CHAPTER 21

EQUIVALENCY VALUES AND THE COMMAND ECONOMY OF THE UR III PERIOD IN MESOPOTAMIA

ROBERT K. ENGLUND
UCLA

Abstract

The question of state imposition and monitoring of silver value equivalencies has fairly dominated discussions of the administrative history of late third-millennium B.C. Mesopotamia. A shekel of silver (ca. 8.33 g) fetched 300 liters of barley, 30 liters of fish oil, 10 liters of clarified butter, or a healthy sheep. Although silver was of imposing importance in mechanisms of exchange and wealth distribution within and across borders of ancient Babylonian states, central household accountants employed, with almost dizzying accuracy, a broad palette of equivalencies as part of their means of control of production. These included value and real equivalencies between such raw materials and finished products as milk and cheese or barley and flour, but most notably labor norms that determined the success or failure of teams of dependent workers engaged in all aspects of early household production. This contribution offers an overview of all such equivalency values documented in Ur III cuneiform accounts dating to ca. 2050–2000 B.C. It follows the emergence of labor value abstraction up the line to potentially generalized silver “wages” that characterized administrative texts of the following Old Babylonian period, and it addresses the likelihood of the imposition by state bookkeepers of state-level equivalencies in determining so-called bala taxation obligations levied by Ur on various neo-Sumerian provinces.
Introduction

Equivalencies come in many guises. We might put one apple here and one over there and claim the two are equivalent; they are physically equivalent, give or take, but more importantly they will satisfy our senses, our hunger, and our appetite in equal measure. We might rather say that both apples together have the same value as this sugar melon. We would then as soon eat, or just own, two apples as we would one melon. Or we might say: This apple is worth fifty cents and so is that one, and the melon one dollar. We have just abstracted from apples and melons to valuations placed on them by the orchard owner, the grocer, the local council, “supply and demand” and backed up by our social and economic order. We might command this equivalence ourselves if we are of a mind and powerful, or presumptuous enough to chance it. It is clear enough that the mechanisms of straightforward equivalencies, then of barter and finally money equivalencies, develop in a more or less linear fashion in history, though often disrupted by artificial mechanisms introduced by social agencies of various stripes or by conflict, natural catastrophes, and so on. One such artificial mechanism consists of imposed price controls that are generally derided in free market economies as an abuse of markets—above all an ineffective abuse. In times of crisis, however, the need to influence access to limited goods and services and to limit the ability of a few to profit from scarce resources—for instance, to control the price of strategic resources such as oil or steel during wartime—is generally accepted, even by the most libertarian of the Chicago School economists.

Economic, administrative, and ideological considerations have led to many such constraints on the unencumbered development or in many cases the crass manipulation of supply and demand, of commodities and labor. In the following, I would like to review and compare evidence in the cuneiform record that would appear to represent an engineered wage and price system based on relatively complex equivalency values that were, as a rule, only implicit factors in account calculations. These early testimonials to social-economic policies are often characterized as evidence of centralized oikos organization under the control of a very few privileged elites, recorded by their slightly more numerous middle-class scribes, to exploit large numbers of productive laborers. Yet the disparity in their relative privileges scarcely compares with modern counterparts. We are witnesses of late to an ever-growing gulf between high- and low-income Americans, and of differences among industrialized nations, threshold nations such as India and China, and the poor nations of much of Africa and Central America. The luck of birth makes a big difference in what you will earn. The wages paid seamstresses doing the same work in varying parts of the globe bear clear witness to this fact, with incomes of $90 per day in Sweden down to $1.50 in most of India (Englund 2012); women were not allowed to work for any wages in Afghanistan under the rule of the Taliban.
Since the time of Bismarck, social democratic policies among the economies of advanced industrial nations have acted to suppress the kind of excess that led to fabulous wealth alongside abject poverty in the nineteenth and early twentieth centuries. Across borders, the liberalization of markets, leveraged loans for capital programs, and economic aid to preindustrial nations were at least conceived as a means of achieving some alleviation of the suffering of many of the world’s poor. It is said that globalization will eventually care for an international leveling of wages and prices, which many—the have-nots—will view with favor, and many others—the Detroit autoworker or the German carpenter—will not. Within the borders of advanced nation-states, the check on excessive economic disparity has taken the form of a progressive tax system that redistributes, for the general good, wealth created by working classes and held by economic elites. A social democratic view would be that a progressive tax code will recognize the efforts of entrepreneurs and those who simply work more but will increasingly claim for the majority of citizens those revenues that a libertarian ideology would grant in unbridled measure to a cunning few. Adam Smith defended the concept of a progressive tax code in his *Wealth of Nations*, published in 1776, supporting tariffs on imports that would tax the rich more than the poor, something akin to a luxury tax, which has lost currency in the American lexicon.

In the United States, the tax rate on the highest earners has eroded in both Republican and Democratic administrations to the point now of a near flat tax of 35 percent for any earnings over $330,000, though itself rarely achieved in the face of massive avoidance schemes. We should remember that in the postwar years of the 1950s, 1960s, and 1970s, marginal rates on income over $200,000 ranged from 70 up to 91 percent. But during the Reagan/Bush I years, with the undying support of legions of those least likely to profit from such “tax reform,” those rates were reduced to as low as 28 percent. The Clinton administration, consistent with its roots in the right-leaning Democratic Leadership Council, championed the deregulatory policies of Goldman Sachs’s Robert Rubin, and Ayn Rand disciple Alan Greenspan. The government did raise marginal rates back to all of 39.6 percent on incomes over $255,000, but in its first term, the Democratic Congress made no change in long- or short-term capital gains rates, so critical to ensuring the disparity between the wealthy and all the rest, and in its second term, it actually agreed to lower those rates to 20 percent, matching Reagan at a level not seen since 1933. With his 1996 Personal Responsibility and Work Opportunity Reconciliation Act and his signing into law of the Financial Services Modernization Act of 1999, Clinton co-opted the policies of the then Republican majority and repealed Democratic social and banking legislation designed during the Great Depression to afford the poor a minimally responsive safety net and to guard against the financial instrument speculation that was tantamount to an act of massive fraud committed against the middle class—in the 1920s and during the period from 1980 to the present day. Thus even leading members of the Democratic Party, once social
progressives, speak today of no need to consider the ultimate value of a hedge fund manager’s labor but rather that the salary tied to this work should merely reflect corporate “results.”

The dismantling of progressive taxation in the United States, combined with the decline of unions and their collective bargaining power, has done its share to ensure quite striking wealth among a very few, while at the same time middle and low incomes have stagnated or retreated. The federal minimum wage in the United States is now a nominal $7.25 an hour (and thus on a continuing spiral downward since the inflation-adjusted FMW of $9.50 in the first year of the Nixon presidency; see generally Waltman 2008:128–146), translating into a yearly compensation of about $14,500, assuming full-time work and no illness, while the compensation paid to the now failed Countrywide Bank chief executive officer Frank Mozilo in 2007 was $142 million. Though he was only the seventh highest-paid CEO of that year, this income still represents 9,800 times the yearly compensation of the (federally indexed) lowest earners and is 13,110 times as much as the 2009 poverty threshold reported by the U.S. Department of Health and Human Services. (See <http://aspe.hhs.gov/poverty/09poverty.shtml>; the threshold, defined since the Johnson administration as demonstrating “insufficient income to provide the food, shelter and clothing needed to preserve health,” is $22,050 for a family of four.) In even more dramatic dimensions, the 20 top Wall Street fund managers earned an average of $658 million in 2006, according to Forbes.com.

It can be difficult to find relevant comparisons for these staggering numbers with some conception of absolute labor value in modern times—the more so when we think of earnings in past periods of our history. Socialist experiments in the nineteenth and twentieth centuries generally did a poor job of regulating prices and wages, thus making efforts to introduce any regulation of the U.S. economy through tax or other legislative policy an easy target for modern ideologues. Still, some efforts were clearly geared to facilitating social cohesion and a fair distribution of wealth. The liberal socialist experiment with wage regulations in the former Yugoslavia commanded that income rates of top managers, based on shop productivity, should not exceed eight times those of factory hall janitors. Simple wage comparisons between modern and less crass periods of our recent past can also be instructive. For instance, the Czech composer Antonin Dvorak was recruited in 1892 by the National Conservatory of Music with what was then considered a fabulous salary, $15,000 per year, the equivalent of about $350,000 today. If in current terms $15,000 is set as the yearly minimum wage in the United States, then Dvorak was offered—and received—about 23 times this amount. How, though, would we rank the New World Symphony against the speculative currency profits of a fund manager with a B.S. in math from Caltech?

The social compact represented by wages and assorted privileges of various classes of the workforce was thus a subject of quantitative engineering in some recent phases of economic development. In other, fancifully described as libertarian economies,
it was left to the whims of an often manipulated labor supply and demand. Such wage management is well known from Old Babylonian legal texts, for instance in the codes (Roth 2003):

Codex Ešnunna § 11: The wages of a day laborer are 1 shekel of silver, and 1 barig [about 60 liters] of barley as ration for service of one month.

Codex Hammurapi § 239: When an awilum hires a boatman, he will pay him 6 gur [about 1,800 liters] barley per year.

Codex Hammurapi § 257: When an awilum hires a field hand, he will pay him 8 gur [about 2,400 liters] barley per year.

Codex Hammurapi § 258: When an awilum hires an ox driver, he will pay him 6 gur [about 1,800 liters] barley per year.

Codex Hammurapi § 261: When an awilum hires a herder to watch over large and small cattle, he will pay him 8 gur [about 2,400 liters] barley per year.

Codex Hammurapi § 273: When an awilum hires a day laborer, he will pay him, from the beginning of the year through the fifth month, 6 grains of silver per day; from the sixth month until the end of the year, he pays 5 grains of silver per day [180 grains equals 1 shekel, about 8.33 g of silver].

**The Ur III Economy and Wage Structure**

I will restrict my remarks here to the Ur III period, dating to ca. 2100 to 2000 B.C. With its now approximately 96,000 published and probably as many unpublished texts, the 50-year phase of bookkeeping in the latter half of the Ur III period presents historians with an otherwise unknown wealth of documentation. Yet the lacunae in the records are very difficult to overcome. For one, we are not privy to the state archives, which must have been prepared and stored in the capital city of Ur. For another, despite recent publications (Dahl 2006; Maeda 1994, 1995; Sharlach 2003; Steinkeller 1987) and much effort expended in understanding it, we have still no clear picture of the system of domestic taxation, known in Sumerian as *bala* (“crossing over”; “term”). Nor do we understand the system of tributary payments (Sumerian *gun mada*, “load of the lands,” using specifically the Akkadian loan *mada* for “land”) or simple campaign plunder extracted from the regions surrounding Mesopotamia, particularly ancient Iran to the east. These are very significant failings that if removed would provide a backdrop for a better understanding of much of what we see in administrative documents that represent efforts of a restricted set of accountants overseeing, as a rule, the activities of households with a range of perhaps 500 to 1,000 or 2,000 dependents, with their various
supervisors and foremen, tradesmen, singers, bishops, clowns, dogs, and herded rats. This was the level of provincial households directed by *sangas* (temple managers) and *šabras* (managers of governors’ estates), which—since relatively self-sufficient, often based on family relationships, and partially autonomous—have been compared to the *oikos* households of Greek city-states. These included a ruling extended family and slaves, living together on one estate, often associated with extensive farmland tended by the slaves.

An important issue for a number of Ur III specialists has been to keep a running tally of Ur III value and labor equivalences that derive from only implied accountant calculations in cuneiform texts. As has been stated repeatedly, we may view such value equivalencies from several perspectives. In the first instance, we can assign relative values to objects and sets of objects based on both their intrinsic worth—food, animals, and so on—and on their nonintrinsic worth—rarity, presumed prestige, etc. In the second instance, we can describe equivalencies between producing agents (humans, farm animals, arable land, and so on) to products over some given length of time. Then, according to the labor theory of value (describing precapitalist societies and commonly abandoned in modern economics in favor of marginal utility as it applies to capitalism), the productive capacity of humans can be abstracted (via the value assigned to the products they make or assist in making, or other services they render) to include a valuation of their labor time—that is, to include wages.

We have good data that help reconstruct the system of wages, usually in the form of rations, paid to members of early Babylonian communities of the twenty-first century B.C. Dependent workers, called *guruš* (male laborer) and *geme₂* (female laborer), were much comparable to chattel slaves but were inalienable wards to the state and may thus be conveniently called corporate slaves. (The reader should be aware that the social and economic status of these men and women, and of individuals with the associated designations *erin₂, ug₁-IL₂*, and *dumu-gi₇*, has been the focus of a very long debate among Assyriologists and historians from related fields; for easily accessible reviews of the relevant literature, compare Englund 2009:note 10; Koslova 2008; Studevent-Hickman 2008.) These laborers made up the large majority of the workforce and received, next to yearly disbursements of clothing and, though undocumented, probably some form of living accommodation, a monthly ration of on average 30 liters of barley for women and 60 for men (Gelb 1965; Monaco 1985–1986; Waetzold 1987, 1988). Unskilled day laborers (Sumerian *lu₂ ḫum-ga₄*) were accorded wages of about three times as much, although as irregular and part-time workers they would not have received additional remuneration; nor would they have enjoyed the safety net—including rations and care while ill, and lessened work norms in advancing age—represented by the large households of which corporate slaves were members. Thus we may peg the normed wage of the lowest rung of workers in the Ur III period at about 200 liters of barley per month.

Many thousands of tablets attest to this system of wages for lowest earners, but
those describing higher levels of income are rare and are in any case to be understood as partial views of third-millennium privilege, where, as in so many other eras, oligarchic land grants and usury may have been major sources of largely unquantifiable individual enrichment. One such rare account is found in the text displayed in Figure 21.1 (Deimel 1916; Englund 1990:60–63). This record from Girsu (modern Telloh) in southern Mesopotamia documents presumed disbursements of grain to the upper and middle management of large households, ranging from 200 gur per year (or about 5,000 liters of grain per month) given to the highest-paid officer (Sumerian šabra) down to 250 liters of grain given out monthly to gardeners and to foremen of couriers and “throne bearers” (assuming that lines i 10–12 were based on four of the former and two each of the latter named categories). (In his treatment of account BM 23622+28004, Maekawa [1986, 1999:83, number 17] demonstrates that the eighth household listed in HSS 4, 4, that of the divinized Namḫani, had two “chief accountants.”) Accordingly, our household director received on the order of 20 times as much as the worst-paid management staff and 25 times the income of the lowest-paid hireling or corporate slave. In simplistic terms of multiples of various wage earners, that would place this ancient manager of the largest oikos household in Girsu at a modern U.S. income of very roughly $375,000—very comfortable to be sure but perhaps not reflective of an obscene disparity either.

1. 3(geš₂) 2(u) še gur lugal
2. šabra
3. 2(u) nu-bandā₁ gu₂ 2(u) gur-ta
4. 1(geš₂) 4(u) ša₃₁-dub-ba
5. 1(geš₂) 4(u) sa₃₁-du₃
6. 1(geš₂) 4(u) ka-guru,
7. 1(4(u) dub-sar gu₄¹ apin
8. 1(4(u) šar₂¹-ra-ab-du
9. 1(geš₂) 4(u)₁ nu-bandā₁ erin₂-na
10. 1(4(u)₁ lu₂ SAR-me
11. 2(u) ugula-geš₂ kas₄-me
12. 1²(u) ugula-geš₂ gu-za-la₅-me
13. 1¹(geš₂) 4(u)₁ la₂ 2(diš) engar 1(u)₅(as)-ta
14. 4(geš’u) 3(geš₂) 5(u) gur
15. 1²(e₂₁ d nin-gir₂⁻¹su₁

200 royal gur of barley
for the chief household administrative
20 oxen managers at 20 gur each;
100 [gur for the] chief bookkeeper[s];
100 [gur for the] chief surveyor[s];
100 [gur for the] silo manager[s];
40 [gur for the] scribe[s] of the plough oxen;
40 [gur for the] šarrabdu[s];
100 [gur for the] manager[s] of the labor troops;
40 [gur for the] vegetable gardeners;
20 [gur for the] “60-foreman” of the couriers;
20 [gur for the] “60-foreman” of the “throne bearers”;
98 ploughmen at 15 [gur] each;
[totals:] 2,630 gur;
the household of [divine] Ningirsu.
Tracking Equivalency Values

In addition to facilitating the understanding of Sumerian accounting tools that makes such speculation about wage levels credible, the evidence for a wide-ranging set of equivalency values employed throughout the Ur III administrative apparatus offers a strong framework for the study of ancient accounting and early mathematical thinking. In this it is important to consider the philological markers that reflected the usually implicit understanding of equivalencies by the empire’s scribes. To follow their calculations, even the casual learner of Ur III texts needs understand little more than some basic mathematics and how to use the search engines of the online Ur III databases. Both the Database of Neo-Sumerian Texts (BDTNS), directed by Manuel Molina of the Consejo Superior de Investigaciones Científicas (Madrid), and the Cuneiform Digital Library Initiative (CDLI; Los Angeles/Berlin) have in the past decade made a wealth of online data available for the study of neo-Sumerian accounts.

Reverse iii

11’. še geš ra sanga šabra-ne  *Threshed barley of the priests and chief household administrative officers*

12’. iti GAN₂-maš  *month: “GANmaš,” [first month, Girsu calendar]*

13’. mu us₂-l-sa₁ ²[³amar]-⁴suen ¹lugal¹  *year following: “Amar-Suen became king” [AS 2]*

**Figure 21.1.** An Ur III-period rations account from Girsu (*HSS* 4, 4). The “wages” of the managerial officers were in fact calculated based on the number of oxen managers and therefore ultimately on the number and size of fields in cultivation in each household listed in the full text. In the subsection describing the household of the tutelary divinity of Girsu, the basis was 20 oxen managers. Thus $20 \times 10 = 200$ *gur* assigned to the chief household administrator, $20 \times 5$ assigned to the chief bookkeeper, and so on. Maekawa 1987:37–41 speaks of 5–6 *bur* domain land per ploughman, five of whom answered to each oxen manager in Umma. Transferred to Girsu, this relationship implies Ningirsu domain holdings of $(20 \times 5 \times 5 =) 500$ *bur*, which in turn translates into planned harvests of $(500 \times 30 =) 15,000$ *gur* for this household, dependent on fallow.
In the case of the CDLI, we currently count some 96,000 Ur III text entries, of which nearly 59,000 are annotated with 880,000 lines of transliteration text.

The accounting notation recording equivalencies in Ur III texts is very simple: n1 X, Y-bi n2, where n1.2 are numerical notations, × and Y describe two quantifiable things, and bi is the Sumerian third singular inanimate possessive pronoun. This may thus be understood in the form of an equation: n1X/n2Y = conversion rate of × to Y.

Strategies for searching attestations of such notations must be responsive to some limitations, at least until Steve Tinney’s ePSD (<http://psd.museum.upenn.edu/epsd/> ) has a greater morphology-analytical capacity and a more robust interactivity in using the files of CDLI. Currently, BDTNS is running on a FileMaker server platform, and it is best to understand the strengths and weaknesses of this software to utilize that website’s data. CDLI is running its search programs through a Python-based Zope package transitioning to SQL-based searches developed by programmers at UCLA. While online searches will thus improve with time, the fastest searches of CDLI files will be achieved by simply downloading the project’s core raw ASCII data at <http://cdli.ucla.edu/downloads.html> for use with local text editor software. If you search for “bi” (whole word) in the Ur III transliterations currently available through CDLI, you’ll achieve nearly 30,000 hits. Narrowing this search to “-bi” (exact string) reduces the number by just 900, but using the regular expression “-bi [0-9]” to avoid instances of ša-ti-bi-ta and to view only those instances with numerical relationships results in 14,000 hits, of which very nearly all are in fact tags for implicit equivalency values. The (approximate) numbers are fairly reflective of the significance in the Mesopotamian agrarian economy of calculations done in grain and grain products and animals and animal products (both dairy and animal hair), but they also prominently include evidence of calculations and use of equivalencies in field measurements and wood beam lengths, in silver used in merchant accounts, and in the manufacturing term ki-la₂, used in a metrological context to indicate the weight of wool used in garments or of copper or bronze in metal tools, the square footage of matted reed used to make baskets, and so on:

<table>
<thead>
<tr>
<th>Equivalency Unit</th>
<th>Approximate Number of Attestations</th>
</tr>
</thead>
<tbody>
<tr>
<td>še-bi (its “barley”)</td>
<td>4,000</td>
</tr>
<tr>
<td>ki-la₂-bi (its “extent”)</td>
<td>2,600</td>
</tr>
<tr>
<td>a₂-bi (its “labor”)</td>
<td>2,000 (including such expanded forms as a₂ (er\in₂-na-bi), its “labor of the troops”)</td>
</tr>
<tr>
<td>ku₁-bi (its “silver”)</td>
<td>1,560 (seldom with the full form (ku₁-babar))</td>
</tr>
<tr>
<td>siki-bi (its “wool”)</td>
<td>290</td>
</tr>
<tr>
<td>zu₂-lum-bi (its “dates”)</td>
<td>280 (often in estimates of tree yields)</td>
</tr>
<tr>
<td>i₃-bi (its “oil”)</td>
<td>260 (including (i₃-geš), “sesame oil”; (i₃-nun), “butter oil”; (i₃-ku₆), “fish oil”)</td>
</tr>
</tbody>
</table>
Based on this listing, Ur III equivalency values may be understood in several categories. In the first instance, -bi refers to fairly concrete though artificially calculated equivalents between objects and quantities of objects, in many cases simply the raw materials used to produce something. Thus amounts of flour, beer, or bread are understood as so much še-bi—that is, equal to the amount of barley considered necessary to produce them. The same applies to garments and wool, mats and reed, butter oil and milk, and so on. Second, the equivalencies refer to conversions into such common denominators in neo-Sumerian accounting as barley, in the case of other grains such as wheat or spelt, or silver, in the case of all quantifiable goods and services. In some restricted contexts, such as payments to day laborers, and doubtless in most informal market transactions among workers in their own communities, barley equated to both work time and, like silver in state accounts, any of a number of commodities sought by these individuals (so-called commodity money; cf. Widell 2005:397–398). Third, equivalencies are attached to such administrative adjustments as barley conversions rated to processing (allowed losses, household or other taxes, and so on); taxes placed on herd animals (MVN 6, 84), reeds (UTI 4, 2983), or fish (often assessed by the enku); or labor concessions such as “free time,” based on gender—either one-sixth (for women) or one-tenth (for men) of the period of work—accorded to dependent laborers. Fourth, equivalents formed the basis for the calculation and monitoring of productivity among workers. Rather than checking on the actual work of their personnel, household supervisors could simply count baskets of fish, measures of flour, or records of canal excavations and, using their implicit tables of work norms, calculate the labor days considered necessary to record these numbers. As will be discussed below, these labor days themselves
could be “monetized” to silver and thus added to general and encompassing value accounts. A few examples of these notations make the implicit calculations noted above clear:

\[1(\text{šar}_2) \text{ sa gi} \quad 3,600 \text{ reed bundles},\]
\[\text{še-bi 1(}u\text{) 2(}aš\text{) gur} \quad \text{their [bi] barley: 12 gur.}\]

[SNAT 444, obverse 1-2]

According to the simple equation, \(3,600 \text{ reed bundles} ÷ 12 \text{ gur of barley} = 300 \text{ reed bundles per gur of barley.}\) (Or, since a gur of barley consisted of 300 \(\text{sila}_3\), about 300 liters, the single reed bundle equated to 1 liter of barley.)

\[2(\text{barig}) \quad ^{\text{zu}_2-lum^1} \text{ sumun} \quad 2 \text{ barig of aged dates},\]
\[\text{ku}_2\text{-bi 2/3 (}diš\text{) gin}_2 \quad \text{their silver: 2/3 shekels.}\]

[AUCT 1, 763, obverse 1-2]

Same calculation: \(2 \text{ barig of dates} ÷ 2/3 \text{ shekels of silver} = 3 \text{ barig of dates (about 180 liters) per shekel (about 8 1/3 g) of silver.}\)

\[1(\text{geš}_2) \quad 4(}u\text{) amar 3(}diš\text{) sila}_3 \text{ še-ta} \quad 100 \text{ calves at 3 sila}_3, \text{ barley each}\]
\[u_4 4(}diš\text{-}še_1, \quad \text{over 4 days,}\]
\[\text{še-bi 4(}aš\text{) gur lugal} \quad \text{their barley: 4 royal gur.}\]

[Berens 21, obverse 1-3]

This only slightly more complex calculation in fact contains an explicit conversion factor expressed in the distributive of the first line: 100 calves \(× 3 \text{ sila}_3\), of barley (feed per calf-day) \(× 4 \text{ days} = 1,200 \text{ sila}_3\), or 4 gur. The conversion \(3 \text{ sila}_3\), per calf-day would not be necessary to solve the equation, since \(1,200 \text{ sila}_3 ÷ 400 \text{ calf-days} = 3 \text{ sila}_3/\text{calf-day.}\)

Based on the last of these examples, we may resolve the implied calculations of the Ningirsu household described in HSS 4, 4 (Figure 21.1):

\[
\begin{array}{c}
200 \text{ gur} \\
20 \times 20 = \\
2 \times 100 \\
100 \\
100 \\
40 \\
40 \\
100 \\
40 \\
20 \\
20 \\
98 \times 15 = 1,470 \\
\hline \\
2,630 \text{ gur}
\end{array}
\]
In fact, obverse i 15 of that text is physically indented on the tablet, a formatting standard used by Ur III scribes to indicate a subtotal of complex calculations that will often be qualified with our še-bi.

THE TRADE AGENT ACCOUNTS AND SILVER EQUIVALENCIES

Let us now expand these examples to include the most straightforward of the larger accounting formats documenting equivalencies in the Ur III period: that of the damgar trade agents and what has been conventionally called silver prices (Englund 1990:181–197; Forde 1964; Neumann 1979; Powell 1977; Snell 1982; Widell 2005; Young 1979). The damgar text described below, TCL 5, 6056 (cf. Snell 1982: number 21), is an entirely representative example of the bookkeeping format employed in all major offices of Ur III households (Englund 1990:13–51; 1991; 2003). In this instance, dating to the fifth regnal year of Amar-Suen, the activities of a well-documented trade agent from the governor’s household in Umma are recorded as his debits and credits in the form of a series of account postings in precisely the same format we know from many hundreds of receipts, characterized above all by the notation n1 X, ku₃-bi n2. The debits section—the agent’s liabilities—commences with a deficit recorded, in silver, from the preceding accounting year, Amar-Suen 4 (which is, in fact, entered in YNER 8, 6 reverse 13: “la₃-ia₃, 4(diš) 1/2(diš) gin₂, 1(u) 2(diš) še ku₃, “the deficit: 4 1/2 shekels, 12 grains of silver”). There follow a number of notations, including counts and measures of various sorts of fish and fish oil, wool, dates, leather products, and grain, in each case followed by their silver equivalence, representing domestic produce of the household and its estates that was, in Amar-Suen 5, transferred to control of the trade agent.

The original deficit and these silver equivalences form the full obligation of the trader to his household and therefore the debit of his account. The second section describes what the trader in turn delivered to officials of that same household: a large delivery of silver, then numbers and measures of copper, lard, raisins, and wooden containers, in each case (as before) duly converted to silver equivalences and added together to form the trader’s credits. These credits deducted from the debits result in a new deficit for this agent, now grown from slightly more than 4 1/2 shekels to 61 1/6. And this new deficit is found recorded in the tablet JRAS 1939, 32 (BM 106064, dating to Amar-Suen 6 xi), with its first two lines reading “1(diš) ma-na 1(diš) gin₂ i gi₆(diš)-gal₂ 1(u)! 2(diš) še ku₃-babbar / si-i₃-tum,” continuing a chain of running accounts linked by deficits carried over from one accounting period to the next.
EQUIVALENCY VALUES AND THE COMMAND ECONOMY OF THE UR III

TCL 5, 6056 Obverse

1. 4(diš) 1/2(diš) gin, 1(u) 2(diš) še ku₃-babbar
2. si-i₃-tum
3. 3(geš’u) 3(geš₂) ku₆ sag-kur₂
4. ku₁-bi 2(diš) gin₂ ıgi 6(diš)-gal₂ 6(diš) še
5. 1(geš’u) 2(geš₂) ku₆ ša₃-bar ku₁-bi 2(diš) gin₂
6. 6(diš) gur₂ siki ku₁-bi 2/3(diš) ma-na
7. ša₃ kišib₃-ba
8. 5(geš’u) 5(geš₂) ku₆ gir₂-us₂
   ku₁-bi 4(diš) gin₂ ıgi 4(diš)-gal₂ 5(diš) še
9. 3(geš’u) 6(geš₂) 3(u) ku₆ sag-kur₂
10. ku₁-bi 2(diš) 1/3 (diš) gin₁ 1(u) 8(diš) še
11. 2 barig i₁ ku₆ ku₁-bi 4(diš) gin₂
12. 1(geš₂) 4(aš) zu₃-lum gur
13. ku₁-bi 2/3(diš) ma-na 2(diš) 2/3(diš) gin₂
14. mu en-ma₅-gal-an-na ba-ḥun
15. 5(u) zu₂-lum gur
16. ku₁-bi 1/2(diš) ma-na 3(diš) 1/3(diš) gin₂
17. mu en-unu₆-gal-₄inanna ba-ḥun
18. 1(u) ku₃-ummu₁
19. ku₁-bi 1/2(diš) gin₂ 12(u) še¹
20. 1(u) ku₂e-l₃ir₂₁ [e₂-ba-an’]
21. ku₁-bi 2/3(diš) 1’gin₂¹ [. . .]
22. 7(diš) [. . .]

TCL 5, 6056 Reverse

1. 1(geš₂) še gur ku₁-bi 1(diš) ma⁻¹na¹
2. še i₁ ša₃-ka
3. 1’ŠU+LAGAB₁ 3(diš) 1/3(diš) ma-na 1(diš) 1/3(diš) gin₁ 1(u) 6(diš) še ‘ku₁¹ -[babbar]
4. sag nig₂-gur₁₁-ra-kam ša₁-bi-ta
5. 1(diš) 1/3(diš) ma-na la₂ 1/3(diš) gin₂ 1(u) še ku₁-babbar
6. 3(u) 8(diš) 1/2(diš) ma-na uruda

4 1/2 sbekels, 12 grains of silver;
the remaining (carry-over) deficit;
1,980 “beaded” fish,
their silver: 2 1/6 sbekels, 6 grains;
720 gutted fish, their silver: 2 sbekels
6 talents of wool, its silver: 2/3 mana;
under seal.
3,300 slit fish,
their silver: 4 1/4 sbekels, 5 grains;
2,190 “beaded” fish,
their silver: 2 1/3 sbekels, 18 grains;
2 barig fish oil, its silver: 4 sbekels;
64 gur of dates,
their silver: 2/3 mana, 2 2/3 sbekels;
year: “Emmahgalana was
installed” [AS 4].
50 gur of dates,
their silver: 1/2 mana, 3 1/3 sbekels;
year: “En-unugal-Inanna was
installed” [AS 5].
10 water skins,
their silver: 1/2 sbekel, 20 grains;
10 pairs? of leather sandals
their silver: 2/3 sbekel . . .
7 . . .

60 gur of barley, its silver: 1 mana;
barley of the lard.
Together: 3 1/3 mana, 1 1/3
sbekels, 16 grains of silver
are the debit; therefrom:
1 1/3 mana less 1/3 sbekel, 10 grains of
silver;
38 1/2 mana of copper,
7. ku₂-bi 1/3(diš) ma-na 5(diš) 2/3(diš) gin₂
8. kišib₁ lu₂-kal-la
9. 1(aš) 2(barig) 4(ban₂) 6(diš) ᵃsil₃ ¹ i, šaḥ₂ gur
10. ku₁-bi 1/3(diš) ma-na 3(diš) 1/3(diš) gin₂ ¹ 
    la₂ 6(diš) še
11. kišib₁ ur⁻šul₃-pa-e
12. 6(diš) sil₃ gešṭin ḫad₂ sa₂-du₁₁ lugal
13. 2(diš) sil₃ gešṭin ḫad₂ giri₁ lugal-ša₃-la₂
14. ku₁-bi igi 6(diš)-gal₂
15. 2(u) ᶘkab₂-kul
16. ku₂-bi 2(diš) gin₂
17. kišib₁ a-gu
18. 8(diš) 1/2(diš) gin₃ ku₁ uruda ur₃⁻ma
19. giri₁ ur⁻š₃amma u, e₂-lu-bi-bi
20. |ŠU+LAGAB| 2(diš) 1/3(diš) ma-na igi ₆(diš)-gal₂ ₄(diš) še ku₁-babbar
21. zi⁻ga-am₁
22. la₂-ia₁ 1(diš) ma-na 1(diš) gin₂ igi 6(diš)-gal₂ ¹ 
    1(u) 2(diš) še ku₁-babbar
23. nig⁻ka₉ aka šeš⁻kal-la dam-gar₁
24. mu en-unu₆-gal⁻₂inanna ba⁻ḥun

their silver: 1/3 mana, 5 2/3 shekels, under the seal of Lukalla;
1 gur, 2 barig, 4 ban₂, 6 sil₃ of lard,
its silver: 1/3 mana, 3 1/3 shekels less 6 grains,
under the seal of Ur-Šulpæ;
6 sil₃ of raisins, royal supplement,
2 sil₃ of raisins via Lugal-šala,
their silver: 1/6 [shekel];
20 wooden k-containers,
their silver: 2 shekels;
under the seal of Agu;
8 1/2 shekels of silver for Ur copper,
via Ur-Lamma and Elubibi.
Together: 2 1/3 mana, 1/6 [shekel], 4 grains
of silver
booked out;
deficit: 1 mana, 1 1/6 [shekel],
12 grains of silver;
account of Šeškala, the trade agent;
year: “En-unugal-Inanna was installed” [AS 5].

An Overview of Silver Equivalencies

Each notation of the form n₁ X, ku₃-bi n₂ can of course be calculated to derive a set
of silver equivalencies for the commodities listed in TCL 5, 6056, including 1,980
÷ 2 shekels 36 grains (1 shekel = 180 grains) = 900 headed fish per shekel of silver;
720 ÷ 2 = 360 gutted fish per shekel; 6 talents ÷ 2/₃ mana = 9 talents of wool per
mana or 9 mana of wool per shekel; 2 barig ÷ 4 = 1/2 barig or 30 sila₁ of fish oil per
shekel; 64 gur ÷ 42 2/₃ = 1 1/2 gur of dates per shekel, and so on. Texts such as MVN
11, 101, with multiple instances of explicit equivalency values in the form of 1(aš)
4(barig) 4(ban₂) 6 sila₁ mun gur 3(aš) gur-ta / ku₁-bi 2/₃ (gin.) la₂, 3(diš) še (obverse
19–reverse 1), “1 gur 4 barig 4 ban₂, 6 sila₁ salt [at a rate of] 3 gur for each [shekel
of silver], its silver: 2/₃ [shekel] less 3 grains” (1.286/300 gur ÷ 3 gur per shekel [of
180 grains] = 117.2 grains, discounting 2/10 of one grain in the notation), are very
rare but do underscore the fact that the shekel was the basis of valuation in our Ur
III accounts. The list below* is designed to give an overview of the major products recorded in Ur III trade agent and related accounts (not sale documents that were as a rule drawn up between private individuals and thus were not subject to state regulation; see generally Wilcke 1976–1980, 2007):

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Sumerian</th>
<th>English</th>
<th>Count or Measure (per shekel silver)</th>
</tr>
</thead>
<tbody>
<tr>
<td>grain</td>
<td>še</td>
<td>barley</td>
<td>4 barig</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 ban, 5 sila, (SNAT 490)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 gur</td>
</tr>
<tr>
<td>animals</td>
<td>peš,-geš-gi</td>
<td>bandicoot rat</td>
<td>48 = (MVN 2, 24)</td>
</tr>
<tr>
<td>šaḫ, niga</td>
<td></td>
<td>fattened pig</td>
<td>(2 shekels per animal; MVN 13, 519)</td>
</tr>
<tr>
<td>udu/maš, (nita,)</td>
<td></td>
<td>sheep and goats</td>
<td>1/2 - 2</td>
</tr>
<tr>
<td>dairy products,</td>
<td>ga gazi (ab,)</td>
<td>gazi dry cheese</td>
<td>2 barig</td>
</tr>
<tr>
<td>oils</td>
<td>ga ḤAR (ab,)</td>
<td>dry cheese (cow)</td>
<td>2 barig 3 ban, (Ur, Drehem)</td>
</tr>
<tr>
<td></td>
<td>ga UDgiššu (ab,)</td>
<td>dry cheese (cow)</td>
<td>3 barig (Umma)</td>
</tr>
<tr>
<td></td>
<td>ga ḤAR (ud,)</td>
<td>dry cheese (goat)</td>
<td>3 barig</td>
</tr>
<tr>
<td></td>
<td>ga SIG/še-a (ab,)</td>
<td>yellowed milk</td>
<td>8 sila, (Ur)</td>
</tr>
<tr>
<td></td>
<td>i,-nun (ab,)</td>
<td>butter oil (cow)</td>
<td>1 ban,</td>
</tr>
<tr>
<td></td>
<td>i,-nun-ḪA (ud,)</td>
<td>butter oil (goat)</td>
<td>1 ban, (Umma)</td>
</tr>
<tr>
<td></td>
<td>i,-geš</td>
<td>sesamum</td>
<td>1 ban,</td>
</tr>
<tr>
<td></td>
<td>i,-šaḫ,</td>
<td>lard</td>
<td>1–2 ban,</td>
</tr>
<tr>
<td></td>
<td>i,-udu</td>
<td>tallow</td>
<td>2 ban,</td>
</tr>
<tr>
<td>fish</td>
<td>ba</td>
<td>b-fish (not turtle)</td>
<td>900 = (TCL 5, 6046)</td>
</tr>
<tr>
<td></td>
<td>ba saga</td>
<td>fine turtle</td>
<td>6 (DAS 46bis)</td>
</tr>
<tr>
<td></td>
<td>ba us,</td>
<td>lesser turtle</td>
<td>10 (DAS 46bis)</td>
</tr>
<tr>
<td></td>
<td>murgu, ba</td>
<td>turtle shell</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>gam-gam</td>
<td>g-fish</td>
<td>360 = (AAICAB 1/2, plate 89, 1935-527)</td>
</tr>
<tr>
<td></td>
<td>gir,-us,</td>
<td>slit fish</td>
<td>780 = (TCL 5, 6046)</td>
</tr>
<tr>
<td></td>
<td>ku, kun-zi-da</td>
<td>reservoir fish</td>
<td>1,200 = (TCL 5, 6046)</td>
</tr>
<tr>
<td></td>
<td>nig,-ki</td>
<td>“buried?” fish</td>
<td>72 (YOS 18, 123 reverse iii 17)</td>
</tr>
<tr>
<td></td>
<td>sag-kur,</td>
<td>“headed” fish</td>
<td>900</td>
</tr>
<tr>
<td></td>
<td>sag-kur, sig</td>
<td>“headed” fish, low quality</td>
<td>1,600 =</td>
</tr>
<tr>
<td></td>
<td>ša,-bar</td>
<td>gutted fish</td>
<td>360</td>
</tr>
<tr>
<td></td>
<td>ša,-bar sig</td>
<td>gutted fish, low quality</td>
<td>450 = (TCL 5, 6046)</td>
</tr>
<tr>
<td></td>
<td>še,</td>
<td>smoked fish</td>
<td>900</td>
</tr>
<tr>
<td></td>
<td>pa mušen?</td>
<td>feathers?</td>
<td>1,800 (9 attestations, each with</td>
</tr>
<tr>
<td></td>
<td>kuš šaḫ,</td>
<td>pig skins</td>
<td>2 mana</td>
</tr>
<tr>
<td>other animal</td>
<td>es-ku-ru-um</td>
<td>wax</td>
<td>18,000 PA ḤU</td>
</tr>
<tr>
<td>products</td>
<td></td>
<td></td>
<td>2,000 (SNAT 365, MVN 16, 910?)</td>
</tr>
</tbody>
</table>

* The list below is designed to give an overview of the major products recorded in Ur III trade agent and related accounts. The list is not exhaustive and does not include all the products that were traded in Ur III. The values provided are approximate and may vary depending on the specific context. For more detailed information, refer to Wilcke 1976–1980, 2007.
<table>
<thead>
<tr>
<th>Commodity</th>
<th>Sumerian</th>
<th>English</th>
<th>Count or Measure (per shekel silver)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commodity</td>
<td>Sumerian</td>
<td>English</td>
<td>Count or Measure (per shekel silver)</td>
</tr>
<tr>
<td>fruit,</td>
<td>kuš udu</td>
<td>sheep skins</td>
<td>60 (TCL 5, 6046) 90</td>
</tr>
<tr>
<td>syrups,</td>
<td>kuš a-ga-la₂</td>
<td>leather a-sack</td>
<td>36</td>
</tr>
<tr>
<td>vegetables</td>
<td>kuš-e-sir₂ ₂-ba-an</td>
<td>leather sandals, in pairs</td>
<td>40 (TCL 5, 6046) 15</td>
</tr>
<tr>
<td></td>
<td>kuš-ummu₂</td>
<td>leather water skin</td>
<td>10 (TCL 5, 6046) 18</td>
</tr>
<tr>
<td></td>
<td>siki</td>
<td>wool</td>
<td>9–12 mana</td>
</tr>
<tr>
<td></td>
<td>siki ud₂</td>
<td>goat skin</td>
<td>9–12 mana</td>
</tr>
<tr>
<td></td>
<td>gu-₃-gal</td>
<td>chick pea</td>
<td>1–2 barig</td>
</tr>
<tr>
<td></td>
<td>gu-tur</td>
<td>lentils</td>
<td>2 1/2–3 barig</td>
</tr>
<tr>
<td></td>
<td>zu₂-lam</td>
<td>dates</td>
<td>1–1 1/2 barig</td>
</tr>
<tr>
<td></td>
<td>zu₂-lam sumun</td>
<td>aged dates</td>
<td>3 barig</td>
</tr>
<tr>
<td></td>
<td>geṣṭin ḫad₂</td>
<td>raisins</td>
<td>1/2–1 barig</td>
</tr>
<tr>
<td></td>
<td>Ṽ’peś, še-er-gu</td>
<td>string of figs</td>
<td>4 ban, 5 sila₂, (ASJ 14, 99 1)</td>
</tr>
<tr>
<td></td>
<td>la₂₁</td>
<td>(date) syrup (honey?)</td>
<td>12–15 (unclear length of strings)</td>
</tr>
<tr>
<td></td>
<td>šum₂, (za)-ḥa-din</td>
<td>leek</td>
<td>1 ban, 5 sila₂, (MVN 11, 101)</td>
</tr>
<tr>
<td></td>
<td>igi nu-saga</td>
<td>leek, unsightly</td>
<td>2 barig 3 ban₂, 2 barig 3 ban₂,</td>
</tr>
<tr>
<td></td>
<td>šum₂, sikil</td>
<td>garlic</td>
<td>2 barig 3 ban₂, 2 barig 3 ban₂,</td>
</tr>
<tr>
<td></td>
<td>sag šum₂, sikil</td>
<td>garlic bulb “head”</td>
<td>1 gur = (SNAT 503)</td>
</tr>
<tr>
<td></td>
<td>šum₂, sikil</td>
<td>garlic, unsightly</td>
<td>1 gur</td>
</tr>
<tr>
<td></td>
<td>igi nu-saga</td>
<td>garlic cloves</td>
<td>1 barig 1 ban₂, 5 sila₂,</td>
</tr>
<tr>
<td></td>
<td>numun šum₂, sikil</td>
<td>sumac?</td>
<td>1 gur</td>
</tr>
<tr>
<td></td>
<td>gazi</td>
<td>sumac</td>
<td>1 gur</td>
</tr>
<tr>
<td>condiments, aromatics, etc.</td>
<td></td>
<td></td>
<td>1 1/2–2 ban₂</td>
</tr>
<tr>
<td></td>
<td>ku-mul</td>
<td>cumin</td>
<td>1 1/2–2 ban₂</td>
</tr>
<tr>
<td></td>
<td>mun</td>
<td>salt</td>
<td>8–12 mana</td>
</tr>
<tr>
<td></td>
<td>naga</td>
<td>potash</td>
<td>1 gur 1 barig–4 gur</td>
</tr>
<tr>
<td></td>
<td>naga si-c₁</td>
<td>“horned” potash</td>
<td>3 gur</td>
</tr>
<tr>
<td></td>
<td>še li</td>
<td>juniper seeds?</td>
<td>4 gur (SNAT 490)</td>
</tr>
<tr>
<td></td>
<td>še-ḫu₂</td>
<td>coriander</td>
<td>2–5 sila₂</td>
</tr>
<tr>
<td></td>
<td>šim gi</td>
<td>reed aromatic</td>
<td>1 barig 3 ban₂, (MVN 16, 910)</td>
</tr>
<tr>
<td></td>
<td>šim gig</td>
<td>bitter aromatic</td>
<td>1 barig 4 ban₂, (ASJ 14, 99 1; Nik 2, 403)</td>
</tr>
<tr>
<td></td>
<td>šu-ur₃-₃me</td>
<td>cypress aromatic</td>
<td>2 barig 3 ban₂, = (YNER 8, 11)</td>
</tr>
<tr>
<td></td>
<td>gi</td>
<td>reed</td>
<td>3 barig 4 ban₂, 5 sila₂, = (YNER 8, 14)</td>
</tr>
<tr>
<td></td>
<td>gi du₂-₃ga</td>
<td>sweet reed</td>
<td>20–30 mana</td>
</tr>
<tr>
<td></td>
<td>Ṽ’p₃-hašṭur</td>
<td>crab apple wood</td>
<td>20 mana</td>
</tr>
<tr>
<td></td>
<td>pa li</td>
<td>juniper branches?</td>
<td>30 mana (SNAT 504)</td>
</tr>
<tr>
<td></td>
<td>im babbar</td>
<td>gypsum</td>
<td>300 sa</td>
</tr>
<tr>
<td>bitumen,</td>
<td>esir₂ E₂₋₁-A</td>
<td>liquid? bitumen</td>
<td>3 ban₂</td>
</tr>
<tr>
<td>gypsum</td>
<td>esir₂ ḫad₂</td>
<td>dry bitumen</td>
<td>36 planks at 3 cubits length</td>
</tr>
<tr>
<td></td>
<td>an-na</td>
<td>tin</td>
<td>60 planks at 2 cubits length</td>
</tr>
<tr>
<td></td>
<td>ku₁-ḫu₃-a</td>
<td>red gold</td>
<td>3–6 ban₂</td>
</tr>
<tr>
<td></td>
<td>ku₁-si₃-g₁ gạo</td>
<td>gold</td>
<td>1–2 1/2 barig</td>
</tr>
<tr>
<td></td>
<td>urud₂</td>
<td>copper</td>
<td>12–20 shekels</td>
</tr>
</tbody>
</table>

SNAT 503
EQUIVALENCY VALUES AND THE COMMAND ECONOMY OF THE UR III

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Sumerian</th>
<th>English</th>
<th>Count or Measure (per shekel silver)</th>
</tr>
</thead>
<tbody>
<tr>
<td>su₂-ḫe₂</td>
<td>borax?</td>
<td>90 shekels</td>
<td></td>
</tr>
<tr>
<td>labor</td>
<td>u₄</td>
<td>60–120 shekels</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>≈ (CT 5, 38 BM 17752)</td>
<td></td>
</tr>
</tbody>
</table>

*The silver equivalencies list follows for the most part Snell 1982:121–181. References are added only to unusual values, and equivalencies exceeding the rate of 1 shekel per unit are set in parentheses. The metrological systems used in the list are:

- Capacity: 1 gur = 5 barig = 30 ban = 300 sīla, (1 sīla, is about 1 liter)
- Weight: 1 gu₂ = 60 mana = 3,600 shekels; 1 shekel (about 8.33 g) = 180 grains
- Length: 1 ninda = 2 gi (reed) = 12 kuš (1 kuš/cubit is about 50 cm)

If we are to draw some comparison of these values with our own experience, then we should base all silver values on the grain equivalencies that were the foundation of commerce for the overriding majority of ancient Sumerians. Thus, with a normative 300 sīla₃ = 1 shekel of silver, and with a yearly neo-Sumerian minimum wage of (12 × 200 = ) 2,400 sīla₃ of barley ÷ 300 = 8 shekels of silver, it is easy to contemplate informal markets within Mesopotamian communities that made a variety of products available to normal workers. Sweet dates or damaged garlic could be exchanged with measures of barley at 1:1; for 1 liter of grain, you could even have received 2 liters of smoked fish; 1 pound of salt would set you back 30 liters of barley or approximately five workdays.

Despite the relative homogeneity of most of the equivalency values derived from damgar accounts, as well as from a large number of individual receipts that would have been entered to the credits sections of those accounts, it remains unclear how much “price” fluctuation was tolerated or even encouraged in the Ur III period. The primary staple, barley, ranges from a high exchange value of 4 barig (240 liters) per shekel of silver down to a rate of 1 gur 2 barig 2 ban₂ (440 liters), representing a difference of some 180 percent. It would not be difficult to postulate a number of credible reasons for this and other fluctuations in the cuneiform records, including exchange pressures generated by bumper harvests or a major influx of silver, conflict, drought, degradation of the fields through salinization, or other processes endemic to alluvial agriculture in antiquity. Gomi (1984) has described the dire economic situation during the reign of the last of the five Ur III monarchs, characterized by disruptions in grain harvest and transportation due to collapsing security. Households scrambled to substitute other foodstuffs for grain, with the exchange value of barley rising to improbable highs. We might also seek to uncover clues of manipulation of the records by one party or the other, since we know from many related texts that equivalencies may have been skewed by the imposition of taxes or fees by households or higher state agencies—and we should remember that the majority of the silver equivalencies cited here and in other studies derive from a limited set of accounts from Umma dating to the middle years of Amar-Suen. That is, these results may be skewed by the unevenness of the unearthed cuneiform record. Still, the golden rule throughout early Mesopotamian history was surely 1 gur of...
barley = 1 shekel of silver, which though not formalized in third-millennium decrees is implied by the majority of barley exchange notations and by the evident interest of the crown in standardizing both metrological systems and barley wages (Roth 2003:16 and 38; and see the nearly complete copy of the Ur-Namma Codex in the Schøyen Collection [=CUSAS 17, 107], particularly columns 5 and 6). Further, we may compare the Ur III exchange equivalencies with the first law of the Ešnunna Code prescribing prices for the basics of the Babylonian household (ca. 1900 B.C.; Roth 2003:59):

<table>
<thead>
<tr>
<th>Ešnunna Prescribed Prices:</th>
<th>Ur III Mean Values:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 gur of barley for</td>
<td>1 shekel of silver</td>
</tr>
<tr>
<td>3 sila₃ of fine oil for</td>
<td>1 shekel of silver</td>
</tr>
<tr>
<td>1 ban, 2 sila₃ of oil for</td>
<td>1 shekel of silver</td>
</tr>
<tr>
<td>1 ban, 5 sila₃ of lard for</td>
<td>1 shekel of silver</td>
</tr>
<tr>
<td>4 ban, 5 of bitumen for</td>
<td>1 shekel of silver</td>
</tr>
<tr>
<td>6 mana of wool for</td>
<td>6–10 ban</td>
</tr>
<tr>
<td>2 gur of salt for</td>
<td>1 shekel of silver</td>
</tr>
<tr>
<td>1 gur of potash for</td>
<td>10 mana</td>
</tr>
<tr>
<td>3 mana of copper for</td>
<td>1 gur 1 barig–4 gur</td>
</tr>
<tr>
<td>2 mana of worked copper for</td>
<td>?</td>
</tr>
</tbody>
</table>

It seems worth noting for the record the apparent lack of a number of important commodities in these accounts. Most finished products, including flour and items made of wood, reed, and metal, are not found here. Of course, in the case of the damgar accounts, we are witness to the conversion of excess unprocessed goods (in the debit sections) into those products desired by household elites (credits), but the known equivalencies include values, if artificial or not, that were necessary to complete accounts in the “commodity money” of the day: silver, barley, fish, oil, and so on. Even here, it seems that unprocessed products moved through valuation mechanisms and then disappeared in the administrative apparatus. Further, both domesticated animals and slaves are effectively missing in the records of the Ur III merchants. The lack of slaves of course reflects the fact that damgar were agents responsible for the exchange of goods produced and owned by central households, where the chief distinction between corporate and domestic slaves was that the former were inalienable while the latter were chattel property of private individuals and thus recorded in contracts, not administrative records. (Note in BPOA 6, 1366 and 1378, the potential anomalies of slaves taken into administrative control [dab₂] at a barter exchange rate of one human per one adult ox or cow.) Since we would expect slaves to have been available for barter purchase in the areas in and around Babylonia that were frequented by damgar or their representatives, it remains notable that such chattel would not have even served as “conversion goods” in the silver accounts of household agents, which might indicate some sort of taboo in this trade. The very few references to cattle, sheep, and pigs are even more difficult to explain, aside from the fact that animals on the hoof required a new layer
of staff—herders—in their transportation from one informal market to the next. There must be some other explanation for this exclusion from the trade records.

The final set of equivalencies listed above derives from a growing number of Ur III accounts dealt with in Englund 2012. Since, as has been amply demonstrated in other publications, the bookkeeping system of third-millennium Mesopotamia developed a set of labor production norms that formed the basis of all labor records in the Ur III period, and since the products of these labor efforts were themselves quantified and standardized in terms of silver equivalencies, it is not in the least surprising that early accountants transferred these values to workdays themselves. These wages in silver equivalencies held to a fairly stable range of one to six months of labor per shekel of silver. The standard of one month per shekel (or its common equivalent of 1 gur of barley, most often attested in the form of daily wages of 1 ban) was the general value of labor used in the succeeding Old Babylonian period of Hammurapi. I will return directly to this expansion of equivalency values to labor output, but I add here an indication from the Umma account Princeton 1, 396, that not only were workdays converted to silver values to fulfill the administrative needs of active worker troop management, but a workforce could in fact be bought in the marketplace (as Adams 2010 has postulated with his consideration of a mobile workforce employed at Garshana; cf. Wilcke 2007:91). Obverse 1–4 of that text reads:

\[
\begin{align*}
2(\text{geš’u}) & 3(\text{geš}_2) 3(\text{u}) 5(\text{diš}) \text{ guruš } u_4 1(\text{diš})-\text{še}_4, & 1,415 \text{ laborer workdays,} \\
\text{erin}_2 \text{ diri} & & \text{[from] “additional troops;”} \\
2(\text{geš’u}) & 5(\text{geš}_2) 3(\text{u}) 3(\text{diš}) \text{ guruš } u_4 1(\text{diš})-\text{še}_4, & 1,533 \text{ laborer workdays,} \\
\text{ku}_1-\text{ta } s\text{a}_{10}-\text{a} & & \text{purchased with silver.}
\end{align*}
\]

**Beyond Silver Equivalencies**

Although silver was of imposing importance in mechanisms of exchange and wealth distribution within and across borders of ancient Babylonian states, central household accountants employed, with almost dizzying accuracy, a broad palette of equivalencies as part of their means of control of production. These included value and real equivalencies between such raw materials and finished products as milk and cheese (Englund 1995) or barley and flour (Brunke 2008; Hrozný 1913), but most notably labor norms that determined the success or failure of teams of workers engaged in all aspects of early household production.

The accounts, first, contain an array of equivalencies between commodities that reflect valuations based presumably on personal preferences, perhaps on availability or production costs of various related goods, for instance barley and wheat, as well as valuations based on labor input, such as the difference between unprocessed barley and barley groats on the one hand and unprocessed barley and finely milled barley flour on the other. The list below offers an overview of such valuations, where in the accounts some measure of unprocessed or processed grain has been assigned an unprocessed barley equivalent:
<table>
<thead>
<tr>
<th>Item</th>
<th>Conversion Rate</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>kaš dida du</td>
<td>1/15 × še</td>
<td>regular dida beer is converted to unprocessed barley at a rate of 15 (measures of beer): 1 (measure of barley) (ASJ 3, 160 128)</td>
</tr>
<tr>
<td>kaš dida saga</td>
<td>1/10 × še</td>
<td>fine dida beer is converted to unprocessed barley at a rate of 10:1 (ASJ 3, 160 128)</td>
</tr>
<tr>
<td>duḫ du/saga</td>
<td>1/5 × še</td>
<td>regular/fine chaff? is converted to unprocessed barley at a rate of 5:1 (MVN 5, 277)</td>
</tr>
<tr>
<td>ziz₂</td>
<td>1/1 × še</td>
<td>unprocessed emmer is converted to unprocessed barley at a rate of 1:1</td>
</tr>
<tr>
<td>dabin</td>
<td>1/1 × še</td>
<td>barley groats are converted to unprocessed barley at a rate of 1:1</td>
</tr>
<tr>
<td>zi₃-gu</td>
<td>1/1 × še</td>
<td>pea flour is converted to unprocessed barley at a rate of 1:1 (TMH NF 1-2, 121)</td>
</tr>
<tr>
<td>ninda du</td>
<td>1/1 × še</td>
<td>regular ninda is converted to unprocessed barley at a rate of 1:1</td>
</tr>
<tr>
<td>kaš du</td>
<td>1/1 × še</td>
<td>regular beer is converted to unprocessed barley at a rate of 1:1</td>
</tr>
<tr>
<td>kaš saga</td>
<td>3/2 × še</td>
<td>fine beer is converted to unprocessed barley at a rate of 2:3</td>
</tr>
<tr>
<td>ninda ar₃-ra saga</td>
<td>3/2 × še</td>
<td>fine ground ninda is converted to unprocessed barley at a rate of 2:3 (TCL 5, 5670 [Umma]; BBVO 11, 279 6N-T366 [Nippur])</td>
</tr>
<tr>
<td>ar-za-na ninda ar₃-ra saga</td>
<td>3/2 × še</td>
<td>arzana fine ground ninda is converted to unprocessed barley at a rate of 2:3 (TUT 121)</td>
</tr>
<tr>
<td>ba-ba zi₃</td>
<td>3/2 × še</td>
<td>baba flour is converted to unprocessed barley at a rate of 2:3 (TUT 121)</td>
</tr>
<tr>
<td>eša</td>
<td>2/1 × še</td>
<td>semolina is converted to unprocessed barley at a rate of 1:2 (TCL 5, 5670)</td>
</tr>
<tr>
<td>gig</td>
<td>2/1 × še</td>
<td>wheat is converted to unprocessed barley at a rate of 1:2 (TCL 5, 5670)</td>
</tr>
<tr>
<td>imagaga₃</td>
<td>2/1 × še</td>
<td>i-grain is converted to unprocessed barley at a rate of 1:2 (TCL 5, 5670)</td>
</tr>
<tr>
<td>zi₃ sig₁₃</td>
<td>2/1 × še</td>
<td>coarse grain is converted to unprocessed barley at a rate of 1:2 (TCL 5, 5670)</td>
</tr>
<tr>
<td>zi₃ gaz₄(KUM)</td>
<td>2/1 × še</td>
<td>“ground” grain is converted to unprocessed barley at a rate of 1:2 (TCL 5, 5670)</td>
</tr>
<tr>
<td>ninda ar₃-ra imagaga₃</td>
<td>2/1 × še</td>
<td>ground ninda i-grain is converted to unprocessed barley at a rate of 1:2 (Ontario 2, 458)</td>
</tr>
</tbody>
</table>
Another form of equivalency generation is seen in the dairy industry (Englund 1995; Gomi 1980; Kraus 1966). Cows or nanny goats (not ewes in the Ur III period) put in the care of herders were, attendant upon parturition and harvest of excess milk (the milk not reserved for the calf), assigned production quotas in the dairying books. For each cow-year, the herder was to deliver 5 *sila*₃ (liters) of butter oil (ghee; Sumerian *i₃-nun*) and 7 1/2 *sila*₃ of dry cheese (*kašk*; Sumerian *ga ḤAR* or *ga UDgunû* [phonetic, not dialectical variants; cf. Englund 1995:381–382, note 10]) to persons representing central offices of Ur III households. These quantities are presumed to derive from calculations of actual milk production by cows and from the processing of milk by herders into dairy products with a long shelf life in a hot climate. Thus, with a hypothetical excess milk quantity of 300 to 400 liters for cows in this climate, 100 liters of the milk product known as *ga še₃*(SIG₇)-a (yellowed milk) would be required to process 5 liters/sila₃ of butter oil and 7 1/2 liters of high-protein dry cheese. *ga še₃-a* was in all likelihood the high-fat top half of fresh milk kept in containers overnight, into which the cream had separated—that is, some form of processed raw milk that dependably contained 5 percent fat or more, whereas fresh milk (not colostrum) would generally contain 2 to 3.5 percent. The 20:1 relationship between yellowed milk and butter oil, then the 2:3 relationship between butter oil and *kašk* cheese, are firm conversion factors in neo-Sumerian accounts documenting the delivery expectations assigned by central household bookkeepers to each mature cow in herds given over to herding personnel. To be clear, where these “nice” numbers are recognizable in the texts, they invariably represent artificial delivery quotas and not records of real deliveries. The corresponding delivery norms for goats was 1/3 and 1/2 (in Girsu texts; in Umma 1/2 and 3/4) *sila*₃ per nanny-year, respectively, retaining the 2:3 relationship between butter oil and *kašk* cheese (Englund 1995:398–399, note 45; 420, note 78).

This artificial nature of the Ur III equivalences signaled by the notation n₁ X, Y-bi n₂ is equally visible in accounts documenting the plan production of agricultural fields. The famous Lagash inventory text RTC 407 offers an excellent example of a practice that is fully established in this era, as indeed in the preceding ED IIIb period and potentially as early as the Late Uruk III phase of the latter fourth millennium B.C. (Nissen et al. 1993:55–59 to figure 51). The Lagash account reads, in the fully preserved subsection reverse 8’–13’, dating to the thirty-third year of Šulgi:

1 (šargal)₃₁ 1(šar’u) 1(šar₂) 1(bur₃) GAN₂

še-bi 3(šar’u) 5(šar₂) 3(geš’u) 3(u) gur
ša₃-bi-ta

2(šar’u) 1(šar₂) 4(geš’u) 7(geš₂) 4(u) 2(aš)
1(barig) 4(ban₂) gur
mu-kuₓ(DU)

la₂-iaₓ, 1(šar’u) 3(šar₂) 4(geš’u) 2!(geš₂) 4!(u)
7(aš) 3(barig) 2(ban₂) gur

1 šargal 11 šar₂ 1 bur₃ [ = 4,261 bur₃]

arable land,

its barley: 127,830 gur;

therefrom:

78,462 gur 1 barig 4 ban₂

[actually] delivered.

The deficit: 49,367 gur 3 barig 2 ban₂
Based on a standardized yield of 30 gur per bur, (value equivalency: 1 bur-year = 30 gur barley less 1 gur seed, half as much feed, and the costs of field and crop maintenance, harvest, and storage; cf. Butz 1980–1983; Butz and Schröder 1985), the Lagash province fields (totaling some 270 km$^2$) are recorded with a planned harvest ($š$-$bî$) of ($4,261 \times 30 =$) 127,830 gur. The recorded yield, however, was just 78,462, leaving a gaping provincial deficit of nearly 50,000 gur of barley (Maekawa 1974:10–11). While this shortfall would have been of existential interest to the Lagash ensi, its potential use by the crown, for instance as a basis for the calculation of bala liabilities, could have had long-term destabilizing consequences for the economy of Lagash that went well beyond the concerns of a local governor, his personnel, and his extended households. Given the attention paid to plan income by Ur III bookkeepers, it is difficult to imagine that Sharlach (2003) can be correct in assuming that kings tallied the provincial harvest and claimed of it some firm bala percentage. Rather taxes would have been levied on the expected, not the real, production of the realm.

**Piecework Equivalencies**

The silver “wages” of workdays are the levels of valuation given by early Babylonians to members of their households, and they may well reflect the ultimate valuation of these persons. We may also flip the accounts and query them about the product equivalencies of labor units (workdays were probably calculated as 12 hours). In this, as with wages and rations, the texts are quite clear, though they never simply give us a manual with explicit equivalencies. I will explore several examples of accounting records covering all imaginable tasks, of which only the very basic activities, such as simple presence at a service center, the lifting of a boat from one canal to another, or even being sick and thus released from actual labor, are not qualified with specific production norms, even though these norms can, due to reasons not made explicit in the texts, be highly variable.

For instance, hoeing and excavation work were rated according to various norms, often recorded in the same text, ranging from 2 to 6 or more $sår$ per day ($1 \ sår = \text{about} \ 36 \ m^2$). Anyone who has done farmwork or has just spent much time in a garden knows there are many reasons to assign more time to one project than another, based on quality of soil, depth of the digging work, and so on. I have seen no studies that go into potential reasons for variation in work norms assigned to other tasks, such as harvesting reed and other plants or harvesting and threshing grain; nor are the variations described in later cuneiform tradition. However, the Old Babylonian mathematical texts are clear in explaining different work norms in excavations; as any archaeologist will attest, work slows as your laborers get deeper in their trenches. The daily norm most common in Ur III accounts was 3 m$^3$, which in the heat of southern Mesopotamia is not a task most of us would welcome.
The list below represents a selection of entries from the approximately 1,100 attestations of labor norms collected and tagged in the course of work on the CDLI transliterations and inserted, with links to the associated texts, into cdli:wiki (<http://cdli.ucla.edu/wiki/doku.php>) as an article entitled “Ur III Equivalency Values” (as of March 2012).

<table>
<thead>
<tr>
<th>Category</th>
<th>Work Description</th>
<th>Translation</th>
<th>Labor Norm</th>
</tr>
</thead>
<tbody>
<tr>
<td>basketry</td>
<td>gi ba-an ḫaībur</td>
<td>basket, crabapples</td>
<td>1 1/2 baskets per day</td>
</tr>
<tr>
<td>matting</td>
<td>gi ba-an du₄-du₄</td>
<td>1-barig gur basket</td>
<td>1 basket per day</td>
</tr>
<tr>
<td></td>
<td>gi gur 1(barig)-ta</td>
<td>3-barig gur basket</td>
<td>1 basket per day</td>
</tr>
<tr>
<td></td>
<td>gur-dub 3(ban,)-ta</td>
<td>4-barig gur basket</td>
<td>5 baskets per day</td>
</tr>
<tr>
<td></td>
<td>gur-dub 4(ban,)-ta</td>
<td>5-barig gur basket</td>
<td>5 1/2 baskets per day</td>
</tr>
<tr>
<td></td>
<td>gi hal 1(barig)-ta</td>
<td>6-barig gur basket</td>
<td>5 baskets per day</td>
</tr>
<tr>
<td></td>
<td>gi kaskal 1(barig)-ta</td>
<td>7-barig journey basket</td>
<td>5 baskets per day</td>
</tr>
<tr>
<td></td>
<td>gi kid (šer,-ru-um)</td>
<td>8-barig kid mat</td>
<td>1.6 days per mat =</td>
</tr>
<tr>
<td></td>
<td>gi kid-dagal ma, 40 gur</td>
<td>wide kid mat,</td>
<td>3 days per mat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40-gur boat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>gi ma-an-sim dabin</td>
<td>sieve, flour</td>
<td>1 2/3 day per sieve</td>
</tr>
<tr>
<td></td>
<td>gi ma-an-sim nig, ar,-ra</td>
<td>sieve, groats</td>
<td>3 sieves per day</td>
</tr>
<tr>
<td></td>
<td>gi pisan gid,-da</td>
<td>long basket</td>
<td>1 basket per day</td>
</tr>
<tr>
<td></td>
<td>gi pisan gid,-da</td>
<td>long basket</td>
<td>2 days per basket</td>
</tr>
<tr>
<td></td>
<td>gi pisan im-sar</td>
<td>tablet basket</td>
<td>2 baskets per day</td>
</tr>
<tr>
<td>brewery</td>
<td>kaš</td>
<td>beer (kvass?)</td>
<td>6 2/3–7 1/2 sila₃ per day</td>
</tr>
<tr>
<td></td>
<td>kaš du</td>
<td>regular beer</td>
<td>2 ban₃ per day</td>
</tr>
<tr>
<td></td>
<td>kaš saga</td>
<td>fine beer</td>
<td>1 ban₃ per day</td>
</tr>
<tr>
<td>bricks</td>
<td>sig₄</td>
<td>bricks</td>
<td>20 shekels (1/3 brick sar, = 240 bricks) per day</td>
</tr>
<tr>
<td>field work</td>
<td>al</td>
<td>hoeing</td>
<td>3–10 sar per day</td>
</tr>
<tr>
<td></td>
<td>al du₄</td>
<td>hoe “planting”</td>
<td>10–20 sar per day</td>
</tr>
<tr>
<td></td>
<td>diḫ₃ ku,-a</td>
<td>cutting camel thorn</td>
<td>10–30 sar per day</td>
</tr>
<tr>
<td></td>
<td>peš, SIG₇,-a</td>
<td>pulling fig trees</td>
<td>10 sar per day</td>
</tr>
<tr>
<td></td>
<td>ima-nu ku,-a</td>
<td>cutting willow</td>
<td>15–30 sar per day</td>
</tr>
<tr>
<td></td>
<td>ima-nu ku,-a</td>
<td>cutting willow</td>
<td>1 bale per day</td>
</tr>
<tr>
<td></td>
<td>gi ku,-a</td>
<td>cutting reed</td>
<td>10–20 sar per day</td>
</tr>
<tr>
<td></td>
<td>SIG₇,-a</td>
<td>pulling reed</td>
<td>13–40 sar per day</td>
</tr>
<tr>
<td></td>
<td>gi zi ku,-a</td>
<td>cutting fodder reed</td>
<td>3 bales per day</td>
</tr>
<tr>
<td></td>
<td>saḫar</td>
<td>soil excavation</td>
<td>6 2/3–10 volume-shekels soil</td>
</tr>
<tr>
<td></td>
<td>sig₄</td>
<td>&quot;plastering&quot; brick</td>
<td>80 bricks per day</td>
</tr>
<tr>
<td></td>
<td>še</td>
<td>harvesting barley</td>
<td>1 gur per day</td>
</tr>
<tr>
<td></td>
<td>gig</td>
<td>harvesting wheat</td>
<td>2 barig per day</td>
</tr>
<tr>
<td></td>
<td>še geš ra</td>
<td>threshing barley</td>
<td>4 barig per day</td>
</tr>
<tr>
<td></td>
<td>gig geš ra?</td>
<td>threshing wheat</td>
<td>1 barig 1 ban, 2 sila₃ per day</td>
</tr>
<tr>
<td>Category</td>
<td>Work Description</td>
<td>Translation</td>
<td>Labor Norm</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>fish</td>
<td>ku₂, kun-zi</td>
<td>delivering reservoir fish</td>
<td>2 fish per day</td>
</tr>
<tr>
<td></td>
<td>sag-kur₂</td>
<td>delivering headed fish</td>
<td>10 fish per day</td>
</tr>
<tr>
<td></td>
<td>še₄</td>
<td>delivering smoked fish</td>
<td>2/3 ban, per day</td>
</tr>
<tr>
<td>milling</td>
<td>ar-za-na ninda ar₁-ra</td>
<td>milling a-groats</td>
<td>2 ban, per day</td>
</tr>
<tr>
<td></td>
<td>dabin</td>
<td>milling flour</td>
<td>1 ban, per day</td>
</tr>
<tr>
<td></td>
<td>cš₄</td>
<td>milling semolina</td>
<td>2 ban, per day</td>
</tr>
<tr>
<td></td>
<td>z₁₁ ba-ba</td>
<td>milling b-flour</td>
<td>1 ban, per day</td>
</tr>
<tr>
<td></td>
<td>z₁₂-gu saga</td>
<td>milling fine pea flour</td>
<td>5–8 sila, per day</td>
</tr>
<tr>
<td></td>
<td>z₁₉ sig₁₅</td>
<td>milling rough flour</td>
<td>1 ban, per day</td>
</tr>
<tr>
<td>leatherwork</td>
<td>ka₂-a-pa-la₁</td>
<td>making a-pouches</td>
<td>1 pouch per day</td>
</tr>
<tr>
<td></td>
<td>kae-sir₁, e₁₂-ba-an</td>
<td>making pairs of sandals</td>
<td>3 pairs per day (MVN 5, 273)</td>
</tr>
<tr>
<td></td>
<td>kummu</td>
<td>making water skins</td>
<td>2 days per water skin</td>
</tr>
<tr>
<td>construction</td>
<td>im du₁-a</td>
<td>raising adobe walls</td>
<td>3 3/4–6 surface-shekels per day</td>
</tr>
<tr>
<td>pottery</td>
<td>dug 1(ban₂)</td>
<td>making 1-ban₂ vessels</td>
<td>3 vessel per day</td>
</tr>
<tr>
<td></td>
<td>dug 3(ban₂)</td>
<td>making 3-ban₂ vessels</td>
<td>1 vessel per day</td>
</tr>
<tr>
<td></td>
<td>dug ninda 1 sila,</td>
<td>making 1-sila,</td>
<td>4 vessels per day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bread vessels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dug ninda 5 sila,</td>
<td>making 5-sila,</td>
<td>3 vessels per day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bread vessels</td>
<td></td>
</tr>
<tr>
<td>garments</td>
<td>tug₄, sag uš-bar</td>
<td>weaving s-garments</td>
<td>3 garments per day =</td>
</tr>
<tr>
<td></td>
<td>tug₄, guz-za 4-kam us,</td>
<td>weaving fourth-class</td>
<td>15 days per garment?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tufted garments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tug₄, guz-za du</td>
<td>weaving regular</td>
<td>15 days per garment?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tufted garments</td>
<td></td>
</tr>
</tbody>
</table>
| woodwork | ge₁₅-pisan       | making crates        | 3 crates per day? (a₁₂-bi n kuš₂⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻‥⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻‥⁻⁻‥⁻‥⁻‥⁻‥‥⁻‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥‥″)
|          | ge₁₅-āpim       | making ploughs       | 5–10 days per plough = |
|          | ge₁₅-ig         | making doors         | 5 days per door (with 2 ox hides) |
|          | ge₁₅-ig saga gid₂-bi | making fine doors | 1 1/2 days per door |
|          | 1 ninda dagal-bi n | 1 n. length, n width | |

Note: Metrological systems in the labor equivalencies list:
- Capacity: 1 gur = 5 barig = 30 ban₂ = 300 sila, (1 sila, is about 1 liter)
- Weight: 1 gn₂ = 60 mana = 3,600 shekels (1 shekel is about 8.33 g)
- Length: 1 ninda = 2 gi (reed) = 12 kuš₃, (cubits, 1 cubit is about 50 cm)
- Surface: 1 iku = 100 sar ("garden plot", about 36 m²); 1 sar = 60 shekels (1 surface-shekels, about .6 m²)
- Volume: 1 sar (1 ninda × 1 ninda × 1 kuš₃, or 6 m × 6 m × .5 m = 18 m³) = 60 shekels (1 volume-shekels, about .3 m³)
- Bricks: 1 sar = 720 bricks (ultimately based on an Old Akkadian brick sar = 1 volume-sar)

*TCL 5, 6036, requires collation for these and other apparently irregular values.*
In nearly all these equivalency values for work norms, the accounting formulation is straightforward. For instance, the first half of text JCS 16, 14, number 1, reads:

**Obverse**

5(u) sar saḥar zi-ga
a₂ lu₂ ḫun-ga₂
šē 5(diš) sila₃-ta
e sa-dur₂-ra a-ša₃ amar-šiši₁₇

1(u) sar saḥar
i₃-muru₁₁-us₂-sa
i₇-lugal-ka

**Reverse**

a₂-bi u₄ 6(geš₂)-kam
ugula ur-e₂-nun-na
kišib, a-kal-la

mu gu-za₄ en-lil₂-la₂ ba-dim₂

*1 volume-sar is approximately 18 m³.

The calculation here is $50 + 10 = 60$ sar; $60$ sar $÷ 360$ workdays $= \frac{1}{6}$ volume-sar or $10$ volume-shekels (about $3$ m³) of soil excavated per workday.

Detailed accounts of labor norms applied to field preparation and sowing add a dimension of complexity to the otherwise fairly trivial calculations involved in Ur III labor accounts. The common $a₂$ eri₂-na Umma texts of the type much studied in Babylonian agriculture (Civil 1994:77; de Genouillac 1924:44, note 1; Maekawa 1990:119) record the surface measures and planned ploughing stages of each year's field preparation with entirely formulaic notations (with $a$, $b$, $c$, and $d$ representing whole numbers):

$a$ (iku) plough type $x$

$b$(iku)-ta geš-ur₁-ra a-ra₁ 1-4 c(iku)-ta

$a₂$ eri₂-na-bi days $d$

Since the personnel handling the nonseeding deep plough ($gē$'tuggur) and the harrow ($geš$-ur₁-ra; literally “wooden beam,” dragged across the prepared fields one to four times) always numbered three $eri₂$, the calculation of workdays needed to prepare a field for seeding was: $d$ (workdays) $= 3 \times ((a ÷ b) + 1-4(a ÷ c))$.

An example may be offered from the initial section of the Umma account UTI 4, 2560*:
Numerous sources contain occasionally easily deciphered, occasionally entirely cryptic notations describing another important activity of Ur III households—milling grain into flour, which was done almost exclusively by female laborers (Englund 1991):

<table>
<thead>
<tr>
<th>Flour Type</th>
<th>Labor Norm per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>dabin</td>
<td>1 ban₁ (≈ 10 liters) flour</td>
</tr>
<tr>
<td>ninda</td>
<td>1 ban₂ bread flour</td>
</tr>
<tr>
<td>zi₁ ba-ba</td>
<td>1 ban₂ baba-flour</td>
</tr>
<tr>
<td>zi₁ gaz₃(KUM)</td>
<td>1 ban₂ crushed flour</td>
</tr>
<tr>
<td>zi₁-gu saga</td>
<td>5–8 sila₁ (1 sila₁ ≈ 1 liter) fine pea-flour</td>
</tr>
<tr>
<td>zi₁ sig₁₅</td>
<td>1 ban₂ s-flour</td>
</tr>
<tr>
<td>eša</td>
<td>2 ban₂ semolina</td>
</tr>
<tr>
<td>nig₂ ar₁-ra saga</td>
<td>2 ban₂ fine a-groats</td>
</tr>
</tbody>
</table>

This is a classic example of input (raw material = grain) and output (processed good = flour). The average production norm was 10 liters of milled grain per workday per female laborer. If we calculate the minimum rationing “cost” of one of these women to be 1 liter of unprocessed barley per day (plus “fringe”), the value of flour should be about 10 percent above that of unmilled grain. But as we have seen above, milled grain (dabin) is converted to unprocessed barley at a rate of 1:1. I have unfortunately been unable to uncover a calculation in the Ur III texts that would confirm this “added value” theory of early millwork.

In like fashion to the excavation and field prep tasks organized by field supervisors, fishing teams composed of corporate slaves, usually blood relations (adult brothers and their sons), were assigned catch and processing norms based certainly on the availability of, and the effort in drying or smoking, fish. An inspection of all available Ur III fisheries texts (Englund 1990) has resulted in a list of fish—probably both raw and processed sorts are represented—and their corresponding daily catch norms, of which several were listed above. The full list is:
Fish Sort | Quantity per Day | Local Context
--- | --- | ---
ku, al-dar-ra | 6 split fish | Common to the types of fish such as eštub or aztug, a type of carp
ku, gam+gam | 10 mana of g-fish | [GU₄] is commonly read
ku, GU₄ | 2 KWU858-crates of G-fish |
ku, kun-zi | 2 reservoir-fish |
ku, kun-zi saga | 1 fine reservoir-fish |
sag-kur | 10 “headed” fish |
sag-keš | 1 “head-bundle” of fish |
sag-keš, DU | 1/10 DU—“head-bundle” of fish |
suḫur-gal | 1 KWU858-crate of large suḫur-carp |
suḫur | 1 KWU858-crate of suḫur-carp |
ti-la | 1 “life” fish |
še₆ | 6 2/3 liters of smoked fish |

*This might be simply ku₆ sag-keš-ra₆, but the value remains irregular and not entirely credible. The reference text, SNAT 345, obverse 6–7, has: “2(geš₃) 3(u) ku₆ sag keš₆ DU / a₂-bi u₂ 2(geš’u) 5(geš.)-kam” for fish described as “ku₆ du₆-ku₆-ga,” followed by various numbers of ku₆, nag, fish, including (obverse 13–reverse 1): “1(geš.) 4(u) ku₆ sag keš₆, DU / a₂-bi u₂ 1(geš’u) 6(geš.)-4(u)-kam”—that is, 150 ÷ 1,500 = 1/10, and 100 ÷ 1,000 = 1/10, respectively. Correct gin₂ in the same text to KWU858.

We needn’t know much about the fish or even the potential metrological designations found in this list of work norms to make other interesting comparisons with the administrative record. As was demonstrated earlier, like many other items of domestic production, fish were moved through the controlled markets of the damgar agents and were thus assigned silver equivalencies. Of these, we find four sorts that are also in the list of fisheries work norms:

Fish Sort | Daily Catch Norm | Fish per Shekel Silver
--- | --- | ---
ku₆ gam+gam | 10 mana of g-fish | 900
ku₆ sag-kur₂ | 10 headed fish | 900
ku₆ kun-zi (saga) | 1 or 2 reservoir-fish | 90
ku₆ še₆ | 6 2/3 liters of smoked fish | 2 gur

The speculation involved in relating the gam-gam fish as silver equivalents in units and as catch norms in mana would appear to be unnecessary given the three remaining sorts with compatible numerical quantifications. These three, remarkably, result in the same equivalence of 90 fisheries workdays per shekel of silver:

900 ku₆ sag-kur₂ per shekel of silver at 10 per day = 90 workdays per shekel of silver
90 ku₆ kun-zi per shekel of silver at 1 or 2 per day = 90 or 45 workdays per shekel of silver
2 gur ku₆ še₆ per shekel of silver at 6 2/3 sīla, per day = 90 workdays per shekel of silver
The labor–silver equivalencies found in a minimum of 25 Ur III accounts result in a range of values reaching from one to six (standardized 30-day) months per shekel of silver, based on some number of workdays of laborers valued as a corresponding weight of silver, but the Umma text TLC 5, 6171, reverse 5–6, appears to assume a singular role in booking an amount of silver and subsequently converting that silver to an abstracted set of workdays that formed the means of common calculation in the account:

\[
1(u) \text{ gin}_2 \text{ ku}_3 \text{-babbar}\quad 10 \text{ shekels of silver,}
\]
\[
a_2\text{-bi } 1(\text{geš’u}) \text{ } 5(\text{geš}_2)\quad \text{their labor: } 900 \text{ (days)}
\]

thus 90 workdays per shekel of silver. Aside from the indirect evidence derived from the fisheries texts above, this three work-month equivalency for 1 shekel of silver is known from only two other accounts (ITT 3, 6541 + 5, 6829 [NG 2, 67] and SNAT 236; see Englund 1990:196–197).

Another important part of the Babylonian economy was the production of containers made of reed, and I would like to close this paper with a short discussion of how much more information we are able to press from our documents when observed in the light of an increasing awareness of unstated equivalencies. I list below some labor norms attached to basketry teams mentioned earlier.

<table>
<thead>
<tr>
<th>Basket Labor Norm per Day</th>
<th>Labor Norm per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>(especially TCL 5, 6036)</td>
<td>(especially TCL 5, 6036)</td>
</tr>
<tr>
<td>gšma-an-sim ninda ar₂-ra</td>
<td>3 sieves</td>
</tr>
<tr>
<td>gšma-an-sim dabin</td>
<td>3/5 sieve</td>
</tr>
<tr>
<td>gšma-an-sim us₂</td>
<td>1/2 sieve</td>
</tr>
<tr>
<td>gšma-an-sim saga lugal</td>
<td>1/5 sieve</td>
</tr>
<tr>
<td>gšgur-dub 3(ban₁)-ta</td>
<td>4 baskets</td>
</tr>
<tr>
<td>gšhal gur-dub 4(ban₁)-ta</td>
<td>5 baskets</td>
</tr>
<tr>
<td>gšgur-dub 1(barig)-ta</td>
<td>5 1/2 baskets</td>
</tr>
<tr>
<td>gšhal gur-dub 1(barig) 3(ban₁)-ta</td>
<td>3 baskets</td>
</tr>
<tr>
<td>gšhal 1(barig)-ta</td>
<td>10 baskets</td>
</tr>
</tbody>
</table>

Simple technical considerations make the equivalence of three units per workday for sieves used with the grain called ninda-ara credible, since it comports well with the fact that this flour was milled about twice as fast as normal flour. Thus it would have been rougher ground and would have required a less fine mesh than better flour sorts. The second group, of gurdub and ḫal baskets, gives fairly confusing numbers in light of the expectation that the smaller the container, the less work expended in its production. The accounts would appear to fail in aiding us in understanding this apparent anomaly. If we review descriptions of basket production found in related instances, however, we can draw quite unexpected new conclusions about the accounting processes that underlie superficially innocent numerical notations. The totals section reverse iv 21–26 (Figure 21.2), found in
TCL 5, 6036, a large (20-column, 750-line) account from the southern province of Umma, represents just one of numerous examples of labor notations in Ur III texts that contain a wealth of unstated information:

1a) |ŠU+LAGAB| 5(geš₂) 2(u) ṣal gur-dub
   1(barig) 3(ban₂)-ta
1b) gi-bi 8(geš₂) sa
1c) a₂-bi u, 1(geš₂) 4(u) 6(diš) 2/3(diš)

Total: 320 ṣal-gurdub baskets at 1 barig 3 ban₂ each
     their reeds: 480 bundles,
     their labor: 106 2/3 days.

2a) |ŠU+LAGAB| 4(u) ṣal-gur-dub 4(ban₂)-ta
2b) gi-bi 2(u) 6(diš) 2/3(diš) sa
2c) a₂-bi u, 8(diš)

Total: 40 ṣal-gurdub baskets at 4 ban₂ each,
      their reeds: 26 2/3 bundles,
      their labor: 8 days.

Let us do some preliminary calculations to discover what these notations mean (remembering that 1 barig = 6 ban₂; 1 ban₂ = 10 sila₃; and 1 sila₃ is about 1 liter):

1a) 320 ÷ 106 2/3 = 3 90-sila₃ units to be constructed per workday
2a) 40 ÷ 8 = 5 40-sila₃ units constructed per workday
1b) 320 baskets × 90 sila₃ per basket ÷ 480 = 60 basketsila per reed bundle
2b) 40 baskets × 40 sila₃ per basket ÷ 26 2/3 = 60 basketsila per reed bundle
1c) 3 units per day × 90 sila₃ per basket + 60 basketsila per reed bundle = 4 1/2 sa gi per day matted into the larger baskets, and
   = 3 1/3 sa gi per day matted into the smaller baskets
2c) 5 units per day × 40 sila₃ per basket + 60 basketsila per reed bundle

In both cases, a bookkeeping construct capacity of 60 “basketsila” (60 liters) is expected per bundle of reed (sa gi). Since we know the reed bundle was, in basketry, equivalent to a KID mat of about 1 × 1 m (1/36 surface-ṣarr; cf. Civil 1964:80; Goetze 1948; see Figure 21.3 for a potential reconstruction of what Ur III scribes might...
have been using as metrological guidelines), and since $6 \, sa \, gi$ were to be matted in one day, then for mats we would expect the equivalent of 360 basketsila per workday. Here we have $4 \, \frac{1}{2} \, sa \, gi$ per day matted into the larger baskets and $3 \, \frac{1}{3} \, sa \, gi$ per day matted into the smaller baskets. I am unable to locate a meaningful mathematical relationship between the two. Still, these production norms make intuitive sense given the time involved in setting out the spokes or staves for a new basket, tying off the rim of the finished product, and making lids and handles.

*TCL* 5, 6036, is replete with background equivalencies that we find recorded in no school exercise but that did reflect the importance attached to basketry in early Babylonian economies. Baskets served to facilitate the storage of most commodities of the day, as well as any number of other natural and man-made products, including, in the *pis an dub-ba*, all clay tablets of archival interest to accountants. Baskets also incorporated into daily activities a quite clear metrology, as we have seen in the current account. Expanded to use in fisheries, wood- and metalworking, and grain harvest and storage, these containers provided a quick and efficient means to quantify expenses and incomes. The 30-liter *ma-sa,-ab* baskets used by porters during harvest to transport grain from the fields, for instance, fit seamlessly into the grain capacity system, itself based on the *barig* of 60 liters: two workers are one, next two are two, next two are three barig and so on, keep counting, eight are four, ten porters are five barig, that is, one gur, twenty are two, keep counting. Further, the utility of strictly defined piecework for basket production is evident, since in advance of the effort, supervisors achieved an exacting overview of input costs for the production of their wares. In the first instance above, assign to Foreman Smith, for a period of 10 days, 10 full-time workmen and 1 committed to two-thirds of normal labor output ($(10 \, \text{days} \times 10) + (10 \, \text{days} \times 2/3) = 106 \, 2/3 \, \text{workdays}$) and deliver to him 480 bundles of reed, and you can with some confidence expect to

---

**Figure 21.3.** A 60-basketsila container. The figure to the right represents the easiest way for the Ur III bookkeeper to imagine a cylinder constructed from a $1 \times 1$ m (in Babylonian lengths, $2 \times 2$ cubits) reed mat. A base of 50 cm (1 cubit) cut from a quarter of the mat would leave three sections, each $50 \times 50$ cm. Given the Babylonian approximation of $\pi$ as 3, these three sections in a strip would provide the cylinder's 50-cm-high wall. Such an idealized basket would hold slightly less than 100 liters and would therefore, given the uncertainties of Ur III basket construction, make a very credible fit with the underlying metrology of the notations in *TCL* 5, 6036, discussed here.
receive back your desired 320 baskets. You need make no inquiries as to how or by whom specifically the work was accomplished. In fisheries accounts: 10 workmen for 360 days makes 3,600 workdays per year, makes 80 gur of smoked fish (3,600 × 6 2/3 liters per day). At the end of the year, the foreman in charge of these laborers, themselves property of the state, has delivery receipts on hand totaling only 60 gur—he owes 20. How can he make that up if called upon to do so? He can submit 10 shekels of silver borrowed from his brother, his father, or the local damgar, since smoked fish are registered in state accounts at 2 gur per shekel (there are some two dozen instances of just this practice, qualified as so much ku₂ ku₆ or “fish silver”), or he can deliver, in baskets, 10 gur of grain. If he dies and leaves behind nothing but his family and this debt, the provincial household to which he was attached can claim his surviving wife and daughters as slaves, in approximate equivalency value to the missing fish.

We must take cardinal examples of equivalency use such as TCL 5, 6036, for what they are—namely, key texts that make available to us, using a simple pocket calculator, a myriad of important bookkeeping norms, or what may prove to be norms, that we can test against current and future text corpora. It is not difficult to abstract this use of equivalencies up the economic hierarchy to the level of provincial and then royal, or so-called bala, accounts. Take a slightly idealized view, from the capital city Ur, of the households under control of the governor of Lagash Province. All land, personnel, and herds are owned by the crown and supervised by the local administration in place in Girsu. Each of those three categories consists of 1 šar₂ (3,600) or a multiple thereof (the figures, incidentally, are likely not far removed from reality): 3,600 bur₃ (expressed in Ur III surface metrology as 1 šargal bur₃ [cf., e.g., RTC 407]; about 23,000 ha) of arable land, 3,600 corporate slaves, 10,800 sheep and goats, and 3,600 oxen and cows. Šulgi claims—for the royal court; for the standing army; for the temples in Nippur, Ur, and Uruk; for trade or storage; or to “present back” to his thankful kingdom—half the grain harvest (cf. CT7, 8 BM 12926; Sharlach 2003:67–69) and one-tenth the products and offspring of the herds (despite Sharlach 2003:140–142) and the labor of the workers. The equivalencies employed to calculate these taxes are known to all parties: 30 gur per bur₃ grain harvest makes 3,600 × 30 ÷ 2 = 15 šar₂ (alternatively, 15 guru₂ or 54,000) gur; 3,600 × 360 ÷ 10 = 36 šar₂ (129,600) workdays that can be credited through the receipt of any combination of products, the confirmation of work done on such crown tasks as road and waterway maintenance or monumental constructions, or the delivery of silver or some like payment foreseen in equivalency tables, including artificial “adjustments” of labor found throughout our accounts but still very imperfectly understood; 10,800 ÷ 10 = 1,080 (male) sheep and goats for offerings and priestly repast; 10,800 × 2 (pounds [ma-na] of wool or goat hair per animal) ÷ 10 = 36 talents (2,160 pounds) bound for textile production (to clothe the wards of the crown and to move into domestic and interregional markets, textiles being the primary export article produced in Babylonia); and 3,600 ÷ 10 = 360 (likely) oxen for
offerings and 1,800 cows × 5 (liters of butter oil) and 7.5 (liters of kašk cheese) ÷ 10 = 900 and 1,350 liters, respectively. The governor of Girsu might well not achieve these results, but he will be in the king’s debt for his generosity in forgiving at least some of the province’s failings, and the royal court itself, with its many princely households, could reckon with a steady and substantial income to fund its lavish expenditures. (Though only slightly more credible than informed speculation, it is worth noting that, based on the above numbers, the crown’s grain income from Lagash Province, expressed in silver [1 gur per shekel], would be valued at more than 10 times the combined total silver value of workdays [at 90 days per shekel], small and large cattle offerings [at about 1 and 5 shekels per animal, respectively], wool and goat hair [at 10 pounds per shekel], and butter oil and dry cheese [at 10 and 150 liters per shekel, respectively].)

This in some ways fanciful reconstruction of the office of the treasury in Ur is admittedly my own attempt to abstract the ultimate form of Šulgi’s bala accounts, now lost somewhere in the depths of the capital, from the numerous attestations of accounting practice found in provincial archives. But we can be quite confident that at least a similarly formulated calculation of plan production played a substantive role in Ur III economies, scaling up from the various teams engaged at basic levels with farmwork, canal maintenance, brick construction, and fishing, through the administrations of relatively self-sufficient households, from there to province-level accounts, and finally to crown accounts of taxes, tribute, and the royal expenditures they funded. Ur III specialists who have attempted to piece this system together should not exclude from their imaginings the tables of implicit equivalencies that speak, with some authority, through the administrative accounts of all provinces.
THE CONSTRUCTION OF VALUE IN THE ANCIENT WORLD

EDITED BY

JOHN K. PAPADOPOULOS

AND

GARY URTON

Cotsen Institute of Archaeology
University of California, Los Angeles
CONSOLIDATED
BIBLIOGRAPHY

Abrams, E. M.

Acosta, J. de

Acuña, F. de
1965 [1586] Relación Fecha por el Corregidor de los Chumbibilcas, Don Francisco de Acuña por mandado de su Ex.a Del Señor don Fernando Torres y Portugal, Visorrey Destos Reynos, para la discripcción de los Indios que su Magestad Manda Hacer. In Relaciones geográficas de Indias-Perú, vols. 1–2, edited by M. Jiménez de la Espada. Reprinted in Biblioteca de Autores Españoles 183:310–325.

Acuto, F. A.

Adams, R. McC.

Addison, J.

Agurto, S.

Albani, J., et al.

Albornoz, C. de

Alcina Franch, J.

Alcock, S. E.

Alcock, S. E., T. D’Altroy, K. D. Morrison, and C. M. Sinopoli (editors)

Alden, M.

Alföldi, A.

Allen, C. J.
1988 The bold life has: coca and cultural identity in an Andean community. Smithsonian Institution Press, Washington, D.C.
Allison, M. J.  

Alonso, A. M.  

Althaus, F., and M. Sutcliffe (editors)  

Alva, W.  

Alva, W., and C. B. Donnan  
1993 *Royal tombs of Sipán*. Fowler Museum of Culture History, University of California, Los Angeles.

Amandry, P.  


Amit, V.  

Anderson, E.  

Anheier, H. K, and Y. R. Isar  
2007 *Conflicts and tensions*. Sage, Los Angeles.

Anonymous  


Antonović, D.  

Appadurai, A.  

Appadurai, A. (editor)  

Arafat, K. W.  

Archivo General del Patrimonio Nacional  
1995 *Inventario del fondo documental del convento de Nuestra Señora de Atocha en el archivo general de Palacio (Madrid)*. Editorial Patrimonio Nacional, Madrid.

Arkush, E., and C. Stanish  

Armani, E. P.  

Arnold, D. Y., and C. A. Hastorf  
2008 *Heads of state: icons, power, and politics in the ancient and modern Andes*. Left Coast Press, Walnut Creek, California.

Arriaga, J. P. de  

Arriaza, B.
1995 Beyond death: the Chinchorro mummies of ancient Chile. Smithsonian Institution Press, Washington, D.C.

Ascher, M.

Ascher, M., and R. Ascher

Ashmore, W., and A. B. Knapp (editors)
1999 Archæologies of landscape: contemporary perspectives, Blackwell, Cambridge, Massachusetts

Asper, M.

Assmann, J.

Astill, G., and W. Davies

Astrupdsson, A.

Aubet, M.

Austin, M. M., and P. Vidal-Naquet

Avi-Yonah, M.

Ayers, G. T.

Bagley, P. W.
1990a A Shang city in Sichuan Province. Orientations (November):52

Bahn, P. G.

Bailey, C., trans.

Bailey, D., with S. Mills (editors)

Baines, J. and P. Lacovara

Balnuth, M. S. (editor)

Bandinelli, R. B.

Bang, P.

Ban Gu 班固 et al.
Barber, E. J. W.

Barker, G. (editor)

Barnett, H. G.

Barrett, C. E.

Barry, F.

Bartelink, G. J. M. (editor)

Barthes, R.

Basso, K. H.

Bastien, J. W.

Bataille, G.

Bates, G.

Baudrillard, J.
1975 The mirror of production. Telos Press, St. Louis.
1981 For a critique of the political economy of the sign. Telos Press, St. Louis.

Bauer, B. S.

Bauer, B. S., and R. A. Covey

Bauer, B. S., and D. Dearborn

Bauer, B. S., and C. Stanish

Bauer, J., R. K. Englund, and M. Krebernik

Baxandall, M.

Bazelmans, J.

Bell, C.

Bender, B. (editor)

Bengston, L.

Benjamin, W.

Benson, E. P., and B. de la Fuente (editors)

Benton, S.

Berleant, A.

Berthoud, G., and F. Sabelli.

Bertonio, L.

Betancourt, P. P.

Betanzos, J. de

Bevan, A.

Bijovsky, G.

Bitel, L.

Blackburn, E. T.

Bloch, M.

Bloch, M., and J. Parry, J.

Blomster, J. P.

Blumer, H.

Boas, F.


Bonniol, D., and S. Cassen

Bonsall, C., V. Boroneanţ, and I. Radovanović (editors)

Bonsall, C., G. Cook, R. Hedges, T. Highem, C. Pickard, and I. Radovanović

Bonsall, C., I. Radovanović, M. Roksandić, G. Cook, T. Higham, and C. Pickard

Borić, D.

Borić, D., and V. Dimitrijević

Borić, D., and J. Robb

Boroneanţ, V., C. Bonsall, K. McSweeney, R. Payton, and M. Macklin

Boteler Mock, S. (editor)

Bourdieu, P.

1984 Distinction: a social critique of the judgment of taste. Harvard University Press, Cambridge, Massachusetts


Bourdieu, P., and J.-C. Passeron

Bourdieu, P., and L. J. D. Wacquant

Bowersock, G.

Bowser, B.

Bradeen, D. W.
Bradley, R.

Bray, T. L.

Briard, J., M. Gautier, and G. Leroux

Bricker, V. R.
1986 *A grammar of Mayan hieroglyphs.* Middle American Research Institute, Tulane University, New Orleans.

Broekman, G. P. F., R. J. Demarée, and O. E. Kaper (editors)

Brown, A.

Brown, L. (editor)

Brown, P.
1977 *Relics and social status in the age of Gregory of Tours.* University of Reading, Reading.

Brubaker, L.

Bruce, R.
1968 *Gramática del lacandón.* Instituto Nacional de Antropología e Historia, Mexico City.

Brunfie1, E. M.

Brunke, H. O.

Buchan, J.

Buckton, D. (editor)
1984 *The treasures of San Marco, exhibition catalogue.* Olivetti, Milan.

Buikstra, J. E., and D. H. Ubelaker (editors)

Bunzel, Ruth

Burger, R. L.

Burger, R. L., and R. Gordon

Burger, R. L., and H. Lechtman

Burger, R. L., and K. Makowski

Burger, R. L., and R. Matos

Burger, R. L., and L. Salazar


Burger, R. L., and L. Salazar (editors)

Burnett, A. P.


Burton, J.

Bury, J. B. (editor)

Butcher, K.

Butler, J.

Buttrey, T. V.

Butz, K.

Butz, K., and Schröder, P.

Byrne, D.

Cabello Balboa, M.

Caillavet, C.


Calame, C.

Calancha, A. de la

Callaway, J. S.

Camphausen, R. C.

Camprón Mila, N.

Carman, J., and A. Harding (editors)

Carmichael, P. H.

Carrión Cachot, R.
1949 Paracas cultural elements. Corporación de Turismo, Lima.

Carson, A.

Carter, T.

Casey, E. S.

Catling, H. W.

Cavanagh, W., and C. Mee

Chacon, R. J., and D. H. Dye (editors)

Chalfont, A. Baron

Chang, K.-c.

Chapman, J.


2004d 成都金沙遗址萬博地点考古勘探与发掘收穫 (Results from the archaeological prospection and excavations at the Wanbo locus of the Jinsha site in Chengdu). 成都考古发现 (Archaeological discoveries in Chengdu) 2002:62–95.


2005c 金沙：再現輝煌的古蜀王都 (Jinsha: reconstructing the prosperous capital city of the ancient Shu state). Sichuan chuban jituan, Chengdu.


2007 成都市金沙遺址“西城天下”地點發掘 (Excavations at the the “Xicheng Tianxia” locus of the Jinsha site, Chengdu City). 成都考古發現 (Archaeological discoveries in Chengdu) 2005:244–272.

Chengdu and Beijing 成都市文物考古研究所 and 北京大學考古文博院

2002 金沙淘珍—成都市金沙村遺址出土文物 (Panning for treasure at Jinsha— artifacts excavated from the Jinsha village site in Chengdu City). Wenwu chubanshe, Beijing.

Chengdu and Pi Xian 成都市文物考古工作隊 and 郫縣博物館


Chumbicarba,Ysabel 1628 Testamento de Ysabel Chumbicarba natural de Santaorlla” 1628 “Testamentos de Indios” Archivo General de la Nación, Lima.


Clark, J. E. (editor)

Clark, J. E., and W. J. Parry

Clark, J. E., and M. E. Pye

Clark, J. E., and M. E. Pye (editors.)

Classen, C.

Clay, J. S.

Cleal, R. M. J., K. E. Walker, and R. Montague

Closmadeuc, G. d

Closs, M.

Coben, L.

Cobo, B.


Cock, G. A.

Coe, M. D.

Coe, M. D., and R. A. Diehl

Coe, W. R.

Collin, Diego
1598  “Testamento de Don Diego Collin en el Panzaleo a cinco días del mes de Julio de mil quinientos y nobenta y ocho años.” Folios 29R–42R, Caja 7 III-22 1657 Archivo Histórico Nacional Quito

Colson, E.

Conklin, W. J.


Connerton, P.

Cook, N. D.

Cooney, K. M.

2008b Profit or exploitation? The production of private Ramesside tombs within the west Theban funerary economy. *Journal of Egyptian History* 1:79–115.


Cooper, K.


Costin, Cathy L.


Covarrubias, M.


Covarrubias Orozco, S. de


Covey, R. A.


Crawford, J. S.


Crawford, M. H.


Croce, B.


Cross, S.


Crump, T.


Csordas, T. J.


Cuatin, Cristóbal

1592 “Testamento de Cristóbal Cuatin Principal del Pueblo de Tuzá” Archivo Histórico del Banco Central del Ecuador, Quito, Ibarra Siglo XVI, 1592.

Cuba Peña, L. A.


Cucichimbo, Catalina and Luisa


Cummins, T. B. F.


Cummins, T. B. F. and J. M. Ossio
2012 “Muchas veces dude Real Mag/aceptar esta dicha ympressa”: the task of making Martín de Murúa’s La famosa historia de los Reyes Incas. Les Presses Universitaires de Rennes, Rennes.

Cuneo-Vidal, R.

Cunliffe, R. J.

Curley, E. M. (editor)

Cusihuamáñ, A.

Cutler, A.

Cutler, A., and J. W. Nesbitt
1986 L’arte Bizantina e il suo pubblico. UTET, Torino.

Cyphers Guillén, A.

Cyphers, A.
2004 Escultura Olmeca de San Lorenzo Tenochtitlán. Instituto de Investigaciones Antropológicas, Universidad Nacional Autónoma de México, Mexico City.

Daggett, R.


Dahl, J.

Dakoronia, Ph.
1989 Κρίκοι· Προνομισματικὲς μορφὲς γεωμετρικῆς ἐποχῆς. Archaiologike Ephemeris 128:115–120.

Dalton, G.

D’Altroy, T. N.


D’Altroy, T. N., and C. Hastorf (editors)

Daressy, G.
1909 Cervueils des cachettes royales, CG nos. 61001–61044. Institut français d’archéologie orientale, Cairo.

Darvill, T.

David, B., and J. Thomas (editors)
2008a Handbook of landscape archaeology. Left Coast Press, Walnut Creek, California.

Davis, F.  

Davis, W.  


Dawson, L. E.  

Day, C.  

Dearborn, D. S. P., M. T. Seddon, and B. S. Bauer  

DeBord, G.  

de Garis Davies, N.  
1925 *The tomb of the two sculptors at Thebes*. Metropolitan Museum of Art, New York.

de Genouillac, H.  

Dehn, W., P. Kalb, and W. Vortisch  

Deimel, A.  

Delehaye, H. (editor)  

DeLeonardis, L.  

DeLeonardis, L., and G. Lau  

Del Pozo F., C. Arturo  

DeMarrais, E.  

DeMello, M.  

de Polignac, F.  

Devall, B.  

Devlin, Z.  

Dewey, J.  

Dietz, S.  

Diez de San Miguel, G.  
Di Fabio, C.

Dissanayake, E.

Dobres, M.-A., and C. R. Hoffman (editors)
1999 The social dynamics of technology: practice, politics and world views. Smithsonian Institution, Washington, D.C.

Dobres, M.-A., and J. E. Robb (editors)

Donnan, C. B.
2007 Moche tombs at Dos Cabezas. Cotsen Institute of Archaeology, University of California, Los Angeles.

Donnan, C. B., D. A. Scott, and T. Braken

Dorsey, G.

Douglas, M.

Douglas, M., and B. Isherwood

Drenson, A., and Y. Inoue (editors)

Drijvers, J. W.
1992 Helena Augusta: the mother of Constantine the Great and the legend of her finding of the True Cross. E. J. Brill, Leiden

Dumont, L.

Dunand, F., and R. Lichtenberg

Dunbabin, T. J.
1948 The western Greeks: the history of Sicily and south Italy from the foundation of the Greek colonies to 480 B.C. Oxford University Press, Oxford.

Duplouy, A.

Durkheim, E.

Durkheim, E., and M. Mauss

Duvieols, P.

Dwyer, E. B.
Evans-Pritchard, E. E.

Falcone, C.

Fanon, F.

Farrington, I. S., and J. Zapata

Faust, K. A., and C. T. Halperin

Feld, S., and K. H. Basso (editors)
1996  *Senses of place*. School of American Research, Santa Fe, New Mexico.

Feldman, R.

Fentress, E.

Ferguson, N.

Ferrari, G.

Field, D.

Figueira, T. J.

Finley, M. I.

Fiskejio, M.

Flad, R. K.

Flad, R. K. and Z. X. Hruby

Fleming, A.

Follensbie, B. J. A.

Forde, N. W.
1964 *The Sumerian DAM-KAR-E-NE of the Third Ur Dynasty*. University Microfilms, Ann Arbor.

Forstemann, E.

Foster, R. J.

Foucault, M.

Fowler, B.

Frame, M.

Frantz, A.

Frézier, A. F.
1717 *A voyage to the south sea and along the coasts of Chili and Peru, in the years 1712, 1713, and 1714*. Jonah Bowyer, London.

Frings, J., and H. Willinghöfer (editors)

Frontisi-Ducroux, F.

Fulghum, M., and F. Heintz

Furtwängler, A.

Furumark, A.

Gallou, C.

Gansu and Jilin 甘肅省文物考古研究所 and 吉林大學北方考古研究所

García Moll, R., D. Juárez Cossio, C. Pijoan Aguade, M. E. Salas Cuesta, and M. Salas Cuesta

García Moll, R. and M. Salas Cuesta
1998 *Tlatilco: de mujeres bonitas, hombres y dioses*. Círculo de Arte, Mexico City.

García Soto, R.

Garcilaso de la Vega, I.


Gasché, R.

Gasparini, G., and L. Margolies

Geary, P. J.

Geertz, C.

Gell, I. J.

Gell, A.

Gemici, K.

Gernet, L.

Gibaja Oviedo, A. M.

Giddens, A.

Gillespie, S. D.

Gillings, M.

Gimbutas, M.

Glave, L. M.
1989 Trajinantes caminos indígenas en la sociedad colonial siglos XVI/XVII. Instituto de Apoyo Agrario, Lima.

Goetzte, A.

Godelier, M.

Goldsworthy, A.

Gombrich, E. H.

Gomi (Ozaki), T.

Gonzales Corrales, J. A.


González Holguín, D. de


Gorini, G.


Gosden, C.


Gosden, C., and Y. Marshall


Gose, P.


Gould, R. A.


Graeber, D.


Graham, D. C.


Graham, I.


Graham, I., L. Henderson, P. Mathews, and D. Stuart


Grajetzki, W.


Granet, M.


Granovetter, M.


Greco, E.


Green, C. P.


Green, S. W., and S. M. Perlman


Greenewalt, C. H.


Gregory, C. A.


Gregory, D.

Grieler, T., A. Bueno Mendoza, C. E. Smith Jr., and R. Malina

Grierson, P., and M. Mays

Grove, D. C.

Grueter, H. A.

Guaman, í

Guaman Poma de Ayala, F.
1615  El primer nueva corónica y buen gobierno in København, Det Kongelige Bibliotek, GKS 2232 4º.

Guarza, M.

Guchte, M. J. D. van de

Guevara, F. de,

Gulyás, S., A. Tóth, and P. Sümegi

Guo Shuchun 郭書春

Guthrie, S. E.

Guyer, J.

Gwinett, A. J., and L. Gorelick

Habinnek, T. N.

Haeberlin, E. J.

Hallwachs, M.

Halstead, P.  
1995  Late Bronze Age grain and Linear B ideograms *65, *120, and *121. Annual of the British School at Athens 90:229–234.

Hamilakis, Y., M. Pluciennik, and S. Tarlow (editors)  


Hanffmann, G.  

Hansen, P. A. (editor)  

Harris, A.  

Harsanyi, J. C.  

Harsanyi, J. C., and R. Selten  

Hastorf, C.  

Häusler, A.  

Haviland, J. B.  
1981  Sk’op Sotz’leb: el Tzotzil del San Lorenzo Zinacantan. UNAM, Mexico City.

Hayashi, M.  

Head, B. V.  

Heckel, W.  

Heffernan, K.  

Heimann, F.  

Heinzelmann, M.  

Helmer, M.  

Helms, M. W.  


Heyerdahl, T., D. Sandweiss, and A. Narvaez  

Herington, C. J.  

Hertz, R.  
Heubeck, A., S. West, and J. B. Hainsworth  

Hickey, D.  

Higgins, R.  

Higgs, E. S. (editor)  

Hilsdale, C.  

Hirsch, E.  

Hirsch, E., and M. O’Hanlon (editors)  

Hodder, I.  

Hoff, M.  

Hogarth, D. G.  

Hollowell, J. L.  
1987  Precision cutting and fitting of stone in prehistoric Andean walls. Unpublished research report 2832-84. Submitted to the National Geographic Society, Washington, D.C.

Hoppin, J. C.  

Horden, P., and N. Purcell  

Horna, K.  

Hoskins, J.  

Houston, S. D., and T. Cummins  

Houston, S. D., and Z. Nelson  
2001  *A thematic bibliography of ancient Maya writing.* Research Press at Brigham Young University, Provo, Utah.

Houston, S. D., D. Stuart, and K. Taube  
2006  *The memory of bones: body, being, and experience among the Classic Maya.* University of Texas Press, Austin.

Howard-Malverde, R.  

Howgego, C. J.  

Hrozný, B.  
Hruby, Z. X.

Hubert, H., and M. Mauss

Hulsewé, A. F. P.
1985 Remnants of Ch’iin law (Sinica Leidensia) Brill, Leiden.

Hume, D.

Hung, W.

Hunt, R.

Hurford, J. R.

Hurwit, J. M.

Hutcheson, F.

Hyslop, J.
1990 Inka settlement planning. University of Texas Press, Austin.

Ikram, S., and A. Dodson

Ingold, T.

Inomata, T.

Insoll, T.

Irigaray, L.

Ishell, W. H.

Isla Cuadrado, J.

Isla Cuadrado, J., M. Reindel, and J. C. de la Torre

Ivanov, I.
Ixer, R. A., and P. Turner

Ixer, R. A. and R. E. Bevins

Jackes, M., M. Roksandić, M., and C. Meiklejohn

Jackson, J. B.

Jacoby, D.

Jacquemin, A.

James, W.

Janusek, J.

Jeffery, L.H.

Jesuit, A.

Jiang Yuxiang 江玉祥
1993 廣漢三星堆遺址出土的象牙 (The elephant tusks unearthed at the Sanxingdui site in Guanghan). In 三星堆與巴蜀文化 (Sanxingdui and Ba Shu culture), edited by Zhao Dianzeng 翟殿增 et al., 198–204. Ba Shu shushe, Chengdu.

2000 成都平原早期城址及其考古學文化初論 (Preliminary discussion of the early town wall remains in the Chengdu plain and their archaeological cultures). In 寶墩遺址：新津寶墩遺址發掘和研究 (The Baodun site: excavations and research on the Baodun site in Xining), edited by Chengdu, 99–121. Chengdu Shi Wenwu Kaogu Yanjiusuo, Chengdu.

Ji Hongbing, C. Li, and J. Wen

Jochim, M. A.

Johnson, M.

Johnston, A.

Johnstone, P.

Jonaitis, A. (editor)

Jones, A.
Joyce, R.  
2000  *Gender and power in prehispanic Mesoamerica*. University of Texas Press, Austin.  

Julien, C.  
2000  *Reading Inca history*. University of Iowa Press, Iowa City.  

Kahn, C. H.  

Kalavrezou, I.  

Kalavrezou, I. (editor)  

Kalb, P.  

Kallet-Marx, L.  

Kant, I.  

Kaplan, M.  

Karlgren, B.  

Karo, G.  

Karpik, L.  

Karsten, R.  

Kassel, R.  

Kaufman, T.  

Kaulicke, P., L. Fehren-Schmitz, M. Kolp-Godoy, P. Landa, O. Loyola, M. Palma, E. Tomasto, C. Vergel, and B. Vogt  

Keane, W.  

Keegan, J.  

Keeley, L.  

Keesling, C. M.  
Keller, K. C.

Kelly, D. H.

Kendall, A. E.

Kendall, A. E., R. Early, and B. Sillar

Kennett, L.

Keynes, J. M.

Kilian-Dirlmeier, I.
1997 *Das mittelbronzezeitliche Schachtgrab von Agina. Alt-Agina Band IV, 3 (Kataloge Vor- und Frühgeschichtlicher Altertümer, Bd 27).* Philip von Zabern, Mainz.

Killen, J. T.

Kim, H. S.

Kirk, G. S., and J. E. Raven

Kitchen, K. A.

Knapp, G. F.
1905 *Staatliche Theorie des Geldes.* Duncker and Humblot, Leipzig.

Kohler, T. A., and G. J. Gummerman
Kolata, A. L.

Kopytoff, I.

Kosiba, S.

Koslova, N.

Kosman, L. A.

Kötting, B.
1965 *Der frühchristliche Reliquienkult und die Bestattung im Kirchengebäude*. Opladen, Westdeutscher Verlag, Köln.

Kousser, R.

Kowalzig, B.


Kraay, C. M.


Kraay, C. M., and M. Hirmer

Kraus, F. R.

Kristeller, P. O.

Kroeber, A. L.


Kroeber, A. L., and W. D. Strong
1924 The Uhle pottery collections from Ica. *University of California Publications in American Archaeology and Ethnology* 21(3):96–133.

Kroll, J. H.


Krusch, B. (editor)

Kurth, A.
Kurke, L.

Lacy, A. D.
1967 *Greek pottery in the Bronze Age*. Methuen, London.

La Lone, D. E.

Lang, M., and M. Crosby

Lareau, A., and E. B. Weiningher

Larson, L.

László, A.

Latour, B.

Latour, B., and S. Woolgar

Lattimore, R. (translator)

Laum, B.

Lavallée, D.

Layton, R.

Layton, R., and P. J. Ucko

Lazzari, M.

Lechtman, H.
Li, Yung-ti


Liddell, H. G., R. Scott, and H.S. Jones

Liddell, H. G., R. Scott, H. S. Jones, and R. McKenzie

Lifschitz, F.

Lillios, K. T.

Linduff, K. M., Han Rubin, and Sun Shuyun

Lippard, B.

Liu Li

Livingston, P.

Locke, L. L.
1923 The ancient quipu or Peruvian knot record. American Museum of Natural History, New York.

Loewe, M.
1961 The measurement of grain during the Han period. T'oung Pao 1–2:64–95.

Long, A. A., and D. N. Sedley

Lonsdale, S. H.


Lopez, R. S.

Louraux, N.

Lothrop, S.


Loudon, J.

Louks, F. G.


Love, B.

Low, S. M., and D. Lawrence-Zúñiga, D. (editors)

Lowe, E. D.
Lowe, G. W.  

Lubar, S., and W. D. Kingery (editors)  
1993 *History from things: essays on material culture*. Smithsonian Institution, Washington, D.C.

Lumbreras, G.  

Lumbreras, L. G.  

Lunt, S. W.  

Luraghi, N.  

Lydon, J.  

Lynch, F.  

Lyon, P. J.  

MacCormack, S.  

MacGoul, L. S. B.  

MacLachlan, B.  

Macri, M.  

Maddoli, G., ed.  

Maeda, T.  


Maekawa, K.  


Magness, J.  

Maier, A.
1930 Kant’s Qualitätskategorien. Pan-Verlag, Berlin.

Major, J. S.

Makkay, J.

Maldonado, Alonso

Malinowski, B.

Malkin, I.

Mangan, J.

Mango, C.

Mango, M. M.

Mann, M.

Marcus, J.

Markham, C.

Marshall, Y., and A. Maas

Martin, T. R.

Martínez Cerceda, J. L.

Marx, K.

Massey, D.

Massey, S. A.

Mateicicová, I., and J. Malecka-Kukawka
Mather, C.  

Mathewson, R. D.  

Matsumoto, Y., and Y. Cavero Palomino  

Mauss, M.  

Mayeski, M. A., and J. Crawford  

Maynard Smith, J.  

Maynard Smith, J., and G. R. Price  

Mayor, A.  

McCuanan, A.  

McCormick, M.  

McCulloch, J.  

McEwan, G. F.  
2006  *The Incas: new perspectives.* ABC Clio, Santa Barbara, California.

McEwan, G. F., M. Chatfield, and A. Gibaja Oviedo  


McEwan, G. F., A. Gibaja Oviedo, and M. Chatfield  


McInerney, J.  

McMullen, D.  

McNeil, C. (editor)  

Meggett, M. J.
1977 Blood is their argument: warfare among the Mae Enga tribesmen of the New Guinea Highlands. Mayfield, Palo Alto, California.

Meikle, S.

Menger, C.

Mens, E.

Menzel, D.

Meredith, J. C. (translator)

Mertens-Horn, M., and L. Viola

Meskell, L.

Meskell, L. (editor)

Meskell, L. M., and R. A Joyce

Michailidou, A.

Michelet, J.

Middleton, A., and I. Freestone

Milka, E.

Mill, J. S.
1874 Essays on some unsettled questions of political economy. 2nd ed. Longmans, Green, Reader, and Dyer, London.

Millar, F.

Miller, A. M.

Miller, D.

Miller, E. (editor)

Miller, H. M.-L.

Miller, J.

Miller, J.-A.
Millon, R.

Mills, K.

Mitchell, T.

Molina, C.

Monaco, S. F.

Monaghan, J.

Montell, G.
1929 Dress and ornaments in ancient Peru. Elanders Boktryckeri Aktiebolag, Göteborg.

Montet, J. P. M.
1951 La nécropole royale de Tanis II: les constructions et le tombeau de Psousennès à Tanis. Fouilles de Tanis. J. P. M. Montet, Paris.

Morgan, E. V.

Morley, I.

Morley, S.

Morley, I., and C. Renfrew (editors)

Morris, C.

Morris, C., and R. A. Covey
2003 La plaza central de Huánuco Pampa: espacio y transformación. Boletín de Arqueología PUCP 7:133–149.

Morris, C., and J. I. Santillana

Morris, C., and D. Thompson

Morris, C., and A. von Hagen
2011 The Incas. Thames and Hudson, New York.
Morris, I.

Moseley, M. E.

Mukařovský, J.

Mullen, W.

Munn, N. D.

Murra, J. V.

Murúa, Fr. M. De
1590-1600 *Historia del origen y genealogía real de los Reyes Incas del Perú*. Sean Galvin Collection.

Museo de Arqueología y Antropología Universidad Nacional Mayor de San Marcos

Muthesius, A.

Myerson, R. B.

Mylonas, G.

Naerebout, F. G.

Nagy, G.

Nair, S. E.

Nash, J.

Neer, R. T.

Nehamas, A.
Netz, R.  

Neumann, H.  

Newman, B. B.  
1947 The first man was an artist. *Tiger’s Eye* 1(1):57–60.

Niederberger, C.  
1976 *Zohapilco: cinco milenios de ocupación humana en un sitio lacustre de la Cuenca de México*. Instituto Nacional de Antropología e Historia, Mexico City.


Niles, S. A.  


1999 *The shape of Inca history: narrative and architecture in an Andean Empire*. University of Iowa Press, Iowa City.

Nissen, H. J., P. Damerow, and R. K. Englund  

Niwinski, A.  

Noe, S. P.  


Nora, P.  

Nordquist, G. C.  


Ogburn, D.  

Ogundiran, A.  

Oikonomides, N.  

Oliver, G. J. (editor)  

Ollman, B.  

Ó Nualláin, S.  

Onuki, Y.  


Patterson, T. 1985 Exploitation and class formation in the Inca state. *Culture* 5:35–42.
Peet, T. E. 1930 *The great tomb‑robberies of the Twentieth Egyptian Dynasty, being a critical study with translations and commentaries of the papyri in which they are recorded*. 2 vols. Clarendon Press, Oxford.
Peponi, A.-E. 2001 *Zhangjiashan banjian «Suanshushu» zhushi 張家山漢簡《算數書》注釋 (Commentary on the Book of mathematical procedures, a writing on bamboo strips dating from the Han and discovered at Zhangjiashan).* Science Press (Kexue chubanshe), Beijing.
1972 *Arqueología del Departamento de Ica: panorama prehistórico*. Museo Regional de Ica, Ica, Peru.
Platt, T.

Polanyi, K.

Polanyi, K., C. Arensburg, and H. Pearson (editors)

Politt, J. J.

Polo de Ondegardo, J.d

Porteous, D.

Porter, J. I.

Powell, M. A.

Powell, M.A. (editor)

Power, T.

Prall, D. W.

Prent, M.

Presta, A. M., and C. Julien

Preucel, R., and A. Bauer

Price, M. J.

Prier, R. A.

Protzen, J.-P.
Proulx, D. A.


2006 A sourcebook of Nasca ceramic iconography: reading a culture through its art. University of Iowa Press, Iowa City.

Purcell, N.

Purves, A. C.

Qaddumi, G. H.

Quiggin A. H.

Quilter, J.


Rackham, O.

Raczky, P., L. Domboróczki, and Zs. Hajdú
2007 The site of Polgár-Csóshalom and its cultural and chronological connections with the Lengyel culture. In The Lengyel, Polgár and related cultures in the Middle/Late Neolithic in central Europe, edited by J. K. Kozłowski and P. Raczky, 49–70. PAN Kraków and EL TE, Budapest.

Radovanović, I.


Rahmstorf, L.

Rainbird, P.

Ramírez, S. E.
2005 To feed and be fed: the cosmological bases of authority and identity in the Andes. Stanford University Press, Stanford, California.

Rappaport, R.

Rasche, W.

Rautman, A. E., and L. E. Talalay

Redfield, J.

Reeves, N.
Reid, J. J., M. B. Schiffer, and W. L. Rathje  

Reid, T.  

Reinhard, J.  

Reinhard, J., and M. C. Ceruti  

Reiss, J. W., and M. Alphons Stübel  

Renfrew, C.  


2003 *Figuring it out: what are we? Where do we come from? The parallel visions of artists and archaeologists*. Thames and Hudson, London.


Restall, M., L. Sousa, and K. Terraciano (editors)  

Reyna Robles, R. M.  

Ricardo, D.  
1817 *On the principles of political economy and taxation*. John Murray, London.


Richards, C.  

Richards, R.  

Richardson, J., and A. L. Kroeber  

Rick, J.  


Ridgeway, W.  


Rubini, A.

1957 Catálogo de la coleccion arqueología de Aldo Rubini Drago, Hacienda Ocucaje, Perú. Manuscript on file, Museo Regional de Ica, Peru.

Sahagún, F. B. de


Sahlins, M.

1972 *Stone Age economics*. Aldine, Chicago.


Saignes, T.


Saito, Y.


Salles-Reese, V.

1997 *From Viracocha to the Virgin of Copacabana: representation of the sacred at Lake Titicaca*. University of Texas Press, Austin.

Salomon, F.


1998 How the huacas were: the language of substance and transformation in the Huarochirí Quechua manuscript. *Anthropology and Aesthetics* 33:7–17.


Sandefur, E. C.


Santillán, F. de


Santillana, J. I.


Sarmiento, P.


Sarmiento de Gamboa, P.

Saunders, N.

Saussure, F. de

Sawyer, A. R.

Saxe, A. A.

Sayre, M.

Scarre, C.

Scarry, E.

Schaedel, R. P.

Schaps, D. M.

Schele, L., and D. Freidel

Schepartz, L. A., S. Stoutamire, and D. A. Bekken

Schepfer-Hughes, N.

Schepfer-Hughes, N., and P. Bourgois

Schiffer, M. B.

Schliemann, H.

Schmandt-Besserat, D.
Schreiner, P.

Scott, J. C.

Scott-Kilvert, I. (translator)

Seaford, R.

Searle, J.

Seki, Y.

Selten, R.

Seyfried, K. J.

Shackleton, C. M., and F. Prins

Shady, R.

Sharlach, T. M.

Sharma, C. L.

Shelach, G.

Shelton, K.

Sherratt, A.

Shields, R.

Shimada, I.

Shiner, L. E.

Shklovsky, V.

Sibley, F.

Sichuan 四川省博物館
1991 巴蜀青銅器 *(Ba/Shu bronzes)*. Chengdu chubanshe, Chengdu.

Sichuan 四川省文物考古研究所
1999 三星堆祭祀坑 *(The ritual pits of Sanxingdui)*. Wenwu chubanshe, Beijing.

Sichuan 四川省文物考古研究所三星堆遗址工作站

Sichuan and Guanghan 四川省文物考古研究所三星堆遗址工作站 and 廣漢市文物管理所

Sichuan et al. 四川省文物管理委員會, 四川省文物考古研究所 and 四川省廣漢縣文化局

Sichuan et al. 四川省文物管理委員會, 四川省考古研究所 and 廣漢市文化局文管所

Siderides, X. A.

Sillar, B.

Silverblatt, I.


Silverman, H.
1993 *Cabuachi in the ancient Nasca world*. University of Iowa Press, Iowa City.

Sima Qian 司馬遷
1959 *The grand scribe’s records* *(Shiji, 史記)*. Zhonghua shuju 中華書局, Beijing.

Simmel, G.


Simon, E.

Simpson, J. Y.

Sjögqvist, E.
1940 *Problems of the Late Cypriot Bronze Age*. Swedish Cyprus Expedition, Stockholm.

Skyrms, B.


Slater, W. J.

Smith, A.

Smith, A. T.


Smith, B. H.

Smith, G. E.
1912 The Royal mummies. Catalogue général des antiquités Égyptiennes du Musée du Caire nos. 61051–61100. IFAO, Cairo.

Smith, J. M. H.

Smith, M. L.

Snell, D.C.

So, J. F.

Splitstoser, J.

Srejović, D.

Srejović, D., and L. Babović

Stanford, W. B. (editor)

Stanish, C.

Stanish, C., and B. S. Bauer

Stark, B. L.

Stark, D., with D. Beunza, M. Girard, and J. Lukács
Starnini, E., G. Szakmány, and A. Whittle  

Stazio, A.  

Stehle, E.  

Stiegemann, C. (editor)  

Steiner, D. T.  

Steinkeller, P.  

Stern, S.  
1982  *Peru’s Indian peoples and the challenge of Spanish conquest*. University of Wisconsin Press, Madison.

Stevanović, M.  

Stewart, A. F.  

Stockl, A.  

Strang, V.  

Strathern, M.  

Strong, W. D.  

Stuart, D.  

Studevent-Hickman, B.  

Suidas,  
1854  *Lexikon*, by edited Bekker, Georg Reimer, Berlin
Summers, D.

Sundwall, J.

Sun Hua 孫華
2002  銅方孔銘形器 (Bronze hoe-shaped objects with square holes). In 金沙淘珍—成都市金沙村遺址出土文物 (Panning for treasure at Jinsha—artifacts excavated from the Jinsha village site in Chengdu City), edited by Chengdu & Beijing, 57–59. Wenwu chubanshe, Beijing.

Sun Zhixin

Sutherland, C. H. V.

Svenbro, J.

Swanton, J. R.

Swenson, E. R.
2007  Local ideological strategies and the politics of ritual space in the Chimú Empire.  *Archaeological Dialogues* 14:61–90.

Taçon, P. S. C.

Tainter, J.

Tarlow, S.

Tawney, R. H.

Taylor, G.

Taylor, J. H.

Tedlock, B.
1982  *Time and the highland Maya*. University of New Mexico Press, Albuquerque.

Teeple, J. E.

Teeten, A. B.

Tello, J. C.
Tello, J. C., and T. Mejía Xesspe

TePaske, J. J., and H. Klein (editors)

Thomas, E.

Thomas, J.

Thomas, R.

Thompson, C. M.

Thompson, J. E. S.

Thompson, M.
1979 *Rubbish theory, the creation and destruction of value*. Oxford University Press, Oxford.

Thomsen, R.
1957 *Early Roman coinage*, vol. 1. Nationmuseet, Copenhagen.

Thorpe, N.

Thorpe, R. S., O. Williams-Thorpe, D. G. Jenkins, and J. S. Watson

Tilley, C.

Tilley, C., and D. Miller (editors)

Todorova, H.


Toledo, F. de
1874 [1571] Informaciones de las idolatrias de las Incas e indios y de como se enterraban. *Colección de documentos inéditos relativos al descubrimiento . . . sacadas en su mayor parte de Real Archivo de las Indias* 21:131–220.


Tollefsen, K. D.

Tolstoy, Paul

Tomasto Cagigao, E.

Tomlinson, G.
Torres, C.

Tozzer, A. M.

Treherne, P.

Treu, M.
1906 Orationes I. Programm des königlichen Victoria-Gymnasiums, Potsdam.

Trigger, B. G.

Tringham, R.

Tsountas, Ch.

Tuan, Y.-F.

Turner, J. (editor)

Turner, R., and R. Scaife

Turner, T.

Turner, V.

Underhill, A. P.

Uriarte, M. T., and R. B. González Lauck
2008 Olmeca: balance y perspectivas. Instituto de Investigaciones Estéticas, Universidad Nacional Autónoma de México, Mexico City.

Urton, G.
1997 The social life of numbers: a Quechua ontology of numbers and philosophy of arithmetic. University of Texas Press, Austin.
1999 Inca myths. University of Texas Press, Austin.

Urton, G., and C. J. Brezine
Vaillant, G. C.

Valcárcel, L.

Valdez, L. M.

Valencia Zegarra, A., and A. Gibaja Oviedo

Valeri, V.

van Andel, T. H., K. Gallis, and G. Toufexis

van de Guchte, M.

Vandkilde, H.

van Straten, F.

van Wijngaarden, G-J.

Varzos, K.

Veblen, T.

Vencl, S.

Ventris, M., and J. Chadwick

Verano, J.
Vermeule, E. T.

Vernant, J.-P.

Vickers, M.

Videiko, M. Y.

Villka, L.

Vogel, H. U.

Volkov, A.

von Falkenhausen, L.

von Neumann, J.

von Neumann, J., and O. Morgenstern

von Reden, S.

Vörös, I.
1983  Lion remains from the Late Neolithic and Copper Age of the Carpathian Basin. *Folia Archaeologica* 34:33–50.

Voutsaki, S.
1997  The creation of value and prestige in the Late Bronze Age Aegean. *Journal of European Archaeology* 5(2):34–52.

Voutsaki, S., S. Triantaphyllou, A. Ingvarsson-Sundström, K. Sarri, M. P. Richards, A. J. Nijboer, S. Kouidou-


Whitby, M.


Whitley, J.

Whittle, A.

Whittle, A., and L. Bartosiewicz

Whittle, A., L. Bartosiewicz, D. Borić, P. Pettit, and M. Richards

Widell, M.

Wilamowitz Moellendorff, U. von

Wick, C.

Will, E.

Williams, D.

Williams, J. (editor)

Williams, S. R., K. Forgey, and E. Klarich

Wilson Jones, M.

Wilson, P.
Wilson, P. J.

Wittenburg, A.

Wolf, E. R.

Wright, F. A.
1936 The poets of the Greek anthology. George Routledge and Sons Ltd., New York.

Wright, H. T.

Wright, H. T., and G. A. Johnson

Xenake-Sakellariou, A.
1991 Αναζήτηση τοῦ ἐργαστηρίου τῶν χρυσῶν κοπέλλων τοῦ Βαφείου. Archaiologike Ephemeris 130:45–64.

Xia Nai 夏鼐 and Yin Weizhang 殷瑋璋

Xiao Lin 肖玲, Yang Junchang 楊軍昌, and Han Rufen 韓汝玢
2004 成都金沙遺址出土金屬器的實驗分析與研究 (Experimental studies of the metal objects discovered at Jinsha in Chengdu). 文物 (Cultural Relics) 2004(4):78–89.

Xiao Minghua 肖明華

Xu, Jie


Yacovleff, E., and J. C. Muelle


Yang Yongfu 楊永富, Li Kui 李奎, and Chang Sihe 常嗣和
2002 金沙村遺址玉、石器材料鑑定及初步研究 (Identification and research on the jade and stone raw material from the Jinsha site). In 金沙淘珍 — 成都市金沙村遺址出土文物 [Panning for treasure at Jinsha — Artifacts excavated from the Jinsha village site in Chengdu City], edited by Chengdu & Beijing, 193-200. Wenwu chubanshe, Beijing.

Yasugi, Y.

Young, G. D.

Young, J. E.

Yu Weichao 俞偉超
1996 三星堆文化在我國文化總譜系中的位置、地望及其土地崇拜 (The position, prestige, and local religion of the Sanxindui culture in the overall scheme of Chinese culture). In 四川考古報告集 (Archaeological reports from Sichuan), edited by Sichuan, 59–63. Wenwu chubanshe, Beijing.

Zelizer, V. A.

Zhao Dianzeng 趙殿增
Zhejiang 浙江省文物考古研究所

Zhongguo and Xianggang 中國社會科學院考古研究所 and 香港中文大學中國考古藝術研究中心
2006 玉器起源探索—興隆洼玉器研究與圖錄 (The origins of Chinese jade culture—Xinglongwa jades research and catalogue). Chinese University of Hong Kong Press, Hong Kong.

Zhongguo (Zhongguo Shehuikexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所)
2006 墳婦好墓 (The tomb of lady Hao at Yinxu in Anyang). Wenwu chubanshe, Beijing.

Zhou, T., R. J. Goldfarb, and G. N. Phillips

Zhu Xun 朱训

Zhu Zhangyi, Zhang Qing, and Wang Fang

Zimmerman, N.

Zou Dahai 鄒大海

Zou Heng 鄒衡
1996 三星堆文化與夏商文化的關係 (The relationship between Sanxingdui culture and Xia Shang culture). In 四川考古報告集 (Reports on Sichuan archaeology), edited by Sichuan, 57–58. Wenwu chubanshe, Beijing.

Zhu Xun 朱训

Zuidema, R. T.

Zwierlein-Diehl, E.