – 16.89 g (ANS 2015.20.881)

The same trophies are to be found on the reverse of the New Style Athenian tetradrachms presumably issued in the years 86-84 BCE.[60] The presence of the distinctive Sullan trophies on the reverses both of the New Style Athenian tetradrachms and of the *aurei* and *denarii* of series *RRC* 359 has long led scholars to hypothesize that the latter issues "were made with metal from the Greek world, presumably in large measure melted down booty".[61] In the same direction goes the orientation of the dies for this issue, uniquely adjusted at ↑↑, in sharp contrast with Roman Republican practices.[62] However, the very scant presence of Roman currencies in Greece and in Asia Minor before the 40s BCE, makes it very difficult to accept Hollstein's hypothesis that *RRC* 359 issues were produced in Greece or in Asia Minor.[63] P. Assenmaker suggests

[58] Santangelo 2006, p. 188-190, esp. 190. For the value of the term *Imperator* on Sullan coinage see Martin 1989, p. 24-31; Assenmaker 2013, p. 249-253 (with previous bibliography). For the use of *Iterum* on *RRC* 359 see Assenmaker 2013, p. 253-257. Venus on Sullan coinage: Assenmaker 2010, p. 197-264. Before him, most notably Keaveney 1983, esp. p. 60-64. Venus on Eastern coinages, related to Sulla's army: Callataÿ 2015, esp. p. 252-260.

[59] Dio 42.18 with Mackay 2000, p. 208.

[60] Thompson 1961, nos. 1341-1345. For the discussion of the dating, most recently, Assenmaker 2017, p. 421-424.

[61] Crawford 2000, p. 124.

[62] Callataÿ 1996, p. 30-31. On the importance of die-orientation for the establishment of the place of production of Roman Republican coinage see Hollstein 2000a.

[63] Metallurgical analysis on *RRC* 359/2: Crawford 2000, p. 124-125, fig. 3. Presence of *denarii* in Greece: *IGCH* 271 (Agrinion, 145-135 BCE: 39 *denarii* out of 1,348 silver coins); *IGCH* 346 (85-80 BCE: 50 *denarii* and 20 Sullan New Style tetradrachms together with other 14 more ancient New Style tetradrachms. Absence of *denarii* in Asia Minor: Carbone 2020b. Eastern mint for *RRC* 359 issues: Hollstein 2000b, p. 489; Woytek 2003, p. 501, no. 787: Both *RRC* 359

for these issues a sort of intermediate solution, proposing that these coinages were struck at the time of the end of Sulla's sojourn in the East (and then sent to Italy with the army) or – more likely – in Italy, right after Sulla's army landed in Italy, as the presence of the coins in Southern Italian hoards leads one to think. [64] *RRC* 359 issues would then have been struck at the moment of Sulla's arrival in Italy and their types were meant to remind everybody of his victory over Mithridates and his privileged relationship with Venus.

Fig. 21 – RRC 367/3 – 3.7 g (Mainz, Historisches Seminar, Arbeitsbereich Alte Geschichte der Johannes Gutenberg-Universität 119)

RRC 367, a Sullan issue composed of three *denarii* and two *aurei*, is usually dated to 83/82 BCE. [65] Following T.R. Martin's argumentation, P. Assenmaker has made a very well-argued case for dating this issue to the years of the Social War, notably based on the presence of the term *imperator* (without iteration) on the reverse of these issues. [66] However, hoard evidence suggests a date very close in time for the two issues *RRC* 359 and 367, which could even be contemporary. [67] Furthermore, the *triumphator* on the reverse of the coins of *RRC* 367 leads in the same direction as the trophies on the reverse of *RRC* 359, namely the depiction of Sulla as an *imperator* beloved by the Gods who succeeded in liberating the Roman East from one of Rome's archenemies. Notice that the

and *RRC* 375 have a strong tendency towards a ↑↑ die-axis; the Roman mint did not attempt to control die axis in this period, but most Eastern mints did.

[64] Assenmaker 2013, p. 261-263. Hoards with *RRC* 359/2: *RRCH* 261 (Ferentino, 81 BCE); *RRCH* 278 (Fragagnano, 79 BCE); *RRCH* 311 (Pontecorvo, 74 BCE); *RRCH* 309 (Maccarese, 74 BCE); *RRCH* 365 (San Giuliano Vecchio); *RRCH* 417 (Alvignano, 40 BCE); *RRCH* 506 (Terranova Pausania); *RRCH* 475 (Vigatto). *RRC* II, p. 652-653 Table L.

[65] *Denarii*: *RRC* 367/1, 367/3 and 367/5. *Aurei: RRC* 367/2 and 367/4. Dating to 83-82 BCE: Frier 1967, p. 111; *Id.* 1969, p. 187; *Id.* 1971, p. 598-599; Crawford 1974, pp. 80, 373-374, 386-387 and 732; Hollstein 2000a, p. 136; *Id.* 2000b, p. 489-490; Mackay 2000, p. 180-206.

[66] Martin 1989, p. 31-35. Assenmaker 2013, p. 263-269. The gold of *RRC* 367 contains more silver (2.6%) and copper (0.6%) than that found in most other Roman gold, both that struck abroad and at Rome; <1.2% silver and no copper are typical; so Botrè & Fabrizi 1994-1995.

[67] Hoards with *RRC* 367/1, 3 and 5: *RRCH* 261 (Ferentino, 81 BCE); *RRCH* 278 (Fragagnano, 79 BCE); *RRCH* 311 (Pontecorvo, 74 BCE); *RRCH* 309 (Maccarese, 74 BCE); *RRCH* 286 (Cergnago, 74 BCE); *RRCH* 365 (San Giuliano Vecchio); Bălănescu & Rogozea 1983-1985 and Petrovszky & Petrovszky 1981 (Tincova, 69 BCE); *RRCH* 351 (Casaleone, 51 BCE); Hersh & Walker 1984 (Mesagne, 58 BCE). *RRCH* 417 (Alvignano, 40 BCE); *RRCH* 456 (Seica Mica, 27 BCE); Giard 1963 (Maille, 15 BCE); *RRCH* 475 (Bourgueil, 15 BCE); *RRCH* 505 (Gallignano, 4 BCE); *RRC* 522 (Aquileia, CE 14); *RRCH* 475 (Vigatto); *RRCH* 506 (Terranova Pausania). *RRC* II, p. 652-653, Table L.

triumphator holds a *caduceus*, not a laurel branch. The caduceus was a herald's staff, sometimes carrying the connotations we might associate with an olive branch or a white flag, but was more generally, a symbol of peace, concord, and reconciliation.[68] *Concordia* ('harmony between the social orders') has even been suggested as a key rhetorical component in Sulla's own civic self-presentation.[69] We can read the caduceus as a statement that Sulla has brought peace and order with his return. He may also be visually playing with the idea of himself as the bringer of *felicitas* (blessings) in that the caduceus relates to his subsequent adoption of the name '*Felix*' (Blessed One).[70]

These two Sullan issues were thus almost contemporary, very likely produced between 84 and 82 BCE. The relative chronology of these two issues is still under discussion, but for the aims of this paper, the relevant element is that they were both issued as a means to support Sulla's reconquest of Italy. In this context, it is of primary relevance to wonder where Sulla obtained the bullion from to issue *RRC* 359 and *RRC* 367. Metallurgical analyses and the orientation of the die axes show – while not proving it – that an eastern provenance for the bullion and perhaps for the coins themselves (in the case of *RRC* 359/2) is indeed a strong possibility.[71] However, in spite of the extraordinary taxation exacted by Sulla in the past, his confiscation of the wealth of sanctuaries, and acceptance of some 3,000 talents from Mithridates himself, no attempt has been made to quantify the correlation between Sulla's demands and Sullan issues between 86 and 82 BCE.[72]

a. Sullan issues in the RRDP archive: estimated production

For both *RRC* 359 and *RRC* 367 issues, only the *denarii* issues, namely *RRC* 359/2 and *RRC* 367/1, 3 and 5 will be included in the following analysis. Two orders of reasoning lead to this choice. First, RRDP provides only limited recording of *aureus* issues. The second and perhaps more important reason is that the issues of *denarii* allow for an easier comparison to the issues of provincial silver we will be dealing with in the next pages, both in terms of bullion and of volume of production.

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[68] Cf. Livy 8.20 and Gell. *NA* 10.27.3-5; Cornwell 2017, p. 36-41 with discussion of this coin in particular.

[69] Sumi 2002, p. 425 with Sall. *Hist*. 1.55.24, cf. discussion of *concordia*, 4.1.

[70] In imperial numismatic iconography the goddess Felicitas' chief attribute is a caduceus, a symbol she shares with Pax, Noreña 2011, pp. 128 and 165-174; this association may go back to the Republican period, Clark 2007, p. 142, cf. Cornwell 2017, p. 36-41 who notes the close relationship of *pax* and *felicitas*.

[71] Crawford 2000, p. 124-125, fig. 3. For the importance of the die axes see Callataÿ 1996 and Hollstein 2000a.

[72] Taxation: Plut. *Lucull.* 4.1; Seizure of temple treasuries: Diod. 38-39.7.1, Plut. *Sull.* 12.5-14, Paus. 9.33.6 and 10.21.6; Payment from Mithridates: Memnon 25.2 Cf. Plut. *Sull.* 12.3-5, Ap. *B Civ.* 1.102, with Yarrow 2006, pp. 245 and 249-250.

With respect to *RRC* 359/2, Schaefer's archive records 281 specimens with a coverage of 75%. As a *comparandum*, M. Crawford based his estimates of 32 obverse dies on 16 specimens found in 8 hoards, whose burial dates range from 81 BCE to CE 14. [73] The results of Schaefer's die study are presented in the tables below, with an average lifetime of 20,000 coins per obverse die.

RRC Type	Coins in RRDP	Dies in RRDP	of which singletons	Esty die estimate and 95% interval	Esty coverage rate (%)	Approx. issue (million)	Approx. date (BCE)
359/2	281	157	71	305 [256-363]	75	5.1-7.3	84-83

Table 14 – Production estimates according to RRDP (Esty 2011).

With an estimated number of 305 obverse dies and a probable range of output between 5.1 and 7.3 million *denarii, RRC* 359/2 was not a minor issue, as previously thought. This discovery is hardly surprising, since Sulla was getting ready to take Rome with his army and was expecting a staunch resistance on the part of Marius and Cinna's supporters, who had at their disposal the coin production of the Roman mint. [74] Indeed, it would have been counterintuitive if the mint moving with Sulla struck only a small amount of coins, especially considering that he presumably had direct access to an enormous amount of eastern coins and bullion alike through the aid of Lucullus. [75]

The *denarii* of the issue *RRC* 367, usually dated to 83-82 BCE, are recorded in RRDP for a total of 358 specimens and 532 estimated obverse dies (Table 15). [76] With a probable range of output between 8.1 and 14.1 million, these issues almost double the volume of emissions of *RRC* 359/2. M. Crawford estimated 186 obverse dies for these issues, building upon a sample of 93 coins in 14 hoards. [77] On the basis of these estimates, he calculated that the volume of

[73] Hoards with *RRC* 359/2: *RRCH* 261 (Ferentino, 81 BCE); *RRCH* 278 (Fragagnano, 79 BCE); *RRCH* 311 (Pontecorvo, 74 BCE); *RRCH* 309 (Maccarese, 74 BCE); *RRCH* 365 (San Giuliano Vecchio); *RRCH* 417 (Alvignano, 40 BCE); *RRCH* 506 (Terranova Pausania); *RRCH* 475 (Vigatto). *RRC* II, p. 652-653, Table L.

[74] For a numismatic survey of the activity of the mint of Rome in the years 83-82 BCE, most recently: Assenmaker 2016, pp. 103-106, 118-120. (83 BCE: *RRC* 357-358. 82 BCE: *RRC* 360-364) and the first part of this paper.

[75] For the direct access of Sulla to the Asian booty see Section 2c of this paper.

[76] For dating of this issue see n. 53.

[77] Hoards with *RRC* 367/1,3 and 5: *RRCH* 261 (Ferentino, 81 BCE); *RRCH* 278 (Fragagnano, 79 BCE); *RRCH* 311 (Pontecorvo, 74 BCE); *RRCH* 309 (Maccarese, 74 BCE); *RRCH* 286 (Cergnago, 74 BCE); *RRCH* 365 (San Giuliano Vecchio); Bălănescu-Rogozea 1983-1985 and Petrovszky-Petrovszky 1981(Tincova, 69 BCE); *RRCH* 351 (Casaleone, 51 BCE); Hersch & Walker 1984 (Mesagne, 58 BCE).*RRCH* 417 (Alvignano, 40 BCE); *RRCH* 456 (Seica Mica, 27 BCE); Giard 1963 (Maille, 15 BCE); *RRCH* 475 (Bourgueil, 15 BCE); *RRCH* 505 (Gallignano, 4 BCE); *RRC* 522 (Aquileia, AD 14); *RRCH* 475 (Vigatto); *RRCH* 506 (Terranova Pausania). *RRC* II, p. 652-653 Table L.

emissions of the *RRC* 367 *denarii* to be almost six times the one of *RRC* 359/2. While confirming the greater volume of issues for the *RRC* 367 *denarii*, the estimates here presented narrow the difference in relative sizes in output of these issues.

RRC Type	Coins in RRDP	Dies in RRDP	of which singletons	Esty die estimate and 95% interval	Esty coverage rate (%)	Approx. issue (million)	Approx. date (BCE)
367/1	38	22	14	57 [33-98]	63	0.7-2.0	83-82
367/3	79	26	12	45 [35-57]	75	0.7-1.1	83-82
367/5	241	152	100	430 [338-548]	58	6.8-11.0	83-82
TOTAL	**358**	**200**	**126**	**532 [406-703]**	**69**	**8.2-14.1**	**83-82**

Table 15 – Production estimates according to RRDP (Esty 2011).

The aggregate volume of these emissions is remarkable, with 837 estimated obverse dies and a probable output of 13.3-21.3 million *denarii*. As a *comparandum*, the calculations in the first section of this paper show that the estimated combined production for the moneyers of 82 BCE is 32-45 million *denarii*.[78] The *denarii* of the *RRC* 359 and 367 issues, the issues financing Sulla's reconquest of Italy, were thus roughly one half of the issues of the Roman mint in the year 82 BCE. This was a year of extraordinary production, as demonstrated in the first part of this paper. Building upon former studies, F. de Callataÿ estimated that the Roman mint struck 3,049 obverse dies in the years 85-81 BCE, *i.e.* 60,980,000 *denarii*.[79] These issues thus represented 37% of Callataÿ's estimated production of the Roman mint for the years 85-81 BCE.

While roughly half the size of the extraordinary issues of the Roman mint in 82 BCE, the scale of Sulla's production is not minor and was likely comparable to the production volume of *RRC* 350a (Table 4) in 86 BCE. This begs even more urgently the question of the provenience of the bullion used. The next pages represent an effort to address this issue.

[78] *RRC* 360-363. Table 2.

[79] Callataÿ 2016, p. 326, Table 6 (sources *RRC* and Depeyrot 1993, p. 76).

b. Trophies issues of Athenian New Style tetradrachm (86-84 BCE)

καὶ χρώμενος ἀπ᾽ ἀρχῆς ἐπὶ τὰ πλείστης ἄξια σπουδῆς διετέλεσεν· ὧν ἦν καὶ ἡ περὶ τὸ νόμισμα πραγματεία. δι᾽ ἐκείνου γὰρ ἐκόπη τὸ πλεῖστον ἐν Πελοποννήσῳ περὶ τὸν Μιθριδατικὸν πόλεμον, καὶ Λουκούλλειον ἀπ᾽ ἐκείνου προσηγορεύθη, καὶ διετέλεσεν ἐπὶ πλεῖστον, ὑπὸ τῶν στρατιωτικῶν χρειῶν ἐν τῷ πολέμῳ λαμβάνον ἀμοιβὴν ταχεῖαν.

It was, however, more owing to constancy and mildness that
Sulla attached him to himself and employed him from first
to last on business of the highest importance.
Such, for instance, was the management of the mint.
Most of the money used in Peloponnesus during the Mithridatic war
was coined by him, and was called Lucullean after him
It remained current for a long time, since the wants
of the soldiery during the war gave it rapid circulation
(Plut., *Lucull.* 2.1-2; transl. B. Perrin)

As Plutarch states in this passage, the presence of Sulla and Lucullus in Greece during the First Mithridatic War lead to a heightened production of local silver coinages. [80] Military needs, *i.e.* the need to pay the armies involved in the war against the Pontic king, caused this steep increase in the volume of local issues. The connection is especially clear in the case of Athens, where the production of Athenian New Style tetradrachms was greatly heightened in the year leading up to the battles of Chaeronea and Orchomenus. [81] While the Romans are likely to have manipulated the Athenian coinage on previous occasions, [82] there is a general consensus that they were directly responsible for the so-called 'Lucullan' issues with the two monograms usually read as MAP-KOY (Lucullus)/TAMIOY [83] as well as the so-called 'trophies issues'. [84]

[80] Most recent quantified overview for these coinages in Callataÿ 2016. Most recently, on the so-called Lucullean coinage see Assenmaker 2017.

[81] Thompson 1961, p. 425-439. M. Thompson makes a clear stylistic distinction between the pre-Sullan issues and the Sullan issues which, according to her, should be considered 'Athenian-like' in style. Notwithstanding this distinction, Thompson includes the Sullan issues in her study of New Style Athenian silver coinage.

[82] For example, the Romans were able to export to Macedonia most of the tetradrachms produced in Athens in the late 120s BCE, possibly to pay for military expenses: Callataÿ 2016, p. 323, n. 51 (with previous bibliography). The same is true for Thessaly after 146 BCE, where Athenian tetradrachms circulated alongside drachms of the Thessalian League: Kremydi-Sicilianou 2004, p. 251-255; Tselekas 2004.

[83] Thompson 1961, p. 425-439, nos. 1273-1340; Callataÿ 1997, p. 310-311; Assenmaker 2017, p. 416-421 (with bibliography).

[84] Thompson 1961, nos. 1341-1345; Assenmaker 2017, p. 421-422.

Fig. 22 – Athens, new Style tetradrachm with monogram interpreted as MAPKOY (Lucullus)/ TAMIOY – Thompson 1313 – 15.66 g – 28.9 mm (ANS 2015.20.871)

The 'Lucullan' issues, characterized by a higher number of observed dies than any other year before 87-86 BCE [85], were also accompanied by a conspicuous number of drachms, which could point in the direction of the Romans for the apparently ready conversion between Attic-weight drachms and *denarii.* [86] The *terminus ante quem* for these issues is the battle of Chaeronea in 86 BCE, as these coins were likely intended to finance the military effort against Mithridates. [87] Furthermore, Lucullus left Greece in the winter of 87-86 BCE and headed to Egypt and Libya, so the 'Lucullan' coins could not have been produced after that date. [88] On the other hand, the general consensus is that the issue with the two trophies should be dated after Chaeronea, because their reverse type commemorates either the two victories of Orchomenus and Chaeronea over the Pontic king or the two trophies erected by Sulla after Chaeronea, as we have already suggested on the basis of the analogous types used for *RRC* 359/2. [89]

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[85] To judge from the number of obverse dies in Thompson 1961, the most prolific issues are ΔΗΜΗΤΡΙΟΣ/ΑΓΑΘΙΠΠΟΣ (99/98 – 52 obverses), ΞΕΝΟΚΛΗΣ/ΑΡΜΟΞΕΝΟΣ (92/91 – 47), ΝΙΚΗΤΗΣ/ΔΙΟΝΥΣΙΟΣ (98/97 – 33) and ΑΡΙΣΤΙΩΝ/ΦΙΛΩΝ – 30). Bresson 2006, p. 78-79; Callataÿ 2016, p. 324, n. 55.

[86] See Price 1987, p. 96 and Callataÿ 1997, p. 311. Ratio 1:1 between Attic standard drachm and denarius: 1 talent = 6,000 *denarii*. Festus, s. u. 'Talentorum': *Atticum* (scil. *talentum*) *est sex milium denarium.* Ratio 1:1.20 between the Attic standard drachm and the *denarius* occurs in an inscription from the Carian sanctuary of Labraunda, probably dated to the 1st c. CE see *I. Labraunda* 52, ℓ. 2-5: [— πατ]ρίδα? ν ἀναṭ[—] ṭῶι Διῖ τῶι Λαβραύνδωι [— ὁλ]κῆς Ἀττικῶν πεντακοσ[ίων —] γίνεται δηνάρια ἑξακόσ[ια]. "[…] offer to Zeus Labraundos […of a bowl?] of the weight of 500 drachms, which become 600 denaria".

[87] Plut., *Lucull.* 2.1-2. Callataÿ 2016, p. 323-324; Assenmaker 2017, pp. 416-421 and 422-424. On the use of the Lucullan tetradrachms in Greece see also Matthaios & Papazarkadas 2014-2019, esp. p. 185-187.

[88] Plut., *Lucull.* 2.3-4. For a production of the Lucullan coins in the months after the departure of L. Lucullus under his brother M. Lucullus see Assenmaker 2017, p. 420-421.

[89] Victories of Chaeroea and Orchomenus: Bahrfeldt 1923, p. 25; Thompson 1961, p. 439; Wosnik 1963, p. 60; Belloni 1993, p. 91; Catalli 2001, p. 191; Callataÿ 2004, p. 146-147; Assenmaker 2017, p. 421, n. 46. Two trophies after Chaeronea: Picard 1957, p. 178; Luce 1968, p. 25-39; Crawford 1974, p. 373; Ramage 1991, p. 93-121, esp. p. 102-103; Hölscher 2006, p. 27-48, esp. p. 32-33; Assenmaker 2017 p. 422, n. 47.

Issues	Coins	Dies	of which singletons	Esty Estimate of tetradrachm obverse die	Total (@ 20,000 tetradrachm coins per die worth 80,000 *denarii*)
Two trophies issues	8	6	5	29.5	2,360,000 *denarii* = 393 1/3 talents [90]

Table 16 – Production estimates of Athenian issues struck for Rome (86-84 BCE). Compare the Esty estimate of 29.5 tetradrachm obverse dies with the 31.9 tetradrachm obverse dies in Callataÿ 2016.

Caution is indeed needed for these estimates, since the Esty coverage for these issues is quite low (37.5%). [91] However, the figures in Table 16 are very close to Callataÿ's calculations, so this could provide some support to these estimates, in spite of the caution elicited by the small sample.

Hoard evidence, epigraphic evidence and a very large volume of issues suggest that the 'Lucullan' issues of Athenian-like tetradrachms had manifold uses, from prize-money of important games such as the *Basileia* in Lebedeia to the financing of Roman armies in the course of the First Mithridatic War. [92] On the other hand, the later issue of the 'two trophies' tetradrachms could have financed Sulla's campaigns in Italy or even provided the bullion for his issues of *denarii*.

Since one Attic-weight drachm is usually considered equivalent to one *denarius*, this issue of Athenian-like tetradrachms was produced from 118 *denarius*-equivalent obverse dies, roughly one-third of the number of dies estimated for *RRC* 359/2. [93] The similarities in reverse types, orientation of the die axes and circulation patterns between the 'two trophies' tetradrachms and *RRC* 359/2 suggest that these two issues – while differing in relative importance – represented an important source of financing for the Sullan campaigns in Italy.

c. Monetary production in Asia after Dardanus

ἐπεὶ δὲ συνθηκῶν γενομένων Μιθριδάτης μὲν ἀπέπλευσεν
εἰς τὸν Εὔξεινον πόντον, Σύλλας δὲ τὴν Ἀσίαν δισμυρίοις

[90] 1 talent = 6,000 *denarii*. Festus, s. u. 'Talentorum': *Atticum (scil. talentum) est sex milium denarium.*

[91] These data partly derive from Callataÿ 2016, Table 4. One more coin (Triton III, 30/XI/1999, lot 444) has been added to the coins included in the study.

[92] M. Thompson (1961, pl. 181-184) uses the Abruzzi hoard, which included 'Lucullan' Athenian tetradrachms together with earlier Athenian tetradrachms, *denarii* and royal coinage from Cappadocia, to argue that the 'Lucullan' issues were used to pay Sulla's soldiers (cf. Plut., *Lucull.* 2.1-2). For the volume of these issues (Thompson 1961, nos. 1273-1340) see again Callataÿ 2016, Table 4. On the use of the Lucullan tetradrachms in Greece see Matthaios & Papazarkadas 2014-2019, esp. p. 185-187.

[93] For a ratio 1:1 between Attic standard drachm and *denarius*: see n. 90; for a 1:1.20 *ratio* between the Attic standard drachm and the *denarius* see n. 86.

ταλάντοις ἐζημίωσε, προσταχθὲν αὐτῷ
τά τε χρήματα ταῦτα πρᾶξαι καὶ νόμισμα κόψαι

Peace being presently made, Mithridates sailed off to the Euxine sea,
but Sylla taxed the inhabitants of Asia twenty thousand talents,
and ordered Lucullus to gather and coin the money.
(Plutarch, *Lucullus* 4.1. transl. B. Perrin)

This excerpt from the *Life of Lucullus* describes the aftermath of the First Mithridatic War, after the hasty conclusion of the peace of Dardanus in 85 BCE. [94] After Mithridates' defeat, Sulla imposed on the Greek cities of Asia Minor an indemnity of 20,000 talents. The reasons for these harsh measures were not only to be found in the desire to punish the Asian cities for their ambiguous attitude towards the king of Pontus and his lieutenant Zenobius [95], but also in the necessity to ease the veterans' disappointment over the mild treatment given to Mithridates. [96] According to Appian, Sulla imposed on the province the payment of five years of taxes plus an indemnity for the expenses incurred by the Romans in the course of the war and in resettling the province. [97] The Plutarchean text also suggests that Lucullus was directly entrusted with the collection of the extraordinary tributes and fines imposed on Asia. This certainly had to do not only with the unusual nature (and amount) of the fines imposed but with extraordinary circumstances, because the *societates publicanorum* – not military authorities like Lucullus – were entrusted with

[94] Plut., *Sulla* 22.5: δεξαμένου δὲ τοῦ Σύλλα τὴν πρόκλησιν ἐγένοντο συνθῆκαι, Μιθριδάτην μὲν Ἀσίαν ἀφεῖναι καὶ Παφλαγονίαν, ἐκστῆναι δὲ Βιθυνίας Νικομήδει καὶ Καππαδοκίας Ἀριοβαρζάνῃ, καταβαλεῖν δὲ Ῥωμαίοις δισχίλια τάλαντα καὶ δοῦναι ναῦς ἑβδομήκοντα χαλκήρεις μετὰ τῆς οἰκείας παρασκευῆς, Σύλλαν δὲ ἐκείνῳ τήν τε ἄλλην ἀρχὴν βεβαιοῦν καὶ σύμμαχον Ῥωμαίων ψηφίζεσθαι. Sulla granted the request, and terms of agreement were made as follows: Mithridates was to renounce Asia and Paphlagonia, restore Bithynia to Nicomedes and Cappadocia to Ariobarzanes, pay down to the Romans two thousand talents, and give them seventy bronze-armored ships with their proper equipment; Sulla, on his part, was to confirm Mithridates in the rest of his dominions, and get him voted an ally of the Romans (transl. B. Perrin).

[95] Ap. *Mithr.*7.48; Callataÿ 1997, p. 173.

[96] The Pontic king who was in turn forced to pay a relatively modest sum which oscillates between 2,000 and 3,000 talents: Memnon 25.2 and Plut. *Sulla,* 22-23 (3,000 talents); Ap., *Mithr.* 54-58 (2,000 talents); Sherwin-White 1984, p. 143-148; Yarrow 2006, pp. 245, 249-250.

[97] App, *Mithr.* 62: εὐφημίας οὕνεκα μόνους ὑμῖν ἐπιγράφω πέντε ἐτῶν φόρους ἐσενεγκεῖν αὐτίκα καὶ τὴν τοῦ πολέμου δαπάνην, ὅση τε γέγονέ μοι καὶ ἔσται καθισταμένῳ τὰ ὑπόλοιπα. διαιρήσω δὲ ταῦθ' ἑκάστοις ἐγὼ καὶ κατὰ πόλεις καὶ τάξω προθεσμίαν ταῖς ἐσφοραῖς καὶ τοῖς οὐ φυλάξασιν ἐπιθήσω δίκην ὡς πολεμίοις; I shall only impose upon you the taxes of five years, to be paid at once, together with the cost of the war expended by me, and whatever else may be spent in settling the affairs of the province (transl. H. White). Santangelo 2007, p. 111-113 (with bibliography).

the exaction of Asian taxes since at least the 120s BCE.[98] The reason for the remarkable absence of the *publicani* from this process finds a plausible explanation with their lack of human resources after the losses suffered after the outbreak of the Mithridatic War.[99] One thinks in particular of the Asian Vespers in which some 80,000 (or more!) Romans are said to have been killed.[100] The presence of *publicani* would have made the exactions readily available for the *aerarium*, as established for each province by the *censoriae locationes*.[101] Through the *societates publicanorum* Rome extracted from Asia the *decuma*, plus other indirect taxes (*vectigalia*), like *scriptura* and *portorium*.[102] The *publicani* relied on a system of customs stations (τελῶνια) for the exaction of the *portorium*, while the exaction of the *decuma* required a more centralized organization, as it implied the assessment of the production of the province as a whole, probably through *pactiones* with each city.[103] The losses suffered by the *societates publicanorum* in Asia enabled Sulla, through his lieutenant Lucullus, to have direct access to the wealth gathered from Asia, with a limited opportunity for the *aerarium* to take advantage of it.

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[98] *Lex Sempronia De Asia*: Ap. *BC* 1.22; Badian 1968, p. 48-49; Sherwin-White 1984, p. 18-31; Kallet-Marx 1995, pp. 120-121 and 138; Merola 2001, p. 34-40; Cottier 2008, p. 8; Kay 2014, p. 59-83. The argument in favor of an organized presence of *publicani* in the province before the *lex Sempronia* relies mainly on the dating of the *SC de agro Pergameno*, found in several copies in the assize district centers of the province: Abbot-Johnson 12 = *IGRP* IV, 262 (copy at Adramyteum); Passerini 1937; Petzl 1987, n. 589; Di Stefano 1998 (copy at Smyrna); *RDGE* 12; Tibiletti 1957; Sherk 1966; De Martino 1983; Petzl 1985 (copy at Ephesus). The inscription, which concerns itself with limiting the power of *publicani* in the *chora* of Pergamum, had been dated originally to 129 BCE, but has now been persuasively redated to 101 BCE rather than 129: Merola 2001, p. 27-34; Magie 1950, p. 1055-1056, n. 25; Mattingly 1972 and 1985, p. 119; De Martino 1983; Gruen 1984, p. 606-607; Sherwin-White 1984, p. 96, n. 9; Badian 1986, p. 15-16; Petzl 1985, p. 58-60. For a summary of the argument: Kay 2014, p. 66-69. The late dating of the *SC de agro Pergameno*, now widely accepted, undermines the thesis of an organized presence of *publicani* in Asia before the *lex Sempronia*.

[99] Brunt 1956 (= Brunt 1980, p. 1-8). Santangelo 2007, p. 113-115.

[100] Val. Max. 9.2.3 and Memnon 22.9 (80,000); Plut. 24.4 (150,000).

[101] Cic. *Verr.* 3.6.12. For an in-depth discussion of the difference in the *censoria locatio* between different provinces, see Tan 2017, p. 40-68. Quinquennial length of the *censoria locatio*: Cicero, *Letters to Atticus* 6.2.5 (communities paying or not paying taxes for blocks of five years). Cottier 2008, p. 4-5 (taxation in the Province of Asia revolving around *lustra*, blocks of five years). Most recently, Tan 2017, p. 42, n. 3.

[102] For a summary with bibliography of taxes exacted from Asia see Hollander 2008, p. 91. *Decuma*: Ap. *BC* 5.4. Cic. *Leg. Man.* 15. *Scriptura*: Cic. *Leg. Man.* 15. *Vectigal*: Cic. *Verr.* II 1.89, 3.27; *Ad Q. Fr.* 1.1.26.; *Leg. Man.* 15. *Portorium:* Cic. *Att.* 2.16; *Leg. Man.* 15. For the relationship between *portorium* and financial administration in the *Provincia Asia* see Corbier 2008, p. 217-223. For a general definition of *vectigalia*, most recently Günther 2016.

[103] Capillary presence of τελῶνια: van Nijf 2008. On the organization of the *decuma* in Asia: Merola 2001, p. 77-80 (with bibliography). Most recently, Cottier 2008, p. 127-133 (commentary to *Lex Portorii* Asiae, ℓ. 72-74, dated to 75 BCE). For the functioning of the *pactiones* between publicani and municipal institutions in Asia see Merola 2001, p. 101-113 (with bibliography).

Two elements of the aforementioned excerpt seem relevant to the goals of the present paper, namely the fact that Lucullus had to 'gather' (πρᾶξαι) wealth and – even more important – that he was asked to 'coin' (κόψαι) currency. The term that Plutarch uses in association with πρᾶξαι is χρήματα, which does not provide any further indication about the nature of the wealth Lucullus, Sulla's *quaestor,* was supposed to amass on behalf of the future dictator. [104] This term suggests that the 20,000 talents were not entirely paid in coined money.

A parallel for Sulla's exactions could be offered by Pompey's Asian booty, paraded in his triumph in 61 BCE. [105] On this occasion, Pompey remitted to the *aerarium* 20,000 talents, an extraordinarily large quantity of wealth consisting both of 'coined money and vessels of gold and silver'. [106] The description of Pompey's triumph shows that the 20,000 talents were not only exacted in coins (certainly including *cistophori*), [107] but also in bullion, in the shape of vessels made out of precious metals. The same should be hypothesized for Sulla's exactions and this is what Plutarch is referring to in the passage with the use of the generic term χρήματα. [108] Furthermore, the importance of bullion as a means of tribute payment in Asia is made evident by the despair of the Ephesians in 41 BCE. Plutarch reports that they were forced to pay the extraordinary tributes demanded by Brutus and Cassius "in plate and orna-

[104] On the role of the *quaestor* with regard to finances, see esp. chap. 5-6 of Pina Polo & Díaz Fernández 2019. For the meaning of χρήματα in relation to booty and war-related exactions see Callataÿ 2006, esp. p. 39.

[105] Sulla's triumph (81 BCE): Plut., *Sulla* 34.1. Ὁ μέντοι θρίαμβος αὐτοῦ τῇ πολυτελείᾳ καὶ καινότητι τῶν βασιλικῶν λαφύρων σοβαρὸς γενόμενος μείζονα κόσμον ἔσχε καὶ καλὸν θέαμα τοὺς φυγάδας. οἱ γὰρ ἐνδοξότατοι καὶ δυνατώτατοι τῶν πολιτῶν ἐστεφανωμένοι παρείποντο, σωτῆρα καὶ πατέρα τὸν Σύλλαν ἀποκαλοῦντες, ἅτε δὴ δι᾽ ἐκεῖνον εἰς τὴν πατρίδα κατιόντες καὶ κομιζόμενοι παῖδας καὶ γυναῖκας. His triumph, however, which was imposing from the costliness and rarity of the royal spoils, had a greater ornament in the noble spectacle of the exiles. For the most distinguished and influential of the citizens, crowned with garlands, followed in the procession, calling Sulla their saviour and father, since indeed it was through him that they were returning to their native city and bringing with them their wives and children (transl. B. Perrin).

[106] Plut., *Pomp.*, 45.3: ἀναφέρεται δὲ εἰς τὸ δημόσιον ταμιεῖον ἐν νομίσματι καὶ κατασκευαῖς ἀργυρίου καὶ χρυσίου δισμύρια τάλαντα. He was bringing into the public treasury in coined money and vessels of gold and silver twenty thousand talents (trans. B. Perrin). Also D.S. 40.4 and Vell. 2.40.3. Melville Jones 1993, no. 358, commentary.

[107] Presence of cistophori in Pompey's triumph: Cic. *Att.* 2.6.2: sed ut ad rem, scripsi ad quaestores urbanos de Quinti fratris negotio. vide quid narrent, ecquae spes sit *denarii* an cistophoro Pompeiano iaceamus. But to keep to the point, I have written to the urban quaestors about my brother Quintus's business. See what they say, whether there is any hope of (payment in) *denarii*, or whether we are to be lumbered with Pompey's *cistophorus* (transl. J.R. Melville Jones). Date of Pompey's triumph: Plin., *HN*, 8.26.98; 33.15.1; 37.13. Liv., *Per.* 103. D.C. 37.21.1. Val. Max. 8.15.8.

[108] The same combination of coins and bullion should be hypothesized for the payment of ordinary Asian tributes: Carbone 2020a, p. 232-235 (with bibliography); Carbone 2020c.

ments."[109] Finally, in an important article, F. de Callataÿ convincingly suggested that – especially for what concerns war-related exactions – monetized metal (*signati*) played a rather minor role compared to bullion (*infecti*) or plate and ornaments (*facti*).[110] Thus, the enormous amount of 20,000 talents amassed by Lucullus on Sulla's behalf was mostly composed of non-coined precious metals.

We also learn from the same Plutarchean passage that Lucullus was actually ordered to strike coins (νόμισμα κόψαι) in Asia. Since *cistophori* were the silver currency overwhelmingly produced and circulating in the province up to the 40s BCE, it can be inferred that the coins struck by Lucullus were indeed *cistophori*.[111] Their production shows a clear increase in the years between the end of the First Mithridatic War and the end of Lucullus' *praetura* in 81-80 BCE.[112] Such an increase was probably caused by the necessity of paying the extraordinary tribute and there seems to be a correlation between the return of Lucullus to Italy in 80 BCE and the decrease in the production of coinage in Asia. The presence of a Sullan Era on Tralles' *cistophori* and the spike in their production in the years right after the Peace of Dardanus provides a further hint in the direction of a correlation between coinage and Sulla's demands.[113]

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[109] Ap. *BC* 5.1.6: οἱ δὲ Ἕλληνες ἔτι λέγοντος αὐτοῦ ταῦτα ἐρρίπτουν ἑαυτοὺς ἐς τὸ ἔδαφος, ἀνάγκην καὶ βίαν ἐς αὐτοὺς ἐκ Βρούτου καὶ Κασσίου γενομένας ἐπιλέγοντες οὐκ ἐπιτιμίων ἀξίας εἶναι, ἀλλ᾽ ἐλέου, δόντες δ᾽ ἂν τοῖς εὐεργέταις ἑκόντες ἀπορεῖν διὰ τοὺς πολεμίους, οἷς οὐ τὰ χρήματα μόνον, ἀλλὰ καὶ τὰ σκεύη καὶ τοὺς κόσμους ἐσενεγκεῖν ἀντὶ τῶν χρημάτων, τοὺς δὲ αὐτὰ παρὰ σφίσιν ἐς νόμισμα χαλκεῦσαι. The Greeks, while he was still speaking, threw themselves upon the ground, declaring that they had been subjected to force and violence by Brutus and Cassius, and that they were deserving of pity, not of punishment; that they would willingly give not only their money, but, in default of money, their plate and their ornaments, and who had coined these things into money in their presence. (trans. H. White). For a comprehensive discussion of Brutus and Cassius's treatment of *provincia Asia* see Kirbihler 2013.

[110] Callataÿ 2006, esp. p. 40-42.

[111] Carbone 2020a, pp. 33-34, 197 (with bibliography) and 222-226.

[112] Ephesus: Callataÿ 1997, p. 177-178 (with a double cornucopia as a control mark). According to p. 178 graph 1 the cistophoric production in Ephesus increased from 6 observed tetradrachm obverse dies in 84/83 BCE to 13 in 82/81 BCE with a sudden decrease to 4 in 81/80 BCE. *Contra* Kinns 1987, p. 110-112 (who doubted the real possibility of identifying the currency struck under Lucullus).

[113] Sullan Era on Asian coinage: Leschhorn 1993, p. 421-423. For Sulla's punishment of Tralles and its consequences on the monetary production of the city, see Carbone 2020a, pp. 197-199, 200-201 (Sullan Era on Trallian coinage) and 215-218.

Fig. 23 – Tralles, cistophorus dated to 85/84 BCE – Carbone 2020 Tralles XXXII – 12.55 g (ANS 2015.20.1459)

Table 17 presents the estimates for the cistophoric production of the mint of Tralles in the years right after Dardanus. As already remarked, the cistophoric issues included here are identified by the so-called Sullan Era, which began in 85/84 BCE. In the case of Tralles, these Sullan issues went on until at least 78/77 BCE. [114]

Magistrate	Coins	Dies	of which singletons	Die estimate	Coverage rate (%)
ΠΤΟΛ (85/84 BCE)	21	6	0	6	100
ΠΤΟΛ Β (84/83 BCE)	25	8	0	8	100
ΠΤΟΛ Γ (83/82 BCE)	19	6	1	7.38	94
ΠΤΟΛ Δ (82/81 BCE)	25	7	0	7	100
ΠΤΟΛ Ε 81/80 BCE)	9	4	0	4	100
ΠΤΟΛ Ϛ (80/79 BCE)	6	3	1	4.8	83
ΠΤΟΛ Ζ (79/78 BCE)	2	2	2	–	–
ΠΤΟΛ Η (78/77 BCE)	4	2	0	2	100

Table 17 – Cistophoric production in Tralles in the years 85-78 BCE (Carbone 2020a, p. 217, table 11.11)

One of us has elsewhere argued that – given at least two reliable die studies – hoard studies could provide a useful proxy for the relative and absolute importance of the cistophoric mints in Asia. [115] Table 18 provides the proportions between these mints, based on the study of 18 cistophoric hoards buried between 105 and 58 BCE. [116]

[114] Carbone 2020a, p. 136-140 Issues XXXII-XXXIX (tetradrachms); p. 143-144 Issues VI-XII (didrachms) and p. 147 Issues IX-X (drachms).

[115] Discussion of the reliability of the study of the hoards dated 105-58 BCE for the estimate of the entire cistophoric production of the *Provincia Asia*: Carbone 2020a, p. 222-228 building upon Callataÿ 1995, p. 292-293. For the reasons for choosing 105 BCE as a starting date for the analysis see Carbone 2020a, p. 38-45.

[116] Cistophoric hoards: *IGCH* 1466 (Asia Minor, 100-50 BCE), *IGCH* 1467 (Asia Minor, 100-50 BCE), *IGCH* 1456 (Asia Minor, 105-100 BCE), *IGCH* 1458 (Asia Minor, *c.* 100 BCE), *IGCH* 1459

Mint (*c.* 105 – *c.* 58 BCE)	Number of specimens in hoards	Percentage of specimens per mint in hoards (%)
Pergamum (105 – *c.* 58 BCE)	1,283	48.5
Ephesus (105 – 67 BCE)	590	22.3
Tralles (105 – *c.* 60 BCE)	381	14.4
Apamea (*c.* 90 – *c.* 60 BCE)	162	6.1
Laodicea (*c.* 90 – *c.* 60 BCE)	192	7.3
Nysa (85 – 62 BCE)	22	0.8
Sardis	13	0.5
Smyrna	3	0.1
Adramyteum	1	0.04
TOTAL	**2,647**	**100.—**

Table 18 – Quantitative overview of late cistophoric specimens included in hoards (Carbone 2020a, p. 227, Table 12.2).

Based on these data, it is possible to estimate the cistophoric production of the whole of *provincia Asia* in the years 85/84-82/81, which are the years between the Peace of Dardanus and the celebration of Sulla's triumph in 81 BCE. [117]

Year	Esty Estimate of obverse dies	Total in *denarii* (@ 20,000 cistophoric tetradrachm coins per die worth 60,000 *denarii*) and in silver talents [118]
85/84 BCE	42.85	2,571,300 = 428.55 talents
84/83 BCE	57.14	3,428,400 = 571.4 talents
83/82 BCE	52.71	3,162,600 = 527.1 talents
82/81 BCE	50	3,000,000 = 500 talents
TOTAL	**202.7**	**12,162,300 = 2,027.05 talents**

Table 19 – Calculation of cistophoric production in Asia based on Carbone 2020a, p. 227 table 12.2

(Asia Minor, *c.* 95 BCE), *IGCH* 1460 (Asia Minor, *c.* 95-90 BCE), Carbone 2020a (Asia Minor, 90/89 BCE), *IGCH* 1461 (Asia Minor, *c.* 88 BCE), *IGCH* 1462 (Asia Minor, *c.* 85-80 BCE), *CH* X 341 (Smyrna, 89-88 BCE), *IGCH* 1383 = *CH* II 113 (Giresun, *c.* 80 BCE), *IGCH* 1358 = *CH* V 52 (Karacabey, *c.* 75 BCE), *CH* IX 558 (Gridia, *c.* 75 BCE), *IGCH* 1415 (Afyon Karahisar, 70-60 BCE), *IGCH* 1359 (Çesme, *c.* 70-65 BCE), *CH* VIII 521 (East coast of Antikythera, *c.* 75-50 BCE), *CH* IX 560 (Mysia, *c.* 70 BCE), Çankaya & Köker 2011 (Dumancık, 67 BCE), *CH* VIII 447 = 525 = 526? (Unknown, *c.* 58-57 BCE).

[117] Sulla's triumph (81 BCE): Plut. *Sulla* 34.1.

[118] 1 talent = 6,000 *denarii* and 1 *cistophorus* = 3 *denarii.* Festus, s. u. 'Talentorum': *Atticum (scil. talentum) est sex milium denarium; Rhodium et cistophorum quattuor milium et quincentorum denarium.*

Table 19 shows that *cistophori* were issued in the enormous amount of 202.7 tetradrachm obverse dies between 85 and 81 BCE. This amount roughly corresponds to 12,162,300 *denarii*, a figure very close to the lower end of the production estimate for *RRC* 359/2 and 367/1, 3 and 5 (13.3 – 21.3 million *denarii*).

d. Some preliminary conclusions

Building upon the data that have just been presented, it is possible to draw a few preliminary conclusions. As already remarked, the absence of a functional network of *publicani* in Asia enabled Sulla to have much more direct access to tribute than might have been possible otherwise. Our calculations suggest that in the years between the end of the First Mithridatic War and his final triumph in 81 BCE, the mint of Athens and the province of Asia delivered in Sulla's hands coined silver with the approximate value of 18,560,600 *denarii*. [119] The silver coinage issued in Athens and in Asia in the crucial years between Chaeronea and the final triumph of Sulla was thus in larger quantities than *RRC* 359/2 and 367/1, 3 and 5, which 'only' totaled 837 estimated obverse dies, approximately corresponding to 16,740,000 *denarii*.

Moreover, coined silver in Asia probably corresponded to only one tenth of the 20,000 talents extracted by Lucullus on behalf of Sulla. The lavish description of Sulla's triumph in 81 BCE offered by Plutarch suggests that the *dictator* had access to enormous resources and the quantitative analyses pursued in the previous pages confirm this scenario. [120] The *comparandum* of Pompey's triumph twenty years later, where 20,000 talents of coined silver and bullion were displayed, offers a probable equivalent for Sulla's triumph. [121] Sulla's resources, both in terms of coined silver and bullion, were thus more than adequate to finance his armies, even if the volume of Sullan issues was not comparable to the one produced by the college of moneyers of 82 BCE. [122]

While only metallurgical analyses will hopefully allow to settle the question in a definitive way, the quantitative analyses pursued in the second part of this paper made the Eastern provenance of the bullion used for *RRC* 359/2 and *RRC* 367/1, 3 and 5 very likely. In sum, M.H. Crawford was right when he suggested that *RRC* 359/2 (and possibly *RRC* 367/1, 3 and 5) "were made with metal from the Greek world, presumably in large measure melted down booty". [123] The bullion to produce these coinages did indeed come from the East, and it was further integrated by silver coinages produced in Athens and in Asia.

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[119] Athens: Table 20. Province of Asia: Table 23.

[120] Plut., *Sulla* 34.1.

[121] Plut., *Pomp.*, 45.3.

[122] Cf. Table 4

[123] Crawford 2000, p. 124.

Conclusions

The analyses pursued in this paper have aimed at showing what RRDP can tell us about patterns of production in its present state and also how we might best target future analysis to increase its utility.

In the first section, RRDP provided the data to establish the size of the coin production of seven complete *collegia* of *triumviri monetales*, stretched through almost fifty years. While the coverage for most of these issues was low, RRDP nevertheless allows us to convincingly establish their relative sizes. The initial amount of coin struck in 79 BCE was in the same range as high estimates for the years 118-117 BCE (*RRC* 283) and low estimates for the year 117-116 BCE (*RRC* 284), but probably slightly less than was struck in whatever year in the late 90s BCE, *RRC* 335 should be assigned. The overall amount of coin struck in 79 BCE including SC issues is likely to be on a scale similar to low estimates for whatever year *RRC* 299 should be assigned (*c.* 102-101 BCE?). However, it is almost certainly far (perhaps 50%) less than the two Cinnan era issues discussed. While our quantification is not precise and will never be exact, we are moving in the direction of more and more accurate relative statements of scale and estimates of production. Only for one college, presumably dated to 79 BCE, RRDP provides exceptionally good coverage and thus it was possible to estimate that an amount comprised between 13.5 and 14 million coins were struck. The vast majority of the production of this year is marked SC and thus we must assume that this exceptional issue received further authorization to strike additional coinage above the original allocation. As already noticed, the breakdown would be about 4 million for the normal annual allocation of funds and some 10 million in additional striking to meet some need, perhaps rebuilding efforts in the city, or to fund the war against Sertorius, or something else entirely and now lost to the historical record. Moreover, the aid of RRDP proved fundamental for the study of the control mark systems adopted by the Roman mint in the Late Republic. This system can help us potentially test and refine our existing models for die estimates, similar to how the Crepusius issue (*RRC* 361/1) has been used in light of Buttrey's detailed die study.

The second section integrated the RRDP data for *RRC* 359/2 and *RRC* 367 to revisit the scale of these two Sullan issues in contrast with Crawford's proposed estimates, but also in light of what we know from other studies about Sullan issues at Athens and cistophoric production in Asia. The aid of the RRDP archive proved fundamental in ascertaining that the production size of *RRC* 359/2 and 367/1, 3 and 5 was far greater than previously estimated. Furthermore, it allowed a comparison between these Sullan issues and the contemporary coinages produced at Athens and in the province of Asia. This comparison suggested that Sullan Roman Republican issues and the 'Sullan' coinages issued in Athens and in the province of Asia between 85 and 81 BCE were of similar size. Integrated with the available literary sources, the production data deriving from different mints allowed us to see historical pro-

duction beyond a single mint and begin to understand better the scale of the striking necessary to fund Sulla's march on Rome.

In sum, while the further expansion of the coverage for the issues discussed here will give better points of comparison going forward, the data included in the RRDP archive already offers a fundamental tool to establish the relative size of the coin issues produced in crucial years for the history of the Roman Republic and have helped placing the production of the Roman mint in a wider Mediterranean context.

Appendix: Additional Crepusius Tables

16	75	140	221	286	339	398	463	481	499	516
27	80	145	227	288	342	420	465	482	504	517
34	89	147	236	290	349	421	468	483	505	
38	95	149	252	299	351	426	471	484	508	
39	127	156	259	304	372	431	474	486	510	
46	130	177	268	312	373	445	478	489	512	
57	136	183	283	334	382	452	479	490	513	
60	139	193	285	338	397	453	480	491	515	

Table A.1 – Reverse control mark numbers anticipated based on the sequence for RRC 361 reverses, but not observed in RRDP or attested by Buttrey (converted into Arabic numerals)

41	138	195	228	265	352	375	424	469	485	495	503
59	146	200	233	270	354	380	439	472	487	496	506
102	154	214	234	280	356	386	449	473	488	498	507
109	164	215	245	302	357	411	450	475	492	500	509
115	180	222	260	323	360	422	466	476	493	501	511
134	185	223	264	350	363	423	467	477	494	502	514

Table A.2 – Reverse control mark numbers for RRC 361 reverses, seen or attested to only once in RRDP and/or by Buttrey (converted into Arabic numerals)

Bibliography

Abbott & Johnson 1926 = F.F. Abbott & A.C. Johnson, *Municipal Administration in the Roman Empire*, Princeton.

Assenmaker 2010 = P. Assenmaker, *De la victoire au pouvoir. Développement et manifestations de l'idéologie impératoriale à l'époque de Marius et Sylla*, Louvain-la-Neuve (unpublished PhD thesis).

Assenmaker 2013 = P. Assenmaker, L. Sulla *imperator* et *imperator iterum* : pour une réévaluation de la chronologie des émissions monétaires de Sylla (*RRC* 367, 368 et 359), *RN* 170, p. 247-277.

Assenmaker 2016 = P. Assenmaker, Zur Datierung der stadtrömischen Münzprägung der Jahre 88-82, in: F. Haymann, W. Hollstein & M. Jehne (eds.), *Neue Forschungen zur Münzprägung der Römischen Republik*, Bonn, p. 99-123.

Assenmaker 2017 = P. Assenmaker, La frappe monétaire syllanienne dans le Péloponnèse durant la première guerre mithridatique : retour sur les monnaies 'luculliennes', in: E. Apostolou & C. Doyen (eds.), Το νόμισμα στην Πελοπόννησο. Νομισματοκοπεία, εικονογραφία, κυκλοφορία, ιστορία. Από την Αρχαιότητα έως και τη Νεότερη Εποχή. Athens, p. 411-424.

Badian 1968 = E. Badian, *Roman Imperialism in the Late Republic*, Ithaca.

Badian 1972 = E. Badian, *Publicans and Sinners: Private Enterprise in the Service of the Roman Republic,* Ithaca.

Bahrfeldt 1923 = M. von Bahrfeldt, *Die Römische Goldmünzenprägung während der Republik und unter Augustus. Eine chronologische und metrologische Studie*, Halle.

Bălănescu & Rogozea 1983-1985 = D. Bălănescu & P. Rogozea, Notă suplimentară asupra tezaurului monetar republican de la Tincova, jud. Caraş-Severin, *Buletinul Societăţii Numismatice Române* 131-133, p. 109-113.

Bloch 1963 = M. Bloch. *The historian's craft*, New York.

Botrè & Fabrizi 1994-1995 = Cl. Botrè & E. Fabrizi, La monetazione aurea nella Roma repubblicana (250-50 a.C.), *Rivista Italiana di Numismatica e Scienze Affini* 96, p. 37-45.

Bresson 2006 = A. Bresson, The Athenian mint in the second century BCE and the Amphictyonic decree, *Annali dell'Istituto Italiano di Numismatica* 52, p. 45-85.

Brizzi 2002 = G. Brizzi, *Silla*, Roma.

Brunt 1956 = P.A. Brunt, Sulla and the Asian Publicans, *Latomus* 19, p. 17-25 (= Brunt 1990, *Roman Imperial Themes*, Oxford, p. 1-8).

Burnett 1977 = A. Burnett, The authority to coin in the late Republic and early Empire, *NC* 137, p. 37-63.

Buttrey 1993 = T.V. Buttrey, Calculating ancient coin production: I. Facts and fantasies, *NC* 153, p. 335-351.

Buttrey 1994 = T.V. Buttrey, Calculating ancient coin production: II. Why it cannot be done, *NC* 154, p. 341-352.

Buttrey 2011 = T.V. Buttrey, Quantification of ancient coin production, the third element, in: F. de Callataÿ (ed.), *Quantifying monetary supplies in Greco-Roman times*, Bari, p. 105-113.

Callataÿ 1995 = F. de Callataÿ, Calculating Ancient Coin Production: Seeking a Balance, *Numismatic Chronicle* 155, p. 289-311.

Callataÿ 1996 = F. de Callataÿ, *Les monnaies grecques et l'orientation des axes*, Milan.

Callataÿ 1997 = F. de Callataÿ, *L'histoire des guerres mithridatiques vue par les monnaies*, Louvain-la-Neuve.

Callataÿ 2004 = F. de Callataÿ, Le monnayage d'argent émis par les Ainianes au type d'Athéna Parthénos, *Coins in the Thessalian Region. Mints, Circulation, Iconography, History Ancient, Byzantine, Modern*, Athens, p. 125-156.

Callataÿ 2006 = F. de Callataÿ, Réflexions quantitatives sur l'or et l'argent non monnayés à l'époque hellénistique (pompes, triomphes, réquisitions, fortunes des temples, orfèvrerie et masses métalliques disponibles), in : R. Descat *et al.* (eds.), *Approches de l'économie hellénistique,* Saint-Bertrand-de-Comminges, p. 37-84.

Callataÿ 2011a = F. de Callataÿ, *Quantifying monetary supplies in Greco-Roman times*, Bari.

Callataÿ 2011b = F. de Callataÿ, Quantifying monetary production in Greco-Roman times: a general frame, in: F. de Callataÿ (ed.). *Quantifying monetary supplies in Greco-Roman times*, Bari, p. 7-31.

Callataÿ 2012 = F. de Callataÿ, Control marks on Hellenistic royal coinages: use, and evolution towards simplification?, *Revue belge de Numismatique* clviii, p. 39-62.

Callataÿ 2015 = F. de Callataÿ, The late Hellenistic didrachms of Leukas: another case of Greek coinage for the Roman army, in: P. van Alfen, G. Bransbourg & M. Amandry (eds.), *FIDES. Contributions to Numismatics in Honor of Richard B. Witschonke*, New York, p. 239-270

Callataÿ 2016 = F. de Callataÿ, The coinages struck for the Romans in Hellenistic Greece: A quantified overview (mid 2nd-mid 1st c. bce), in: F. Haymann, W. Hollstein & M. Jehne (eds), *Neue Forschungen zur Münzprägung der Römischen Republik,* Bonn, p. 315-338.

Callataÿ *forthcoming* = F. de Callataÿ, The Yehud Coinage: An Essay on Quantification.

Camp *et al.* 1992 = J. Camp, M. Ierardi, J. McInerny, K. Morgan & G. Umholtz, A Trophy from the Battle of Chaeroneia of 86 bc, *American Journal of Archaeology* 96, p. 443-455.

Çankaya & Köker 2011 = A. Çankaya & H. Köker, Dumancık Kistophor Definesi, *Adalya* 14, p. 63-70.

Carbone & Yarrow 2019 = L.F. Carbone & L.M. Yarrow, Opening Access to Roman Republican Die Studies, *ans Magazine* 3, p. 6-19

Carbone 2020a = L.F. Carbone, *Hidden Power*, New York.

Carbone 2020b = L.F. Carbone, The Introduction of Roman Coinages in Asia (133 bce-1st century ad), in: R.H.J. Ashton & N. Badoud (eds.), *Graecia capta ? Rome et les monnayages de l'Égée aux IIe-Ier s. av. J.-C.* Basel (forthcoming).

Carbone 2020c = L.F. Carbone, Roman taxation and monetary production: the case of the Provincia Asia up to 48 bc, in: M. Kelly & P. Pachà (eds.), *Capitalism's Past* (https://capitalismspast.org) (*forthcoming*).

Carter 1983 = G.F. Carter, A simplified method for calculating the number of dies from die-link statistics, *ansmn* 28, p. 195-206.

Catalli 2001 = F. Catalli, *La monetazione romana repubblicana*, Roma.

Clark 2007 = A. Clark, *Divine qualities: cult and community in Republican Rome*, Oxford.

Cornwell 2017 = H. Cornwell, *Pax and the politics of peace: Republic to Principate*, Oxford.

Cottier 2008 = M. Cottier (ed.), *The Customs Law of Asia*, Oxford.

Crawford 1974 = *RRC* = M.H. Crawford, *Roman Republican Coinage*, Cambridge.

Crawford 2000 = H. Crawford, The Sullan and Caesarian Periods, in: W. Hollstein (ed.), *Metallanalytische Untersuchungen an Münzen der Römischen Republik*, Berlin, p. 124-129.

Davies 2017 = P. Davies, *Architecture and Politics in the Roman Republic*, Cambridge.

Debernardi *et al.* 2018 = P. Debernardi, A. Campana, R. Lippi & M. Passehl, I denari di L. CENSOR con simboli/lettere (*RRC* 363/1a-c), *Monete Antiche* 102, p. 12-34.

De Martino 1983 = F. De Martino, Il *Senatus Consultum de agro Pergameno*, *La parola del passato* 210, p. 161-190.

Depeyrot 1993 = G. Depeyrot, La république romaine, in: F. Callataÿ, G. Depeyrot & L. Villaronga, *L'argent monnayé d'Alexandre le Grand à Auguste*, Bruxelles, p. 75-89.

Di Stefano 1998 = G. Di Stefano, Una nuova edizione del Senatus Consultum de agro Pergameno, *RAL* 9.9, p. 707-748.

Esty 2006 = W.W. Esty, How to estimate the original number of dies and the coverage of a sample, *Numismatic Chronicle* 166, p. 185-215.

Esty 2011 = W.W. Esty, The geometric model for estimating the number of dies, in: F. de Callataÿ (ed.), *Quantifying monetary supplies in Greco-Roman times*, Bari, p. 43-58.

Faucher *et al.* 2009 = T. Faucher, F. Tereygeol, L. Brousseau & A. Arles, À la recherche des ateliers monétaires grecs : l'apport de l'expérimentation, *Revue Numismatique* 165, p. 43-80.

Frier 1967 = B.W. Frier, Augural Symbolism in Sulla's Invasion of 83, *ANSMN* 13, p. 111-118.

Frier 1969 = B.W. Frier, Sulla's Priesthood, *Arethusa* 2, p. 187-199.

Frier 1971 = B.W. Frier, Sulla's Propaganda: The Collapse of the Cinnan Republic, *AJPh* 92, p. 585-604.

Gruen 1984 = G. Gruen, *The Hellenistic World and the Coming of Rome*, Berkeley, Los Angeles & London.

Hammond 1938 = N.G.L. Hammond, The Two Battles of Chaeronea (338 BC and 86 BC), *Klio* 31, p. 186-218.

Hersh 1952 = C.A. Hersh, Sequence marks on the *denarii* of Publius Crepusius, *Numismatic Chronicle* 6th series, vol. 12, p. 52-66.

Hersh & Walker 1984 = C.A. Hersh & A. Walker, The Mesagne hoard, *ANSMN* 29, p. 103-134.

Hollstein 1990 = W. Hollstein, *Die stadtrömische Münzprägung der Jahre 78-50 v. Chr. zwischen politischer Aktualität und Familienthematik: Kommentar und Bibliographie*. München.

Hollstein 2000a = W. Hollstein, Exkurs: die Bedeutung der Stempelstellung für die Münzprägung der Römischen Republik, in: W. Hollstein (ed.), *Metallanalytische Untersuchungen an Münzen der Römischen Republik*, Berlin, p. 133-136.

Hollstein 2000b = W. Hollstein, Die Stempelstellung: ein ungenutztes Interpretationskriterium für die Münzprägung der römischen Republik, in: B. Kluge & B. Weisser (eds.), *XII. Internationaler Numismatischer Kongress Berlin 1997*, Berlin, p. 487-491.

Hölscher 2006 = T. Hölscher, The transformation of victory into power: From event to structure, in: S. Dillon & K.E. Welch (eds.), *Representations of war in ancient Rome*, Cambridge, p. 27-48.

Howgego 2009. = C. Howgego, Some numismatic approaches to quantifying the Roman economy, in A.K. Bowman & A.I. Wilson (eds.), *Quantifying the Roman economy: methods and problems*, Oxford, p. 287-295.

Kallet-Marx 1995 = R.M. Kaller-Marx, *Hegemony to empire: the development of the Roman Imperium in the East from 148 to 62 BC*, Berkeley.

Kay 2014 = P. Kay, *Rome's Economic Revolution*, Oxford.

Keaveney 1982 = A. Keaveney, Sulla *Augur*: Coins and Curiate Law, *American Journal of Ancient History* 7, p. 150-171.

Kirbihler 2013 = F. Kirbihler, Brutus et Cassius et les impositions, spoliations et confiscations en Asie mineure durant les guerres civiles (44-42 a.C.), in: M.-C. Ferriès & F. Delrieux (eds.), *Spolier et confisquer dans les mondes grec et romain*, Chambéry Cedex, p. 345-367.

Kremydi-Sicilianou 2004 = S. Kremydi-Sicilianou, Hoard evidence from Thessaly in the second and first centuries BCE: from a 'multi-currency' to a 'double-currency' system, in: [Collective], *Coins in the Thessalian region. Mints, circulation, iconography, history. Ancient, Byzantine, Modern*, Athens, p. 235-258.

Leschhorn 1993 = W. Leschhorn, *Antike Ären. Zeitrechnung, Politik und Geschichte in Schwarzmeerraum und in Kleinasien nördlich des Taurus*, Stuttgart.

Lockyear 2007 = K. Lockyear, *Patterns and process in late Roman Republican coin hoards, 157-2 BC*, Oxford.

Lockyear 2018 = K. Lockyear, Mind the Gap! Roman Republican Coin Hoards from Italy and Iberia at the End of the Second Century BC, *Numismatic Chronicle* 178, p. 123-164.

Luce 1968 = T.J. Luce, Political Propaganda on Roman Republican Coins: circa 92-82 BC, *American Journal of Archaeology* 12, p. 25-39.

Mackay 2000 = C.S. Mackay, Sulla and the Monuments: Studies in his Public Persona, *Historia* 49, p. 161-210.

Magie 1950 = D. Magie, *Roman Rule in Asia Minor*, Princeton.

Martin 1989 = T.R. Martin, Sulla *Imperator Iterum*, the Samnites and Roman Republican Coin Propaganda, *SNR* 68, p. 19-45.

Matthaios & Papazarkadas 2014-2019 = A.P. Matthaios & N. Papazarkadas, Ἀολογία ἀγωνοθέτου τῶν Βασιλείων ἑκ Λεβαδείας, *Horos* 26-31, p. 159-192.

Mattingly 1972 = H. Mattingly, The Date of the *Senatus Consultum De Agro Pergameno*, *AJP* 93.3, p. 412-423.

Mattingly 1985 = H. Mattingly, Scipio Aemilianus and the Legacy of Attalus III, *LCM* 10, p. 117-119.

Mattingly 2004 = H. Mattingly, *From Coins to History*, Michigan.

Meadows & Williams 2001 = A. Meadows & J. Williams, Moneta and the monuments: coinage and politics in Republican Rome, *The Journal of Roman Studies* 91, p. 27-49.

Melville Jones 1993 = J. Melville Jones, *Testimonia Numaria: Greek and Latin Texts Concerning Ancient Greek Coinage: vol. I. Texts and Translations*, London.

Merola 2001 = G.D. Merola, *Autonomia Locale – Governo Imperiale*, Bari.

Moens 2017 = J. Moens, Reliability of the estimation methods of the total number of dies based on the Esty Model, *Revue belge de Numismatique* CLXIII, p. 365-412.

Noreña 2011 = C.F. Noreña, *Imperial ideals in the Roman West: representation, circulation, power*, Cambridge.

Passerini 1937 = A. Passerini, Le iscrizioni dell'Agorà di Smirne concernenti la lite tra i publicani e i Pergameni, *Athenaeum* 15, p. 252-283.

Pedroni 2006 = L. Pedroni, *Crisi finanziaria e monetazione durante la Guerra Sociale*, Bruxelles.

Petrovszky & Petrovszky 1981 = M. Petrovszky & R Petrovszky, Tezaurul de monede republicane romane de la Tincova (jud. Caraș-Severin), *Acta Musei Porolissensis* 5, p. 175-188.

Petzl 1985 = G. Petzl, Reste eines ephesischen Exemplars des Senatusconsultum de Agro Pergameno, *Epigraphica Anatolica* 6, p. 70-71.

Petzl 1987 = G. Petzl, *Inschriften von Smyrna II*, Bonn.

Picard 1957 = G.C. Picard, *Les trophées romains : contribution à l'histoire de la religion et de l'art triomphal de Rome*, Paris.

Pina Polo & Díaz Fernández 2019 = F. Pina Polo & A. Díaz Fernández, *The Quaestorship in the Roman Republic*, Berlin.

Price 1987 = M.J. Price, Southern Greece, in: A. Burnett & M.H. Crawford (eds.), *The coinage of the Roman world in the Late Republic*, Oxford, p. 85-103.

Ramage 1991 = E.S. Ramage, Sulla's Propaganda, *Klio* 73, p. 93-121.

Santangelo 2006 = F. Santangelo, *The impact of Sulla on Italy and the Mediterranean World*, PhD thesis, Université Catholique de Louvain.

Santangelo 2007 = F. Santangelo, *Sulla, the Elites and the Empire. A Study of Roman Policies in Italy and in the Greek East*, Leiden & Boston.

Sherk 1966 = R.K. Sherk, The Text of the Senatus Consultum de Agro Pergameno, *Greek, Roman, and Byzantine Studies* 7, p. 361-369.

Sherk 1984 = R.K. Sherk, *Roman Documents from the Greek East. Senatus Consulta and Epistulae to the Age of Augustus*, Baltimore.

Sherwin-White 1984 = A.N. Sherwin-White, *Roman Foreign Policy in the East*, London.

Speidel 2009 = M.A. Speidel, *Heer und Herrschaft im Römischen Reich der Hohen Kaiserzeit*, Stuttgart.

Sumi 2002 = G.S. Sumi, Spectacles and Sulla's public image, *Historia* 51.4, p. 414-432.

Thompson 1961 = M. Thompson, *The New Style Silver Coinage of Athens*, New York.

Tibiletti 1957 = G. Tibiletti, Rome and the Ager Pergamenus: the acta of 129 BC, *JRS* 47, p. 136-138.

Tselekas 2004 = P. Tselekas, Αθηναϊκά τετράδραχμα στη Θεσσαλία: η μαρτυρία των "θησαυρών", in: [Collective], *Coins in the Thessalian region. Mints, circulation, iconography, history. Ancient, Byzantine, Modern*, Athens, p. 207-222.

Witschonke 2012 = R. Witschonke, The use of die marks on Roman Republican coinage, *Revue belge de numismatique et de sigillographie* CLVIII, p. 63-84.

Wosnik 1963 = B. Wosnik, *Untersuchungen zur Geschichte Sullas*, Würzburg.

Woytek 2003 = B. Woytek, *Arma et Nummi. Forschungen zur römischen Finanzgeschichte und Münzprägung der Jahre 49 bis 42 v.Chr.*, Wien.

Yarrow 2006 = L.M. Yarrow, *Historiography at the End of the Republic: Provincial Perspectives on Roman Rule*, Oxford.

Yarrow *forthcoming* = L.M. Yarrow, *The Roman Republic to 49 BCE: Using Coins as Sources*, Cambridge.