

Deep Monetisation: The Case of the Netherlands 1200-1940

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Abstract

Overall monetisation levels may diverge substantially from the daily use of small currencies by common people (recently termed ‘deep monetisation’). In order to compare levels of ‘deep monetisation’ over a long period this article proposes the following formal definition: a substantial stock of currencies per capita in circulation, consisting of denominations equalling the value of one hour or less of waged work. Deep monetisation according to this definition has been reconstructed for one country here: the Netherlands 1200-1940. In this case deep monetisation has been demonstrated to have prevailed from at least the early sixteenth century. A per capita stock equal to between five and ten times the prevailing hourly wage was attained most of the time between 1550 and 1940. This level is therefore proposed here as a second element of the definition of deep monetisation, indicating what a ‘substantial’ level was. However, significant fluctuations are visible between the chronological cross sections. Especially between 1650 and 1700 and between 1750 and 1800, the official supply of small change lagged. This was caused not by technical but by institutional failure. As demand seems not to have declined, two solutions provided the answer: the de facto acceptance of unofficial currencies, and – it is suggested – the extension of small credit.¹

¹ I would like to thank Bert van Beek, Eltjo Buringh, Femme Gaastra, Joost Jonker, Jaap Kloosterman, Peter Nissen, Chris Teulings, Joost Welten, Jaco Zuijderduijn, and the anonymous reviewers for comments on earlier versions of this article, as well as Chris Gordon for the language editing.

1 Introduction

Monetisation is not a prerequisite for the existence of markets, but it certainly facilitates and even enhances the functioning of commodity, labour, and other markets. Money in the form of metallic currencies used as means of exchange in different parts of Eurasia has been around for more than 2,500 years. It is no wonder that monetisation and demonetisation processes in societies as far apart as classical Greece, the Roman Empire, the ancient empires of China and India, and Europe since the Middle Ages have been described in terms of progress or even 'modernity' (de Vries and van der Woude), or its reverse.

Leaving aside the debatable value of progress and modernity as concepts, there are two problems with the historical study of monetisation, and these are interconnected. First, historians do not use clear quantifiable benchmarks such as 'low', 'medium', or 'high' to indicate degrees of monetisation, which makes comparisons difficult if not impossible. Second, monetisation as an overall characteristic of societies is an abstract which combines widely diverging exchange practices in different markets into one melting pot (as noted by Kuroda): markets in high-value commodities may be monetised while low-value goods are not, domestic markets may be far less monetised than international ones (Spufford; Welten), and, at the same time, labour markets may be free or unfree, and if free show different levels of monetisation depending on modes of remuneration for work (Lucassen).

The growing need to differentiate between different spheres and different levels of monetisation recently led to the introduction (by Koen Verboren and Shailendra Bhandare) of the concept of 'deep monetisation', indicating the wide distribution of low denomination currencies for the frequent (weekly, daily or more) exchange of goods and services, including wage payments. For this approach, so far no quantifiable benchmarks have been proposed in the historical literature. This article therefore has two aims: to propose benchmarks for the concept of 'deep monetisation' and to test the concept, thus precisely defined, in a case study.

To ensure the benchmark can be applied across very different cultures, it is derived from the prevailing value of labour because frequent market exchange of goods is possible only if a substantial part of the population depends on income from wages. My earlier research has suggested that in a wide variety of societies worldwide wages used to be paid out in medium currency denominations equalling one half or one full day's work. Parallel to and inspired by this empirical result, this article defines 'deep monetisa-

tion' as the situation where a substantial stock of small denomination currencies is in circulation, 'small' being defined as fractions equal to the value of one hour or less of waged work.

Deep monetisation, thus defined, has been reconstructed for one country here: the Netherlands 1200-1940, which includes the period during which the country played a dominant role in European history and far beyond that period. At what point did the Netherlands become a deeply monetised country? To answer this question, the production and circulation of these small denominations has to be reconstructed. Furthermore, this test case makes it possible to address the definitions question, which has so far remained unanswered: how large is a 'substantial' stock of small change? The empirical results for the Netherlands will show that a per capita circulation stock equalling between five and ten hours' waged work was usual between 1840 and 1940, tending to the upper limit in the first half of the twentieth century. It seems to be acceptable to consider this level, beyond any doubt, as sufficient to characterise a society as 'deeply monetised'.

This level had already been attained, as will be demonstrated, centuries before. To be more precise, and based on the three assumptions mentioned above and which will be elaborated later (the necessity to distinguish between deep and overall monetisation; deep monetisation defined as the circulation of a sufficient stock of currencies equalling one hour or less of waged work; and, finally, 'sufficient' defined as a per capita sum equal to five to ten hours of waged work), the Netherlands has been a deeply monetised country since the early sixteenth century, and possibly even earlier.

The analysis of these results will show that it was not always easy to ensure adequate provisioning of small change following the transition to deep monetisation say around 1500-1550. Several sub-periods of serious shortages of small change have been identified. The supply of small change depended on many countervailing interests among members of the political and economic elites, but also on the reactions of those who actually used small change on a daily basis.

The much-cited title *The big problem of small change* by Sargent and Velde suggests that the supply side was a universal problem, and they point to technical and logistical innovations in the nineteenth century which finally enabled the authorities to overcome these difficulties. Volckart, however, successfully attacked this approach, showing how this problem had been successfully resolved from the late Middle Ages onward. Nevertheless Sargent and Velde have a point in that, occasionally, in sev-

eral countries, small change was in acute demand, and for Great Britain it has been shown how demonetisation could be coped with through the issue of private tokens (Selgin) or by forcing an extension of credit (Muldrew). I will demonstrate that the deep-monetisation history of the Low Countries confirms Volckart's reflections in his critique of Sargent and Velde, but also that solutions similar to those described by Selgin and Muldrew were, or might have been, applied in this particular case.

This article starts with a brief overview of existing theories on monetisation, 'deep monetisation', and 'the big problem of small change'. This overview will conclude by proposing clear definitions and benchmarks in order to reconstruct deep monetisation in one particular case: the Netherlands 1200-1940. Finally, fluctuations between the chronological cross sections 1550, 1600, 1650, 1700, 1750, 1800, 1840, 1890, and 1940 will be discussed. In the appendices, the sometimes elaborate reconstruction of production, export, and circulation figures will be explained, especially for the Dutch Republic – with reference to the data that will be available in the form of Excel tables on the Internet site of the IISH.

2 Monetisation

The introduction and further expansion of currencies in a metallic (coins) or other form (cowrie shells or paper money for example) as a medium of exchange (including savings) and as a measure of value in a society is described and analysed by historians and most economists as a process of 'monetisation'.² Since their 'invention' more or less simultaneously in the middle of the first millennium BCE in Asia Minor, Northern India, and China, coins have been used worldwide but to varying degrees of intensity. Western Europe, for example, underwent an initial period of monetisation under the Romans, followed by centuries in which coins were hardly ever used, after which a second phase of monetisation started during the High

2 In modern parlance, monetisation has acquired a much broader meaning, that of making money by taking up any sort of enterprise.

Middle Ages. Similar developments have been described for India and other parts of Eurasia.³

Not only has monetisation as a historical process been described many times, it has also been interpreted in a very specific way. As a rule, the circulation of coins is regarded as a sign of progress. This was true, for example, of the writings of Aristotle and Plato, and of the numerous authors who followed these icons of classical wisdom.⁴ In this vein, monetisation has more recently been presented as an important sign of modernity. Most scholars might hesitate to go as far as Jan de Vries and Ad van der Woude have done, but few objections have so far been raised to their bold assertions:

Monetization is clearly a critical factor in the spread of the calculating, rational conduct that we associate with a modern society. In the case of the Netherlands [...] at the earliest date that we can follow this process, payment in kind was of distinctly secondary importance. The life of this society soon came to be enveloped in a swelling stock of money fed by multiple sources of supply. [...] not until the nineteenth century did Europe raise up an equal in this respect.

This conclusion is based on their 'very tentative estimates of the [real per capita] money stock circulating in the Dutch Republic' as compared with the Southern Netherlands, France, and England.⁵

The authors of *The First Modern Economy* point to our lack of knowledge of the monetary history of the Republic, and in this respect they are right. However, there are at least two conceptual problems arising from their conclusions which deserve much greater attention.⁶ The first is the

3 Robert S. Wicks, *Money, markets, and trade in early southeast Asia. The development of indigenous monetary systems to AD 1400* (Ithaca NY 1992); Richard von Glahn, *Fountains of fortune: money and monetary policy in China, 1000-1700* (Berkeley 1996); Jan Lucassen (ed.), *Wages and currency: global comparisons from Antiquity to the twentieth century* (Bern 2007); Walter Scheidel (ed.), *Rome and China: comparative perspectives on ancient world empires* (Oxford 2009); Koenraad Verboven, 'Currency, bullion and accounts: monetary modes in the Roman world', *Revue belge de numismatique et de sigillographie* 155 (2009) 91-121.

4 Joseph Schumpeter, *History of economic analysis* (London 1972) 56, 62-64.

5 Jan Vries and Ad van der Woude, *The first modern economy: success, failure, and perseverance of the Dutch economy, 1500-1815* (Cambridge 1997) 81-91, 714.

6 Here I ignore the problem that de Vries and van der Woude equate monetisation with the disappearance of payments in kind and money stock with mint production minus coins exported, which disregards the highly developed credit instruments of the time. Schumpeter would call this 'practical metallism' (Schumpeter, *History*, 288-299, 698-705). See also the introduction to this special issue of the *TSEG*.

equation of certain levels of monetisation with modernity, the second the underlying assumption that overall money stocks characterise an economy as a whole.

If – the first problem – we may derive the characteristics of modernity (or any other overarching characteristic of an economy or society) from certain levels of monetisation, the question arises: at what level is a country monetised, half or partially monetised, or fully monetised? As far as I know, no benchmarks have yet been proposed for defining such a state which would allow for comparisons between countries or between cross sections in time. Only in such a way can comparisons between levels of monetisation in the Roman Empire, Sung China, or for that matter the Dutch Republic – all characterised as highly monetised⁷ – become more meaningful.

The second problem is even more fundamental and has to be addressed before we may start discussing benchmarks for levels of monetisation. Detailed studies of the day-to-day circulation of currencies in many parts of the world have revealed that different layers of society use different denominations and types of coin, not only depending on their wealth but also on the types of transaction. The Japanese economic historian Akinobu Kuroda has even concluded that historians should not use just one equation for the velocity of money, as in Irving Fisher's well-known formula $MV = PT$,⁸ but instead break it down into many different ones depending on 'temporality, seasonality, and locality in making transactions'. Coexisting monies, so Kuroda argued, are not necessarily substitutes for one another, and this affects their acceptability in specific situations.⁹ For the Netherlands this has been impressively demonstrated by Joost Welten on the basis of extensive data on Limburg (the territory covered by the Belgian and Dutch provinces actually bearing that name) between 1770 and 1839. He distinguishes fourteen different categories of transaction, and discusses coins used in mortgages, shopping, payments by shopkeepers to their sup-

7 In addition to the authors cited in fn. 3, see, for the Roman Empire, W.V. Harris, *Rome's imperial economy: twelve essays* (Oxford 2011) 182-183, 248-251, 300-305.

8 See Schumpeter, *History*, 311-317, and especially fn. 4 on 314-315.

9 Akinobu Kuroda, 'What is the complementarity among monies? An introductory note', *Financial history review* 15:1 (April 2008) 7-15; Idem, 'The Eurasian silver century, 1276-1359: commensurability and multiplicity', *Journal of global history* 4:2 (2009) 245-269; Idem, 'Concurrent but non-integrable currency circuits: complementary relationships among monies in modern China and other regions', *Financial history review* 15:1 (2008) 17-36; Idem, 'The Maria Theresa Dollar in the early twentieth-century Red Sea region: a complementary interface between multiple markets', *Financial history review* 14:1 (2007) 89-110.

pliers, theft, and probate inventories. All transactions show very different patterns which overlap only partially and sometimes not at all. Furthermore, the different types of coin and denomination used are not pure substitutes; they may be exchanged but only at a certain cost.¹⁰

3 A differentiation in monetary transactions

In addition to the monetary transactions analysed in detail by Welten for Limburg between 1770 and 1839, we are rather well informed about settlements between large merchants in medieval and early modern Europe thanks to the studies of Peter Spufford, and about modes of wage payment and the currencies involved since antiquity worldwide.¹¹ Following up on an insightful comment by Peter Spufford, a number of scholars have tried to systematise wage payment practices. They found two different currency systems that coexisted alongside one another for over two millennia.¹² On the one hand we have a system, originally Chinese, in East and South East Asia, introduced in the third century BCE, in which only small bronze and copper 'cash' coins were produced, approximating to the value of a half or a full hour's work.¹³ In this region, wages were paid out in multitudes of cash coins, sometimes strung together. On the other hand, to the west, in India, the Middle East, North Africa, and Europe (and later in Europe's

10 Joost Welten, *Met klinkende munt betaald. Muntcirculatie in de beide Limburgen 1770-1839* (Utrecht 2010).

11 Peter Spufford, *Money and its use in medieval Europe* (Cambridge 1988); Idem, 'Mint organisation in late medieval Europe', in: N.J. Mayhew and Peter Spufford (eds.), *Later medieval mints: organisation, administration and techniques. The eighth Oxford symposium on coinage and monetary history* (Oxford 1988) 7-29; Idem, *Power and profit: the merchant in medieval Europe* (London 2002); Idem, *How rarely did medieval merchants use coin?* (Utrecht 2008); Jan Lucassen, *Wages and currency*; Idem, 'Deep monetization, commercialization and proletarianization. Possible links, India 1200-1900', in: Sabyasachi Bhattacharya (ed.), *Towards a new history of work* (New Delhi 2014) 17-55; Jan Linggen and Jan Lucassen, 'The "Mansuri" or "Munsooree Paisa" and its use: combining numismatic and social history of India, c. 1830-1900', *Numismatic digest* 31 (2007) 187-222; Idem, 'Copper circulation in northern India in 1830', *Ibidem*, 34-35 (2011) 148-183, Idem, 'Two lacs of Bharatpur and Bindraban rupees and 15 bags of copper pyce', captured at Dig on Christmas' eve 1804', *Journal of the Oriental numismatic society* 218 (2014) 24-32.

12 Lucassen, *Wages and currency*.

13 Von Glahn, *Fountains of fortune*; Jan Lucassen, 'Coin production, coin circulation, and the payment of wages in Europe and China 1200-1900', in: Christine Moll-Murata, Song Jianze and Hans Ulrich Vogel (eds.), *Chinese handicraft regulations of the Qing Dynasty: theory and application* (Munich 2005) 423-446; Idem, *Wages and currency*. For a European variant (small fractions tied up in rolls), see Welten, *Met klinkende munt betaald*, 42-43.

colonies), we find a multi-metal and multi-fraction system emerging in the fifth century BCE, which is still with us today. In this region, wages were paid preferably in the form of mid-range coins or other fractions equal to the value of a half or a full day's work.

In sum, not only did the specific currencies used differ depending on the types of transaction and, closely connected, the sums typically involved, the transactions also differed in frequency. In this way, to summarise it briefly, we may distinguish roughly four types of transaction, with appropriate modes of payment, in decreasing order of size and value. The first were the occasional settlements in the wholesale trade (based on records of credit and debt and bills of exchange for each single purchase or sale); payments between states and their principal institutions, in the latter case often on a regular basis; and large savings. All of these required the most precious coins and the largest currency fractions.¹⁴

The second were annual payments of rent or taxes, as well as regular payments by retailers to their suppliers. These required much smaller, but still sizeable sums, which in Eurasia, until about 1900, were paid in gold and large silver coins.

Thirdly, there were weekly payments of wages and monthly payments of salaries.¹⁵ These required currency fractions equal to the value of a half or a full day's work, which often involved mid-sized coins (more on this below).

Finally, there were the weekly or daily payments made by wage labourers and other low-income individuals in shops and the market place, as well as payments for renting accommodation. These required the smallest fractions, including the small change that was needed to finalise a transaction on the spot.

The various time units in this schematic presentation of payment modalities – from a day through to a week or a month to a year – demonstrate how crucial it is to know whether promptness of payment is required at the moment of delivery, or whether deferment is possible. As a rule, one notices that the longer the deferment the higher the mutual trust between creditor and debtor, but also the stronger their mutual dependency.¹⁶ In the case of goods, mutual trust is essential (witness the development of

14 Spufford, *How rarely?*.

15 Lucassen, *Wages and currency*. Of course, there are also daily and hourly wages, but generally they are paid out only once a week.

16 Bart Willems, *Leven op de pof. Krediet bij de Antwerpse middenstand in de achttiende eeuw* (Amsterdam 2009); Clare Haru Crowston, *Credit, fashion, sex: economics of regard in Old Regime France* (Durham and London 2013).

such instruments as bills of exchange); in the case of rendered labour, all kinds of dependency may prevail. The reason for this difference is obvious: social and economic distance tends to be less important in the former case than in the latter. In fact, labourers with limited or no property have to pay for perishable food in cash. As this is not generally practical on a daily basis, they are dependent on credit from shopkeepers or market vendors, which, however, may not extend beyond a week. In the case of wages due for a longer period, and for credit beyond labour already performed – urgently needed to counter misfortune, or for the costs of the major events in life such as funerals and marriages – they depended mostly on their employers or moneylenders. It goes without saying that employers are tempted to obtain the labour power of their labouring debtor and his family at a low price. Bondage and debt slavery are the extreme outcomes of this situation.

For the social historian, the question could be rephrased very generally as: which groups used which means of exchange for which types of transaction, and what were the alternatives? For the labour historian, it might be: how often were wages paid, in which coins or other means of exchange, and what were the implications for the dependency of workers (which is not the same as their standard of living)? For labour and social historians interested in the history of the commoner, the obvious question would be one of how to measure monetisation when small sums were paid at a certain frequency to compensate labour, and how these sums were subsequently spent in consumption (types 3 and 4 above). Recently, for these payments at the lower end of the spectrum, some authors have proposed the term ‘deep monetisation.’

4 Deep monetisation

Simultaneously, but independent from each other and in totally different contexts, in 2008 two historians introduced the concept of ‘deep monetisation’. Shailendra Bhandare, curator of the South-Asian coin collections at the Ashmolean Museum, Oxford, used it in a short article on Indian coins, while Koenraad Verboven, Professor of Roman History at Ghent University, used exactly the same expression in a long essay on bronze and copper coins in the Roman Empire. For Bhandare, deep monetisation ‘involve[s] the use of coined money in the lowest stratum of a transaction system based on the introduction of cheap, low-denomination coinage’, which he calls ‘microcosmic’ money economies’. Verboven did not so much define

deep monetisation as use this expression in order to make two important remarks. First, 'In deeply monetized societies social actors are tacitly and explicitly taught that specific social settings (market exchanges for instance) require money for exchanges and transactions to occur and that we can and should accept 'money' in exchange for goods and services'. Second, and in accordance with what we saw above, 'that 'deep monetization' does not imply full monetization. [...] No pre-industrial economy ever came near to being fully monetized. Gift exchange, command economics and redistribution remained important structuring principles that governed the flow of resources'.¹⁷

Without using the expression 'deep monetisation' as such, other historians had earlier drawn attention to the phenomenon. Robert Wicks, for example, combined some of the elements just discussed when quoting Colin Renfrew, 'the existence of any low-denomination coinage, used within the jurisdiction of the issuing authority, is an indication of market exchange [...]. The presence of multiple denominations, especially in base-metal coin series, opens the door to wider usage, allowing for the possibility that the coinage was utilized in marketized transactions'. Briefly, 'deep' in this sense denotes the permeation of coin usage deep into society until it reaches the large mass of the working population: small independent producers unable to subsist without advance payments, such as peasants and craftsmen, and wage labourers.

We may combine this with another observation by Peter Spufford, who added an important temporal and spatial element to the historical process of monetisation by showing that it tends to spread out from urban centres into the countryside. For thirteenth-century Europe he described it in his usual vivid style as

a great seasonal flow and ebb of coined money [...]. Peasant producers had a great deal to offer for sale, but their sales were generally made all at once. This frequently happened at only one time of year, when the grain had been

17 Shailendra Bhandare, 'Jamgaon, Harda and Khachrod: three new mints under the Sindhias of Gwalior' *Journal of the oriental numismatic society* 197 (2008) 32-37, 37 (without reference); Verboven, 'Currency, bullion and accounts', 91-93, 105, 119; Wicks, *Money, markets and trade*, 16. From private correspondence I understand that Verboven 'invented' the term for a paper delivered in June 2008, independently of Bhandare. Bhandare was inspired by Frank Perlin's work on India in general, not by a specific passage. When using the term for the first time in 2008, he did not know either Verboven or his work. I do not know of the term having been used before 2008. I applied the term for the first time in a lecture given in 2012, from which this section is borrowed.

threshed, the grapes, olives or cheeses pressed, the sheep sheared, the cattle fattened or the woad balled.

Only then, when the harvest was sold at the annual fairs, did coin fly into the countryside – only to return to the city within a few weeks in the form of rent, tithe, and taxation payments, with the exception of money ‘saved against the great expenses of peasant life, most notably the accumulation of dowries for daughters or the accumulation of land’. In addition to the hoarding of coins, ‘peasants very frequently also lent money one to another, against the security of their tenements’. It was only on such occasions, too, that wages were paid by richer farmers who hired full-time shepherds and ploughmen, or day labourers. These then paid their creditors; and the agricultural labourers could try to save and hoard what was left in order to set up as a peasant tenant and to marry. The small weekly markets that sprung up in the thirteenth century did not require many coins for the sale of small products such as eggs and the purchase of salt. In the cities, on the contrary, money was used throughout the year. Here, wages were paid much more frequently – mostly weekly, hence purchases were paid for weekly as well. Even rents might be monthly. In the hinterland of the great cities of northern Italy and the southern Low Countries, we find a mixed pattern that was enhanced by the spread of market gardening and late-medieval rural proto-industry.¹⁸

I propose to combine the approaches discussed above in order to define two benchmarks for monetised transactions by the common man, who uses rather small and medium-sized coins instead of large, valuable currencies or credit instruments on paper. These formal and quantifiable definitions may subsequently be tested on the basis of historical sources so as to make comparisons possible between the intensity of monetisation, with their social implications, in different societies in time and space. Thus, we have to distinguish between ‘deep’ and ‘medium’ monetisation,¹⁹ where ‘medium’ monetisation is the regular and widespread circulation of denominations equalling a full or a half daily average wage of a skilled worker (in the historical literature, conventionally a mason’s summer wage), and ‘deep monetisation’ is the circulation of smaller currencies, more in particular those equalling a full hour’s average wage or less.

18 Spufford, *Power and profit*, 95-99, quotations at 95 and 97.

19 Logically, this would demand something like ‘undeep’ or ‘superficial’ monetisation in addition, but I refrain from this on purpose because it would not be consistent with the many useful varieties that exist for circulation types 1 and 2, nor with Akinobu Kuroda’s approach to the functionality of all types of currency in their specific spheres of circulation and transaction.

For the measurement of these processes, we obviously have to look for data on wage levels (or, for that matter, on levels of remuneration for peasants and craftsmen), for circulation data of middle-size and smaller coins, and of course for population data, in order to obtain meaningful per capita figures.²⁰



Illustration 1. The social distance between the different denominations is excellently depicted by Albert Hahn in his drawing 'Berekening' ('Calculation') accompanied by the following question-and-answer among the Amsterdam poor: 'Moeder hoeveel is een gulden? Tweehonderd hallefies, jongen' ('Mother, how much is a guilder? Twohundred half cents, my boy')

Source: *De Notenkraker: Politiek Satiriek Weekblad*, 23 February 1907 (Collection International Institute of Social History, Amsterdam).

20 My approach, to link coin circulation to hourly and daily wages, does not differ fundamentally from that of linking it to GDP per capita (as de Vries and van der Woude do), but it has a great advantage in that it offers a direct connection between the wage levels and monetary transactions of wage labourers. In this way it can also be more easily applied to regions where we have data on wage levels but not on GDP per capita.

5 Demand for and supply of small currencies

Because of a lack of data for most societies, coin circulation cannot easily be measured directly before the nineteenth or even twentieth centuries. Instead, coin production – for which data are much more easily accessible to the historian – is here taken as a proxy. Yet in coin production, too, there are important differences in the way big, medium and small money is procured.

In most states, mediums of exchange such as silver and gold coins were provided by state-run mints, where the initiative to mint certain amounts of bullion was left to the merchants.²¹ Coins made of non-precious metals also used to be made at the government mints, but here the initiative was not commercial, since the logic of international bullion price fluctuations – which determined whether it was profitable to monetise bullion or to demonetise coins – was less easily applicable. Rather, public utility was the primary concern. This is why in most cases governments, and not merchants, took responsibility for producing the lowest-value denominations. The most telling example is the near-continuous government production of so-called cash-coins in China for over two millennia. In the early modern period, these equalled roughly one hour's work or less, and may therefore be considered small denominations. No other coin denominations were produced, and merchants had to use heavy silver or gold ingots in order to settle commercial debts.²² Western Europe offers another illustration from the late Middle Ages on, when small denominations became current. In a thorough test of Sargent and Velde's well-known assertion that early modern Europe was struggling with 'the big problem of small change' (an echo of Carlo Cipolla's 'big problem of the petty coins'), Oliver Volckart has convincingly demonstrated that between around 1300 and 1600 most European governments could cope very well.

Volckart summarises the problem as follows: 'Small coins are more useful than larger ones, hence demand for them is relatively stronger, hence they tend to be relatively scarce; and in order to be able to increase their quantity, governments reduce their content of bullion more rapidly than that of larger denominations.'²³ Although this temptation was real and

21 Thomas J. Sargent, and François R. Velde, *The big problem of small change* (Princeton 2002) 3-12; Spufford, *Power and profit*, 342-375.

22 Von Glahn, *Fountains of fortune*; Lucassen, 'Coin production, coin circulation'.

23 Oliver Volckart, "The big problem of the petty coins", and how it could be solved in the late Middle Ages', *Working papers* no. 107/08 London school of economics (2008 <http://eprints.lse.ac.uk/22310/1/WP107.pdf>, retrieved 8 March 2013) 3.

governments occasionally fell prey to it, as a rule – Volckart argues – the feared loss of reputation and ensuing danger to political survival constituted a strong countervailing power. The most successful solution was transferring the right to issue low-value coinage to an independent authority, usually a town.

Rulers could credibly commit to respecting exclusive minting right granted to a town because here their defection would be immediately obvious. Urban authorities, too, had to credibly commit to the preservation of monetary stability. However, for them this was easier than for territorial rulers: They were governed by councils, whose members would not have benefitted individually from reductions of the standard of the coinage. Furthermore, such reductions required an agreement among the council members which was costly to reach, and finally, councils were directly affected by urban unrest due to discontent with the coinage.²⁴

After the period discussed by Volckart, the general replacement of billon by cheaper copper from the sixteenth century onward, not only by towns but now also by states, was an additional reason not to debase small change.

The fact that small-change circulation seems to be intrinsically problematic to many historians is due largely to a few cases in which large states actually did fail dramatically in the provisioning of small change in the quantities needed. In particular, Spain (c. 1600-1660, overproduction followed by restamping and cry-downs) and England (private tokens only 1644-1672, 1787-1797, and 1811-1817) have received much attention.²⁵ Yet these were not typical for these situations, as has been shown by Volckart and will be demonstrated in this article for most of the history of the Dutch Republic. Indeed, the nineteenth-century solution of state provisioning of small change, evidenced by systematic population and economic statistics, has a long prehistory in late medieval and early modern Europe and beyond.

A final question to be answered before we embark on more specific historical research is whether we can speak of deep monetisation as soon

²⁴ *Idem*, 39.

²⁵ Sargent and Velde, *The big problem*, 2002; Craig Muldrew, 'Wages and the problem of monetary scarcity in early modern England', in: Jan Lucassen (ed.), *Wages and currency: global comparisons from Antiquity to the twentieth century* (Bern 2007) 391-410. For the provisioning of merchant tokens in England in the 1790s see George Selgin, *Good money: Birmingham button makers, the Royal Mint, and the beginnings of modern coinage, 1775-1821. Private enterprise and popular coinage* (Ann Arbor 2008).

as coins equalling one hour's work are produced, or whether their circulation should assume a certain importance. And if the latter, when is the production of small change important enough to conclude that a certain region or country has passed the threshold of deep monetisation?

I propose to link the sum of small change circulating in a specific historical case to the prevailing wage level. As will be argued below, there are good reasons to conclude that deep monetisation has been achieved when the total circulation of small denominations (defined as the remuneration of one hour's wage or less) jumps to five to ten times such a level wage (i.e. to a full day's wage) per capita.

6 A case study: deep monetisation in the Netherlands

In order to show the difficulties and pitfalls – but ultimately of course the feasibility – of this approach, I have studied one particular case of deep monetisation. Given the availability of coin production figures for Western Europe from the late Middle Ages on, this region was an obvious choice. I have selected the Netherlands not just for practical reasons, such as the availability of sources and my previous study of its coin circulation and wage labour, but also because of its interesting economic development. Karl Marx, after all, considered it to be the cradle of commercial capitalism, and, as we have seen, more recently de Vries and van der Woude have dubbed it 'the first modern economy'.²⁶

I will concentrate here on deep monetisation as I have already said a lot about coins used for wage payments in previous studies, without, however, using the phrase 'medium monetisation' as I plan to do from now on.

7 A new start: thirteenth-fourteenth centuries

In Western Europe, including the Low Countries, the demise of the Western Roman Empire was followed by many centuries of demonetisation, in which the production and hence the circulation of coins was much lower than in classical antiquity and sometimes even ceased altogether, while

²⁶ Karel Davids and Jan Lucassen (eds.), *A miracle mirrored: the Dutch Republic in European perspective* (Cambridge 1995); De Vries and van der Woude, *The first modern economy*; see Piet Lourens and Jan Lucassen, 'Marx als Historiker der niederländischen Republik', in: Marcel van der Linden (ed.), *Die Rezeption der Marxschen Theorie in den Niederlanden* (Trier 1992) 430-454.

the rare denominations that survived were high. The feudal society of the early Middle Ages can best be characterised as redistributive, at a rather low intensity. Markets were non-existent or unimportant, few cities were left, and wage labour was insignificant.

A new monetisation round started with the emergence of towns – in the southern parts of the Low Countries from around 1100 onward, in the northern parts a century later.²⁷ In the north, in the thirteenth century, only one denomination – the small silver denarius or *penning* – was produced on a regular basis in the major towns controlled by the bishops of Utrecht, the counts of Holland, and the counts of Gelderland. It is difficult to say what level of monetisation this mono-denominational situation represented. On the one hand, the production of the *penning* might count as an argument for a considerable level of monetisation, because from the oldest wage data we have (in the Dordrecht town accounts, which begin in 1285) it appears that a daily wage was twenty *penningen*, so one penning equalled half an hour's wage.²⁸ On the other hand, it seems hard to push this argument too far as there were no coins available for medium monetisation or beyond, and the wage data look skewed: only an extremely small proportion of the population was engaged in wage labour, which consequently had an exceptionally high purchasing power. The problem is exacerbated by a lack of coin production statistics, which makes quantification impossible.

At the very end of the thirteenth century, a multi-fractional system came into being, with the introduction of various silver denominations of two-and-a-half and eight *penningen*, greatly facilitating payments.

27 H.E. van Gelder, *De Nederlandse munten* (Utrecht 2002) 33-36; Jan Lucassen, 'Loonbetaling en muntcirculatie in Nederland (1200-2000)', *Jaarboek voor munt- en penningkunde* 86 (1999) 1-69; Idem, *Wages and currency*; Spufford, *Money and its use*.

28 A. van Vollenhove, *Ambachten en neringen in Dordrecht* (The Hague 1923) 95-97. Wage labourers in the building trade seem to have been rare and thus in high demand in thirteenth-century Dordrecht as their purchasing power was extremely high: for twenty *penningen* one could buy twenty loaves of bread, eighty eggs, or three chickens.

8 Towards medium and deep monetisation in the fifteenth century?

From the fourteenth century onward, the sources contain more details. Coin production data are available for Flanders from 1346 to 1384, and for the Burgundian-Habsburg Netherlands as a whole from 1419 to 1598.²⁹ In the fifteenth century these consisted mainly of provinces in the south (Flanders since 1384, Namur since 1429, Brabant since 1430, Hainault since 1433), whereas in the north only the county of Holland and Zeeland since 1433 (and for some time Guelders) was part of it. Although the production data cover only parts of the Netherlands, one development deserves attention. The average annual production of coins equalling one full day's wages or less (indicating medium monetisation) jumped in those provinces from 1,000 to 38,000 guilders between the first and the second half of the fifteenth century.³⁰ This impressive increase might have been due only partially to population growth in what was then the Burgundian Netherlands; it was due mainly – I would suggest – to increased monetisation levels, in particular following the production of two-*stuiver* coins (or half a daily wage). At the same time, the minting of smaller fractions (half *stuivers* and less, equalling hourly wages) increased at about the same pace, from 22 to 770 guilders. The explanation could be that those who received their wages in double *stuivers* needed change in order to make purchases at markets and in shops.

Although it is tempting to see this as firm proof of medium and simultaneously deep monetisation in the second half of the fifteenth century, at least in Brabant and Flanders, there are two serious caveats. The first is the frequent reminting of debased coins under Maximilian I, the Holy Roman Emperor, which must have diminished circulation figures fairly seriously.³¹ Furthermore, it is virtually impossible to calculate accurate population data for the different provinces since they were absorbed by the Burgun-

29 Lucassen, 'Loonbetaling en muntcirculatie', 43-45 (after H.E. van Gelder and Marcel Hoc, *Les monnaies des Pays-Bas bourguignons et espagnols, 1434-1713* (Amsterdam 1960).

30 Lucassen, 'Loonbetaling en muntcirculatie', 43, after van Gelder and Hoc, *Les Monnaies* (I compare all coins of four *stuivers* and less in the periods 1419-1467 and 1467-1506, when daily summer wage levels varied between three and four *stuivers* and between four and four-and-a-half *stuivers* respectively). For wages see Hubert Nusteling, *Welvaart en werkgelegenheid in Amsterdam, 1540-1860* (Amsterdam and Dieren 1985) 252; and Geertruida de Moor, *Wages and prices from the convent Leeuwenhorst, 1410-1570*, <http://www.iisg.nl/hpw/data.php#netherlands> (last visited 21 August 2014).

31 Spufford, *Money and its use*, 313-314; *Idem*, *Monetary problems and policies in the Burgundian Netherlands 1433-1496* (Leiden 1970) for an analysis and detailed statistics for the period 1433-1496.

dian state. This makes per capita calculations very difficult, and consequently prevents reliable comparisons with the following period. Perhaps more detailed research will enable us to resolve this issue and push medium and/or deep monetisation for the Southern Netherlands and possibly Holland and Zeeland back towards the second half of the fifteenth century. For the moment, we can take solace in the fact that such deep monetisation can definitely be demonstrated for the first half of the sixteenth century.

9 Medium and deep monetisation under Charles V and Philip II

Under Charles V (1506-1555) most of the Netherlands (the Prince-Bishopric of Liège being the main exception), were united under one lord, and so Charles V's reign offers a solid starting point for a quantitative reconstruction of coin production and coin circulation in the Netherlands. In this period the series of major debasements under his immediate predecessors ceased and coinage was re-established on a sound basis. It was greatly enhanced by the rich supply of silver from the Americas, which were ruled by the same Charles, and somewhat later by the decision to replace billon by copper as the raw material for the smallest fractions. The first full-copper coin in the Northern Netherlands was minted in Utrecht in 1523, but on a larger scale its introduction dates from the later years of Charles V's reign, when in 1543 the *korte* (*courte*, or 1/24th of a *stuiver*, or about 1/16th of an hourly wage) was minted in the Low Countries. Under Philip II, this was followed by other copper denominations, of which the *duit* (*gigot* or 1/8 of a *stuiver*) was the most popular after the *korte*.³² It is important to note how large the variety of small fractions had become by now: values of one *stuiver* and less were produced in no less than ten different denominations, in copper, billon, and silver.

Table 1 is based on the available production figures for certain periods (often a number of years for which the mint masters had to open their books), but in order to make the step from production to actual circulation we have to take into account the considerable 'loss' of coinage in circulation. As John Deyell put it, 'Coins once issued into circulation were exposed to a constant withdrawal from circulation, due to accidental losses, hoarding, melting for bullion, reminting, outmigration in trade, etc'. For

32 Van Gelder and Hoc, *Les monnaies*; Van Gelder, *De Nederlandse munten*.

medieval Indian silver coins, he derived the 'rule of thumb' that 'the stock of coinage in circulation suffered a diminution of two and a half per cent annually (unless replenished)'. Put differently, the 'half-life' of coins in circulation is twenty years.³³ We may assume that hoarding, melting, and reminting applies more to silver than to copper coins, and that loss of coppers was less often due to these particular causes. This is confirmed by one Dutch example, when the Dutch copper cent, struck between 1819 and 1877, was withdrawn from circulation between 1877 and 1884. This yielded only 50 percent of the total production, suggesting a 'half-life' of 30 years.³⁴ In my calculations for this article (see the Appendix) I have adopted the following rule of thumb: that at the end of a 50-year period half the coins put into circulation will have been lost and, accordingly, that the sheer maintenance of any stock requires continuous replenishment.

The results of all these calculations are presented in Table 1. Unfortunately it is difficult to differentiate between the economically heterogeneous provinces of the Habsburg or Spanish Netherlands, since the coinage of the various provincial mint houses of the Burgundian and Habsburg Netherlands was uniform (with a few exceptions) and current throughout the entire Netherlands. Around 1550 the economic centre of the Low Countries still lay indisputably in the south, and more particularly in the provinces of Flanders and Brabant. Fifty years later, however, it was already quickly shifting to the north.³⁵ As a consequence, the results for 1550 will have been more representative for the south than for the north.

33 John S. Deyell, 'Cowries and coins: the dual monetary system of the Bengal sultanate', *The Indian economic and social history review* 47:1 (2010) 63-106, 97 (more precisely for a compounded 2.55 this would be just over 27 years); for weight loss from wear, see François R. Velde, 'On the evolution of specie: circulation and weight loss in 18th and 19th century coinage', *Document de travail Banque de France* 422 (2013; [http://www.banque-france.fr/uploads/tx_bdfdocumentstravail/DT42\[0\]](http://www.banque-france.fr/uploads/tx_bdfdocumentstravail/DT42[0]); last visited 8 August 2014).

34 C. Hoitsema, 'Over samenstelling en omvang eener metaal-circulatie', *De Economist* 51:2 (1902) 919-942, 922. However, he gives a return of only 15 per cent for half-cent coins, suggesting a 'half-life' of only ten years for this smaller and less current denomination. This works out at a compounded 4 percent loss per year.

35 For a rough indicator see average wages for Amsterdam, which varied between 50 and 75 percent of those in Antwerp before 1590, equalling them in the 1590s and surpassing them thereafter (Nusteling, *Welvaart*, 258; see also Table 3 below).

Table 1. Small-coin circulation in the Southern and Northern Netherlands, c. 1550 and 1600

	Per capita (population 1550: 3 million)	Per capita (population 1600: 2.6 million)
2 <i>stuiver</i>	-	0.14
<i>Stuiver</i>	0.22	0.17
½ <i>stuiver</i>	0.08	0.05
¼ <i>stuiver</i>	0.01	0.02
1/6 <i>stuiver</i>	-	0.00
1/8 <i>stuiver</i>	0.01	0.02
1/12 <i>stuiver</i>	0.00	0.01
1/16 <i>stuiver</i>	0.00	0.00
1/24 <i>stuiver</i>	0.01	0.01
< 1/24 <i>stuiver</i>	0.00	
Total	(1 <i>stuiver</i> and lower) 0.33	(2 <i>stuiver</i> and lower) 0.42
Average hourly wage Antwerp (in <i>guilders</i>)	0.045	0.10
Small-coin circulation expressed in terms of hourly wages	7	4

Sources: See appendix 1

Though, without rejecting the possibility, we must be cautious about regarding the late fifteenth-century Low Countries as one of medium or even deep monetisation, we may be sure that the first half of the sixteenth century can be characterised as such. In 1550 the small denominations in circulation might have equalled no less than a seven-hour wage for the Low Countries taken as whole, and this figure will have been even higher in the south. This is impressive because – as we will see – it was the same order of magnitude as that found in the Netherlands in the late nineteenth century and in the inter-war period.

At the same time, once attained, such high levels are not easily maintained. We do not have to attach too much significance to the differences between the reign of Charles V and Philip II as the figures are fraught with uncertainty. Population estimates certainly play a role: if we take the lower ones for 1550 per capita circulation jumps from fl. 0.33 to 0.39. Further, the level of circulation around 1500, the starting point for all these reconstructions, had to be estimated, and part of my reconstructed production figures (11 percent under Charles V and 6 percent under Philip II) are estimates. Nor can one exclude the possibility that losses (assumed to be c. 50 percent per half century) varied over time. All in all, the high circulation levels may not have changed substantially in the second half of the sixteenth century.

With the Dutch Revolt spreading after 1572, it is certainly unlikely that they increased substantially.

In order to extend the comparisons for the Northern Netherlands after independence into subsequent centuries, one needs to address a much greater problem, namely the differentiation between the southern and northern provinces around 1600. The economic domination of the south at the time of Charles V's abdication implies even higher levels of deep monetisation in the south than the average for the Low Countries as a whole. But what about 1600? Perhaps the north had not yet overtaken the south in this respect, and the war must certainly have hampered coin circulation. An extreme example of this problem is demonstrated by the small denominations in the obsidional money of some cities: the $\frac{1}{2}$, 1, 2, and 4 *stuiver* coins of Deventer issued on 30 October 1578, the $\frac{1}{2}$, 1, 2 *stuiver* coins issued by Maastricht on 28 April 1597, the *oord* and $\frac{1}{2}$ *stuiver* issued by Leiden on 13 November 1573 and 27 March 1574 respectively, and – much later – the 1 and 2 *stuiver* coins issued by Breda in the spring of 1625.³⁶ This may have been balanced by the new copper issues of the rebellious provinces since the 1580s. In general terms, we may be confident that c. 1600 per capita coin circulation in the north can be estimated at between fl. 0.30 and fl. 0.40, representing a wage of between three to four hours.

10 Varying degrees of deep monetisation in the Dutch Republic, 1600-1800

For a number of reasons, it is more difficult to reconstruct small-coin circulation for the Dutch Republic than for the Burgundian Netherlands. The main reason is the decentralisation of government, which also affected coin production and circulation and – most importantly – the preservation of the relevant archival documents (see Appendix 2.2). The second is the increasing influence of key merchants, who were in favour of high-denomination coin production and eager to monitor it closely, whereas small-coin production, especially of copper coins, was considered far less important. Consequently, far fewer documents concerning copper coinage have been preserved than about silver and gold coinage. Whereas I had to estimate

³⁶ D. Purmer and H.J. van der Wiel, *Handboek van het Nederlandse kopergeld 1523-1797* (Vriezenveen 1996) 202-209 (I have omitted the heavy Maastricht obsidional pieces of between 8 and 30 *stuivers*).

only 9 percent of the circulation of silver two-*stuiver* pieces (the *dubbeltjes*), the corresponding figure for the one *stuiver* was 23 percent and no less than 60 percent for the copper *duit*, or $\frac{1}{8}$ *stuiver*. Luckily, numismatists have meticulously catalogued all years with which coins are stamped, so that on the basis of assumptions about average annual production per denomination (derived from years for which production figures are available) reasonably good reconstructions may be made, as explained in Appendix 2.

A third reason stems from a combination of administrative and political decentralisation and the domination of large merchants: the uncertainty regarding the number of coins exported. To finance its trade, the Dutch Republic exported gold and high-denomination silver coins to the Baltic, the Levant, and to Asia on a massive scale. Only for Asia are statistics available, offering varying degrees of detail, as the Dutch East India Company (VOC) had a monopoly of this trade. In our calculations of deep monetisation we need not consider exports of small change to the Baltic or the Levant, but we certainly need to consider exports of small silver coins to Asia, data on which are especially lacking for the seventeenth century. This issue, too, has been tackled in Appendix 2 and in the underlying Excel files, available on the website of the IISH.

Combining the results of all these exercises, one conclusion is inescapable: the variations in circulation per capita at the five chronological cross sections between 1600 and 1800 were considerable (see Table 2). The results would be different of course if different cross sections were selected, but one would still find variations.

When we put the circulation figures into perspective by expressing them in terms of the prevailing wage levels (see Table 2), we find not only variations similar to those just mentioned, but also a sort of constant. This deep monetisation constant suggests that in a well-developed economy the ideal per capita circulation of small denominations equals between five to ten times the average hourly wage. The upper boundary of ten might be taken as an ideal, whereas the lower boundary indicates a mismatch between the demand for and supply of these mediums of exchange. Below that level, one might expect daily exchange in the marketplace and in shops to have been problematic.

Table 2. Per capita circulation of small-denomination coins in the Netherlands, 1550-1940 (in *gulden* of account)

Denominations in Dutch	Half cent	Duit (and lower)	Cent	Oord	Halve stuiver	stuiver	dubbeltje	kwartje	Total
Fractions of a guilder	1/200	1/160	1/100	1/80	1/40	1/20	1/10	1/4	
1550 N&B		0.03		0.01	0.08	0.22	-	-	0.33
1600 N&B		0.04		0.02	0.05	0.17	0.14	-	0.42
1650 N		0.05		0.01	?	0.32	0.52	-	0.89
1700 N		0.10		0	?	0.20	0	-	0.30
1750 N		0.24		0	?	0.25	0.88	-	1.37
1800 N		0.34		0	?	0.16	0.18	-	0.68
1840 N&B	0.05		0.20	?	?	0.02	0.22	-	0.49
1890 N	0.11		0.44		0.12	0.06	0.95	-	1.68
1940 N	0.07		0.40		0.15	0.27	2.06	1.23	4.18

NB: Coinage during the period not defined as small change is indicated by -; no coinage is indicated by a blank; unknown but insignificant amounts by ?; coinage less than 0.01 cent per capita by 0.00; N and B = the present-day Netherlands and Belgium.
 Because of the union between the Netherlands and Belgium, which started de facto in 1811 and ended officially in 1839, I have opted for the cross sections 1840, 1890, and 1940 (instead of 1850, 1900, and 1950).

Table 3. Per capita circulation of small-denomination coins in the Netherlands, 1550-1940, in relation to wage levels (in *guldens* of account)

Cross section	Circulation per capita	Hourly wage levels			Circulation expressed in terms of hourly wages	
		Antwerp	Amsterdam	The Netherlands	Antwerp	Amsterdam / The Netherlands
1550 N&B	0.33	0.045	0.027		> 7	< 12
1600 N&B	0.42	0.100	0.077		4	5
1650 N	0.89		0.125			7
1700 N	0.30		0.125			2
1750 N	1.37		0.125			11
1800 N	0.68		0.125			5
1840 N&B	0.49		0.125	0.108		> 4-5
1890 N	1.68		0.208	0.203		8
1940 N	4.18			0.479		9

Sources: wages from Nusteling, *Welvaart* 255-259; J. van der Spek, 'Een eeuw lonen en prijzen (1870-1970)' in: P.J.A. ter Hoeven (ed.), *Breukvlakken in het arbeidsbestel* (Alphen aan den Rijn 1972) 77-91, 87; Table 2 (p. 95).

In the rest of this section I therefore wish to concentrate on variations in levels of deep monetisation in the Dutch Republic and the first few decades of the Kingdom of the Netherlands. Why did they vary so much, and, at the lower end, what kinds of solutions were resorted to?

The first half of the seventeenth century shows an increase, which is not unexpected. The Twelve Years' Truce with Spain (1609-1621) provided the Republic with an opportunity to put things in order on the monetary front too. In the 1620s the minting of *duiten* increased threefold compared with preceding decades, and from 1614 onward that of *stuivers* and *dubbeltjes* showed a significant resumption. It is quite possible that by about 1630 the pre-revolutionary levels of small-coin circulation had been restored.

Surprisingly, however, small-coin circulation fell in the second half of the seventeenth century. In 1648 the Treaty of Münster was signed, ending hostilities between the Dutch Republic and Spain. In subsequent decades the Republic reached the zenith of its glory, commercially, military, and politically. After 1650 its monetary situation improved, too, as the provinces gradually came to an agreement to coordinate their efforts more efficiently by closing down local mints, and, from 1680 onward, to introduce *statenmunten* of 1 guilder and multiples thereof. The mechanisation of the production process after 1670 also played a role.³⁷ The most important innovations – rolling mills instead of manually hammering mint

37 Van Gelder, *De Nederlandse munten*, chapter 7.

plates, punching machines instead of hand clippers, and a ball-drive screw press instead of hammer and anvil – had already appeared in southern Europe in the sixteenth century, to be introduced much later in the countries of northern European, including the Republic.³⁸ Together with a silversmith colleague, Christoffel Adolphi in Amsterdam was the first to own a private screw press;³⁹ the provincial mint of Holland at Dordrecht followed in 1670. So did the provincial mint at Middelburg a year later. Then Utrecht, and probably Enkhuizen, bought the new machinery, and finally the other mint houses followed, or instead closed down, like the provincial mints of Groningen (1693) and Friesland (1752) after a long period of inactivity or very low activity. In fact, overall coin production was robust during the Golden Age, as is shown by the estimates provided by de Vries and van der Woude (see Table 4).

Table 4. Estimates of total Dutch money supply in relation to small-coin circulation, 1540-1790

	Money stock (in millions guldens)	Money stock per capita (guldens)	Per capita grams silver	Per capita small-coin cir- culation	Per capita small coins as per cent of total money stock
1540 N&B	20	5-7.5	95	0.33	5.3 per cent
1690 N	120	60	576	0.30	0.5 per cent
1790 N	200	100	960	0.68	0.7 per cent

Source: De Vries and van der Woude, *The First Modern Economy*, 90; Table 3 (p. 96).

During the seventeenth century the importance of small coins in relation to the (total) money stock rapidly fell, becoming insignificant by 1700. Although this situation was not to change much in the eighteenth century, it did not improve either. So if neither technical weakness nor economic problems caused this deterioration of small-coin circulation, in particular in the second half of the seventeenth century, how can it be explained?

38 F.C. Spooner, 'On the road to industrial precision: the case of coinage in the Netherlands (1672-1791)', *Economisch- en sociaal-historisch jaarboek* 43 (1980) 1-18; H.W. Jacobi, 'De mechanisatie van het Zeeuwse muntbedrijf in 1671', *Archief: mededelingen van het Koninklijk Zeeuwsch genootschap der wetenschappen* (1982) 150-176; Van Gelder, *De Nederlandse munten*, 147-151; Karel Davids, *The Rise and Decline of Dutch Technological Leadership: Technology, Economy and Culture in the Netherlands, 1350-1800*, 2 vols (Leiden and Boston 2008) 144-146.

39 John R. Brozius, 'Twee Hoornse schutterspenningen door Christoffel Adolphi en Jacob 't Lam', *Jaarboek voor munt- en penningkunde* 95 (2008) 123-137, 127-129.

Most likely by the commercial expansion of the Republic and its political implications. The key merchants, who also formed the political elite, were much more concerned with the minting of large denominations than with the minting of *duiten*, *stuivers*, and *dubbeltjes*. And as far as they were interested in providing silver to be coined into these small denominations, they sent most of the *stuivers* and nearly all the *dubbeltjes* overseas. Together with the six-*stuiver schellingen*, these coins were exported in huge quantities through the VOC, as is shown in the appendices.⁴⁰ The export of *duiten* became more important in the eighteenth century (see the article by Alberto Feenstra in the present issue).⁴¹ For the quantitative historian, the export of Dutch silver coins of the domestic type poses many problems, although the order of magnitude is more or less clear. Fortunately for that same historian, from 1726 onward the *duiten* sent to Asia by the VOC differed in appearance from those intended for domestic circulation; the same was true for the *stuivers* somewhat later.

It is no wonder that the high cost of small change from about the mid-seventeenth century caused by the disappearance of the *dubbeltjes* and the serious fall in the volume of *stuivers* in circulation (shown in Table 2) provoked unorthodox answers. Domestic per capita *duiten* production increased by 50 percent in the second part of the century, but that was far from sufficient. Because of the disappearance of small silver coins, the stock of small change was now supplemented by (partially low-weight) *duiten* minted by small principalities and noblemen in border regions such as Thorn, Stevensweert, Gronsveld, and Reckheim in the Maas valley, or in Huissen and Batenburg. In addition to disseminating their own types of coppers, these mints inundated the Republic with imitations of Dutch *duiten* (especially those of Friesland and Utrecht).⁴² The import of these

40 J.R. Bruijn, F.S. Gaastra and I. Schöffer (eds.), *Dutch-Asiatic shipping in the 17th and 18th centuries*, Vol. I (The Hague 1987) 238-245; Arent Pol, 'Tot gerieff van India. Geldexport door de VOC en de muntproductie in Nederland, 1720-1740', *Jaarboek voor Munt- en Penningkunde* 72 (1985) 65-195; H.J. van der Wiel and C.J.F. Klaassen, 'De Zeeuwse hoedjesschellingen', *Jaarboek voor munt- en penningkunde* 72 (1985) 50-64; H.J. van der Wiel, 'De Hollandse scheepjesschelling', *Jaarboek voor munt- en penningkunde* 74 (1987) 82-94.

41 Sometimes coin hoards in Indonesia provide information: one from the Moluccas after 1653 contained 250 silver *dubbeltjes* dated 1614-1653, 128 silver *stuivers* dated 1614-1641, and 5 Spanish and French coins (H.W. Jacobi, 'Muntvondsten. Molukken 1977', *Jaarboek voor munt- en penningkunde* 68 (1981) 107-119).

42 Van Gelder, *De Nederlandse munten*, 140-141, 164-165. For some types see Purmer and Van der Wiel, *Handboek*, esp. Appendix 2.

duiten and *oordjes* is difficult to date exactly. Many bear no date at all, and as far as they do these can only be taken as dates *post quem*.⁴³

Contrary to what was common with respect to most silver and gold coins,⁴⁴ it was traditionally the government, not individual merchants, that took responsibility for circulating copper coins (*duiten*, in this case).⁴⁵ In this respect the Dutch Republic operated in accordance with the observations of Volckart (*ut supra*). Notwithstanding these principles, increased copper coin production could by no means make up for the loss of small silver in the second half of the seventeenth century. Things changed for the better, however, after 1700.

When the lack of small silver became too serious a problem and the traditional response of minting more *duiten* proved unsatisfactorily, the province of Holland took radical steps. In 1702 it forbade the circulation of all non-Holland *duiten*, halved the value of its own old *duiten* of about 2.5 grams, and introduced heavier ones of 3.84 grams (thus making semi-official minting no longer profitable); the other provinces were quick to follow.

This change was greatly enhanced by the introduction previously of new machinery, which was now also used to mint coppers.⁴⁶ The new screw press produced forty-four coins a minute.⁴⁷ The implications of the new techniques, at last applied to *duiten*, may be demonstrated by the example of the Gelderland mint at Harderwijk. Its *duiten* showing the year 1693 or earlier must still have been produced with a hammer and anvil. After a production gap of almost ten years, those of 1702 and onward

43 The coins issued by Reckheim, Gronsveld, and Stevensweert as listed in Purmer and Van der Wiel, *Handboek* start in the 1610s, show a heavy concentration on the years 1620-1650, and continue until the end of the century.

44 Exceptions to this rule in the Dutch Republic are the *gouden ridders*, struck between 1749 and 1764, and $\frac{1}{4}$ and $\frac{1}{8}$ *rijksdaalders* commissioned by the Gecommitteerde Raden van Zeeland. See H.E. van Gelder, 'Gouden ridders 1749-1764', *Jaarboek van het Koninklijk Nederlandsch genootschap voor munt- en penningkunde* 33/34 (1946-1947) 97-110; and L.S. Beuth, 'Gouden ridders uit de 18^e eeuw', *Jaarboek van het Koninklijk Nederlandsch genootschap voor munt- en penningkunde* 44 (1957) 34-42; for the silver *pijlstuiver* see below.

45 Van Gelder, *De Nederlandse munten*, 121; August Sassen, 'De Hollandsche en Westfriesche duiten 1739-1780', *Tijdschrift van het Nederlandsch genootschap voor munt- en penningkunde* 20 (1912) 187-195. has already shown that the government's production of *duiten* might have been profitable.

46 Van Gelder, *De Nederlandse munten*, 166; for Gelderland see W.I. de Voogt, *Geschiedenis van het muntwezen der Vereenigde Nederlanden 1576-1813. Deel I, provincie Gelderland* (Amsterdam 1874) 55; for Holland see Albert A.J. Scheffers, *Om de kwaliteit van het geld. Het toezicht op de muntproductie in de Republiek en de voorziening van kleingeld in Holland en West-Friesland in de achttiende eeuw*, 2 vols. (Voorburg 2013).

47 Spooner, 'On the road', 8.

were clearly fabricated with a screw press, and this was immediately reflected in the productivity figures.⁴⁸ Between 7 and 14 February, fourteen Harderwijk moneyers hammered 3,600 marks in *duiten* – apparently still with the date 1693 – or (there being 116 *duiten* to the mark) 417,600 coins. This implies (deducting Sunday as the day of rest) 69,600 coppers a day were struck, or (assuming a working day of effectively eight hours) 145 *duiten* a minute per fourteen moneyers, or some twenty per pair of workers with one anvil. If these assumptions are acceptable, screw presses really led to a jump in productivity. Moreover, the new *duiten* had a much more uniform and neat appearance. The effect on productivity can once more be shown using the Harderwijk figures for the new, heavier *duiten* with the dates 1702 and 1703. Between 7 October 1702 and 19 March 1703, or in a maximum of 130 working days, the moneyers fabricated no fewer than 2,402,710 pieces,⁴⁹ at a minimum of 18,500 per day or 40 per minute.

As Table 2 shows, this upsurge in copper-coin production after 1702 had a marked effect, although the improved domestic circulation of silver had an even stronger impact. As long as the principle that the coinage of silver should be left to the market continued to be observed (and it was, excepting a brief interval in the eighteenth century) the government was bound to fail if it acted alone. Given the government's earnest efforts to adjust copper-coin production according to demand, it is a pity we know so little about how, exactly, it became aware that small-denomination coins were in short supply and decided to take appropriate action if need be. The following observations might offer a few clues here.

The initiative for the new type of *duiten* coined from 1702 onward was certainly local. The year before, the important industrial town of Haarlem had complained that the poor quality of the *duiten* in circulation was detrimental to petty traders and craftsmen, and all those who earned a living with their hands. Only one payment per day, of a maximum of 80 *duiten*, was allowed, which made this type of copper coin unfit for the weekly payment of wages. *Duiten* were clearly defined as small change, for which the government was responsible.⁵⁰ Along the same lines, there is ample evidence that *duiten* circulated in the towns of the province of Holland in the eighteenth century, from which we may conclude that individual towns took the initiative to supplement the existing stock.⁵¹

48 De Voogt, *Geschiedenis*, 53. Note that dies bearing the years 1690 or 1691 will probably have been used in the following year (cf. Purmer and van der Wiel, *Handboek*, 44).

49 De Voogt, *Geschiedenis*, 56, 60.

50 Scheffers, *Om de kwaliteit*, I, 31, 182-185 and 224.

51 Scheffers, *Om de kwaliteit*.

The want of small change could not be remedied by coining just coppers, as the problems encountered in the second half of the seventeenth century made clear. That is why on one occasion existing traditions were put aside and in 1738 the government even felt compelled to mint small silver pieces, the *pijlstuiver*. How serious the need for this new type of *stuiver* had become is apparent from a serious riot that broke out in Amsterdam. With the supply of new coins being insufficient, a revolt broke out against employers wanting to pay wages in old *wapenstuivers* of an inferior quality, as well as against shopkeepers refusing these old *wapenstuivers*. In August 1738 the town hall, which housed the *Wisselbank*, was occupied. The directors of the *Wisselbank*, who reported these troubles, distributed sums of ten to twenty new *stuivers* to a number of those occupying the town hall, after which the unrest apparently subsided.⁵²

A formal consultation process has been described by de Voogt for the province of Gelderland in 1720, where demand for *duiten* was determined by the towns (Table 5). Total *duiten* production in that year was probably worth much more: in 1716 authorisation was given for *duiten* valued at fl. 15,000 to be minted; this was not actually achieved until 1720.⁵³

Table 5. Demand for *duiten* by towns in Gelderland, 1720

Town	Demand		No. of inhabitants	Demand per inhabitant
	In guildens	Amount		
Zutphen	1,000	160,000	7,000	23
Nijmegen	500	80,000	12,000	7
Harderwijk	500	80,000	3,000	27
Arnhem	435	69,600	7,000	10
Doesburg	300	48,000	3,000	16
Doetinchem	200	32,000	1,200	27
Lochem	100	16,000	1,000	16
Wageningen	100	16,000	1,500	11
Total	3,135	501,600	35,700	14

Sources: W.I. de Voogt, *Geschiedenis van het muntwezen der Vereenigde Nederlanden 1576-1813. Deel I, provincie Gelderland* (Amsterdam 1874) 61 (demand); Piet Lourens and Jan Lucassen, *Inwoneraantallen van Nederlandse steden ca. 1300-1800* (Amsterdam 1997) 17-29 (inhabitants).

⁵² Scheffers, *Om de kwaliteit*, I, 347-350. Cf. Machiel Bosman, *De polsslagen van de stad. De Amsterdamse stadskroniek van Jacob Bicker Raye (1732-1772)* (Amsterdam 2009) 57, and, for other – possibly related – social unrest in the same month, Jan Wagenaar, *Amsterdam in zyne opkomst, aanwas [...] beschreeven*, vol. 1 (Amsterdam 1760) 742.

⁵³ Not all towns have been listed here. The following ones – all small to very small – have been omitted: Batenburg, Borculo, Bredevoort, Buren, Culemborg, Eibergen, Elburg, Groenlo, Hattem, 's-Heerenberg, Huissen, Nijkerk, Terborg, Tiel, Zaltbommel, and Zevenaar.

All these government attempts to remedy the situation were certainly successful in the first half of the eighteenth century, as Table 2 shows. From the same table we can also conclude that these achievements were short-lived, since they depended totally on the private initiatives of wealthy merchants in coining small silver. This happened only rarely, with the objective being to remedy immediate shortages of small change. Such an occasion occurred when the Republic's richest banker, Henry Hope decided to build a large mansion (called 'Welgelegen') near Haarlem between 1785 and 1789. In order to pay the workers weekly he had new *scheepjesschellingen* made at the (West-Friesland or Utrecht) mint.⁵⁴ Unfortunately for domestic circulation in the second half of that century, small silver coins were still being exported to Asia on a huge scale, causing shortages on the domestic market which could not be offset by increasing the output of *duiten* or even *pijlstuivers*, or by further rationalising production by farming out the manufacture of coin flans to specialist private firms.⁵⁵ Only fundamental political change could secure a more stable and adequate supply of small change.

II Centralisation and stabilisation of deep monetisation after 1800

The new state that eventually emerged after the Batavian Revolution and the foundation of a unitary republic happened to be a kingdom, the Kingdom of the Netherlands under William I. In these tumultuous years, nearly all the mint houses had been closed down except for one in the north (in Utrecht). Because of the short-lived unification between north and south, the old mint in Brussels resumed production as well.

The new mints now employed steam power, but productivity per unit of time did not increase dramatically in subsequent decades, although the quality of the coins minted did, including that of the smallest ones.⁵⁶ In

54 Raymonde Padmos (Ed.), *W. van den Hull, Autobiografie (1778-1854)* (Hilversum 1996) 121.

55 De Voogt, *Geschiedenis*, 60-67; J. MacLean, 'Koperindustrie in Nederland, 1750-1850', *Economisch- en sociaal-historisch jaarboek* 43 (1980) 39-63; S.W. Verstegen and A. Kragten, 'De Veluwse kopermolens in de negentiende eeuw; een raadsel voor de historiografen?', *Jaarboek voor de geschiedenis van bedrijf en techniek* 1 (1984) 172-187; Ryuto Shimada, *The Intra-Asian trade in Japanese copper by the Dutch East India company during the eighteenth century* (Leiden 2006); Scheffers, *Om de kwaliteit*.

56 The quality of the gigantic number of coppers for the Dutch East Indies between 1816 and 1835 (see C. Scholten, *De munten van de Nederlandsche gebiedsdeelen overzee, 1601-1948* (Amsterdam 1951) 89-91) was significantly lower however.

1821 the (now national) Utrecht mint bought an Uhlhorn steam-driven coin press, a year after its twin mint in Brussels.⁵⁷ In August 1843 the Utrecht mint master Agnitus Vrolik reported on a visit to the London Mint that this could produce an average of 31,000 coins per steam-powered screw, the equivalent of sixty-five coins every minutes, assuming an eight-hour working day.⁵⁸ These figures were for large coins. Between 40 and 45 small coins per minute could be made⁵⁹ – no significant increase it seems compared with the improvement in *duiten* production in the early eighteenth century.

It was not technical improvement that mattered in increasing the circulation of small change. At last, demand really could be met because of a new style of active government that considered the maintenance of what I call in this article ‘deep monetisation’ as one of its primary aims. Merchants were still allowed to have precious metals minted in Utrecht and Brussels, but, at last, central government assumed responsibility for providing enough coins to meet daily circulation needs.⁶⁰

The results of the new regime are not immediately visible in Table 2 because it takes account only of the production of the new coins bearing the crowned initials of King William I on the small ones up to the one-quarter guilder and his (uncrowned) effigy on half-guilder coins and upwards. The actual stock in circulation must have been substantially higher than the figures presented here because until 1827-1828 the old copper *duiten* circulated alongside the newly minted *centen* and half-*centen*, and until the 1840s the new silver *stuivers* and *dubbeltjes* competed with the old small silver pieces of the Dutch Republic and, in the south, with other coins issued by the Austrian Netherlands and France. A precise quantification of coin circulation in these years is not possible without further research, as the new coins were valid for the entire country, the more industrial south, and the more agricultural and mercantile north. In sum, the figures for 1840 in Table 2 are minimum figures. After the split between Belgium and the Netherlands, all the small coins discussed here were destined for domestic

57 E.J.A. van Beek, ‘Munttechniek’, in: Idem (ed.), *Encyclopedie van munten en bankbiljetten* (Houten 1986ff) M139-140; However, according to Albert A.J. Scheffers (ed.), *Agnitus Vrolik bezoekt de Londense Munt (1843)* (Utrecht 2000) 6, it was not until his 1843 trip that Vrolik decided to buy machinery from Krupp and Uhlhorn; but see also 77.

58 Scheffers, *Agnitus Vrolik*, 68: Vrolik provides production figures for 1816-1817, but apparently considers these to have been the same 25 years later.

59 Scheffers, *Om de kwaliteit*, 273.

60 Van Gelder, *De Nederlandse munten*; Marcel van der Beek, *De muntslag ten tijde van Koning Willem I. Ontwerp en productie van de Nederlandse munten 1814-1839* (Utrecht, 1997).

circulation, whereas only the larger pieces were still exported to the Indies, which had its own distinct small change. The efficiency of the new procedures becomes unequivocally clear for the last century analysed here.

12 Concluding remarks

As the Dutch case makes clear, social historians (and most economic historians as well) might benefit from distinguishing between different levels of monetisation. The term ‘deep monetisation’, i.e. the sufficient per capita circulation of small denominations – defined as those equalling one hourly wage or less – seems to offer a useful tool for comparisons within one geographic unit over several centuries. Further research might demonstrate its usefulness too for comparisons between geographical and political units. The Dutch evidence suggests furthermore that a per capita supply of small denominations equal to the wages paid for between five and ten hours work does meet average demand in a deeply monetised society. The same case study shows, however, that supply and demand are not automatically in equilibrium. This is not primarily due to technical reasons, but depends principally on the responsibilities governments are prepared to assume. In the more unified states of the Burgundian Netherlands and of the Kingdom of the Netherlands, this was, apparently, more feasible than in the intermediate Dutch Republic, notwithstanding its very high *overall* levels of monetisation.

The present article does not pretend to offer more than the basics of deep monetisation for further discussion. The bare average per capita circulation figures conceal a whole world of payment modalities. Here, modes of small payments have only occasionally been mentioned, and the alternatives to cash settlement have not been investigated at all. It makes a substantial difference for the stock of coins needed if wages are paid weekly, fortnightly, or even monthly.⁶¹ Equally, the large-scale extension of credit to ordinary customers diminishes the demand for small coins. The composition of the population, but also the structure of retailing, might play a role as well. To give one example for a hypothesis that could be tested in the future: during the seventeenth century, large-scale urbanisation owing to immigration might have temporarily weakened social cohesion.⁶² Consequently the propensity of shopkeepers to provide credit

61 See Lucassen, ‘Loonbetaling en muntcirculatie’; Idem, *Wages and currency*.

62 Davids and Lucassen, *A miracle mirrored*.

might have diminished, causing an enhanced demand for small-coin circulation.

The structure of retailing might matter as well, and I wonder what the implications for the supply and demand of small change might have been. In their recent contribution to the 'industrious revolution' debate on the Dutch Republic, Danielle van den Heuvel and Sheilagh Ogilvie argue that the size of the retail sector (including the by-employed) increased between the 1670s and the 1740s, after which it remained stable until the 1790s. They conclude,

'Case-studies suggest that many of the new practitioners entering retailing in this period were not household heads but wives or other family members. This mobilization of other household members into market activities, together with our evidence that by-employment but not fulltime retailing expanded in this period, would support the idea that the Industrious Revolution may have been continuing, at least in some sectors, even while the Dutch economy at large stagnated'.⁶³

Van den Heuvel and Ogilvie note that the retail density was significantly higher by 1803-1813 than in any preceding period (it was to change little before 1849) by pointing to the demise of the retailers' guilds. This opened up possibilities for Jews, women, migrants, and non-citizens, which had been limited before. Retailing was also denser in the northern provinces than in the southern provinces, as becomes clear from their comparison between Holland and Limburg. These institutional changes in the eighteenth century suggest the hypothesis that cash payments for small purchases might have increased because sellers were less prosperous than before and, particularly after the demise of the guilds, because the social distance between buyer and seller was probably greater than before.

Finally, what might have been the implications of shifts in the employment structure away from agriculture and towards industry and services in the nineteenth and twentieth centuries?⁶⁴ Ongoing urbanisation after 1870 was part of this process. The shifts were related to those from self-employ-

63 Danielle van den Heuvel and Sheilagh Ogilvie, 'Retail development in the consumer revolution: the Netherlands, c. 1670-c. 1815', *Explorations in economic history* 50 (2013) 69-87, 83; cf. Willems, *Leven op de pof* for small consumption credit in Antwerp after 1750.

64 For the period 1800-1939 in general, see Jan Luiten van Zanden and Arthur van Riel, *Nederland 1780-1914. Staat, instituties en economische ontwikkeling* (Amsterdam 2000); J.A. de Jonge, *De industrialisatie in Nederland tussen 1850 en 1914* (Nijmegen 1976); and Lucassen, 'Loonbetaling en muntcirculatie'.

ment to wage dependency (including from family wage to individual wage), and from living-in servants (in agriculture, in the crafts, and in domestic service) to wage dependants living on their own, with or without a family.

Deep monetisation in the Low Countries started certainly in the sixteenth century, possibly even earlier, first in the south, and later in the north. Overall, this situation did not subsequently change, but strong fluctuations in supply after 1650 require explanations, as we have no reason to suppose that the demand for small coins was declining in the Dutch Republic.

Echoing Volckart (and pace Sargent and Velde), the present case study shows that these problems had been mastered as early as the sixteenth century; however useful, none of the subsequent technical improvements resulted in fundamental improvements. The occasional supply problems that arose in the Dutch Republic stem from its political structure and economic concepts, which determined who was responsible and which instruments were available. Solutions therefore were always inadequate, even to the extent that in the second half of the seventeenth century unofficial coins had to be allowed into circulation, just as in mid-seventeenth and late eighteenth-century England. The extension of small credit in similar situations in England, as demonstrated by Muldrew, suggests that this might also have played an important role in the Netherlands after *c.* 1750. That, however, could not be researched here.

About the author

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Appendices⁶⁵

1. Small-coin production in the Habsburg Netherlands under Charles V and Philip II

Prevailing wage levels determine the denominations that have to be included (see Table 6). For the first half of the sixteenth century (and the cross section 1550) this implies coins of 1 *stuiver* and less, for the second half (and the cross section 1600) coins of 2 *stuivers* and less, mainly because of price and wage inflation.

Table 6. Summer building wages in Antwerp (master masons) and Amsterdam (master carpenters) around 1506, 1556 and 1598, in *guldens* comprising 20 *stuivers*

	Antwerp		Amsterdam		Maximum denominations to be included
Around	Per day	Per hour	Per day	Per hour	
1506	0.25-0.30	0.02-0.03	?	?	½ <i>stuiver</i>
1556	0.45-0.50	0.04	0.30-0.35	0.03	1 <i>stuiver</i>
1598	1.20	0.10	0.75-1.10	0.06-0.09	2 <i>stuiver</i>

Source: Nusteling, *Welvaart*, 258-259.

The population data are given only by approximation in the literature, and are summarised in the following table.

Table 7. Population figures for the Southern and Northern Netherlands, 1500-1800

	Southern Netherlands	Northern Netherlands	Total	Maximum
1500	850,000	950,000	1,800,000	
1550	1,300,000	1,250,000	2,550,000	3,000,000
1600	1,100,000	1,500,000	2,600,000	
1650	1,300,000	1,900,000	3,200,000	
1800	3,000,000	2,100,000	5,100,000	

Sources: E. Hélin, 'Demografische ontwikkeling van de Zuidelijke Nederlanden 1500-1800', in: *Algemene Geschiedenis der Nederlanden* 5 (Haarlem 1980) 169-194, 174; A.M. van der Woude, 'Demografische ontwikkeling van de Noordelijke Nederlanden 1500-1800' in: *ibidem*, 102-168, 134; De Vries and van der Woude, *The First Modern Economy*, 52, 91 (3,000,000 in 1550); for the Duchy of Brabant see Paul Klep, *Bevolking en arbeid in transformatie. Een onderzoek naar de ontwikkelingen in Brabant, 1700-1900* (Nijmegen 1981).

65 The detailed data will be published on the website of the IISH.

For the reign of Charles V, all numbers of coins struck are available in van Gelder and Hoc, *Les monnaies des Pays-Bas bourguignons et espagnols, 1434-1713*, based on Peter Spufford's original calculations. Only four denominations for the Holland mint at Dordrecht had to be estimated, as well as two for the mint in Roermond. These estimates relate to 10.9 percent of total output by value. The same applies for the reign of Philip II, but the estimated output value is less, only 5.8 percent.

Based on these production data, circulation per capita can be reconstructed for the cross sections 1550 and 1600. Because of the previous hyper-inflation, I have for the first cross section assumed that at the start of Charles V's reign only the latest issues of his predecessor Philip of Burgundy, i.e. his eighth issue, minted in 1499-1506 were actually still in circulation.⁶⁶ Between the reigns of Charles V and Philip II there is no break in the circulation of coins and consequently all coins of the former – minus the usual loss – were used. For the coin circulation around 1550 and 1600 see Tables 8 and 9.

66 Van Gelder and Hoc, *Les monnaies*, 31, 35, 58-65.

Table 8. Availability of coins of 2 stuivers and less in the Netherlands at the end of the reign of Charles V (1506-1555) in guilders

Available in 1550	2 stuiver	stuiver	½ stuiver	¼ stuiver	1/8 stuiver	1/12 stuiver	1/16 stuiver + 2 z/3 mijt	1/24 stuiver	Smaller than 1/24 stuiver	Total
1500	948427.7	517465	40711	5249	3304	1758	384	3131	291	572293
Productie 1500-1550	0	815572	418934	29429	60452	3266	13746	60635	7191	1409226
Total	948427.7	1333037	459645	34679	63755	5024	14131	63767	7482	1981519
Total 1500 minus loss 50%	474213.9	666519	229823	17339	31878	2512	7065	31883	3741	990760
Inhabitants 1550	3000000	3000000	3000000	3000000	3000000	3000000	3000000	3000000	3000000	3000000
Circulation 1550 per capita		0.22	0.08	0.01	0.00	0.00	0.00	0.01	0.00	0.33

Sources: Van Gelder and Hoc, *Les monnaies*, 75-96.

Table 9. Availability of coins of 2 stuivers and less in the Netherlands at the end of the reign of Philip II (1555-1598) in guilders

	2 stuiver	stuiver	½ stuiver	¼ stuiver	1/6 stuiver	1/8 stuiver	1/12 stuiver + 2 2/3 mijt	1/16 stuiver	1/24 stuiver	Total
Silver	250863	213866	14131	750	0	63	0	31	0	479704
Billion	0	0	0	320	0	5884	0	10152	0	16356
Copper	0	0	0	111284	833	72114	28126	3059	21014	236430
Total produc- tion 1550-1600	250863	213866	14131	112354	833	78060	28126	13242	21014	732490
In circulation 1550	474214	666519	229823	17339	0	31878	2512	7065	35624	1464973
Losses 1550- 1600	362539	440192	121997	64847	417	54969	15319	10153	28319	1098732
In circulation 1600	362539	440192	121997	64847	417	54969	15319	10153	28319	1098732
Inhabitants 1600	2600000	2600000	2600000	2600000	2600000	2600000	2600000	2600000	2600000	2600000
Production per capita 1550- 1600	0.10	0.08	0.01	0.04	0.00	0.03	0.01	0.01	0.01	0.28
Circulation per capita 1600	0.14	0.17	0.05	0.02	0.00	0.02	0.01	0.00	0.01	0.42

Sources: Van Gelder and Hoc, *Les monnaies*, 97-145.

If we accept the lower population estimates of 2,550,000 inhabitants in 1550, the result for that cross section would be fl. 0.39 in circulation per capita. Given the circulation of small denominations in 1550 and the production 1550-1600, and now also taking into account the double *stuivers* available, we can estimate per capita circulation in 1600.

In the Northern Netherlands, actual circulation around 1600 may have been higher, as some of the mint houses in the rebellious provinces began producing, independent of the government in Brussels, though for a number of years, with the effigy and/or the name of the king.⁶⁷ I have refrained from including these relatively small numbers (with the exception of some five million *duiten* issued by Holland) as these data are only partially available, but also, in particular, because circulation patterns between the Northern and Southern provinces at the end of the sixteenth century is impossible to disentangle.

2. Small-coin production, export, and net circulation in the Netherlands / Northern Netherlands, 1555-1940

Small-coin production, exports, and net domestic circulation in the Netherlands / Northern Netherlands between 1600 and 1939, which in this article we have formally defined as the production of all coins equalling the value of an average hourly wage (i.e. for the cross sections 1600-1900 all denominations of a *dubbeltje* (two *stuivers* or fl. 0.10) and less, and for 1940 also including the *kwartje* or fl. 0.25), may be reconstructed directly from production figures only for the earliest and for the last periods. For the coins issued by or in the name of King Philip II, production figures have been published by H. Enno van Gelder and Marcel Hoc, and for those issued after 1800 by Jacques Schulman.⁶⁸

67 For the types see van Gelder and Hoc, *Les monnaies*; for the copper ones also Purmer and van der Wiel, *Handboek*; L.W.A. Besier, *De muntmeesters en hun muntslag in de provinciale en stedelijke munthuizen van de Republiek der Vereenigde Nederlanden en van de Bataafsche Republiek en in de Utrechtsche Munt van het Koninkrijk Holland en tijdens de inlijving bij het Fransche Keizerrijk* (Utrecht 1890) provides some production figures for the later years for Gelderland (s.a. 1591), Zeeland (s.a. 1580-1583), and Holland (s.a. 1590-1598) which are not in van Gelder and Hoc, *Les monnaies*.

68 Van Gelder and Hoc, *Les monnaies* (for a few cases I had to make estimates myself); Jacques Schulman, *Handboek van de Nederlandse munten 1795-1975* (Amsterdam 1975); H.E. van Gelder, 'Van Republiek tot Koninkrijk', *Jaarboek voor munt- en penningkunde* 67 (1980) 237-240.

For the period 1600-1800 a rather elaborate reconstruction is necessary, one that involves the following steps:

- *The selection of the denominations to be studied:* for the Dutch Republic four main denominations have to be reconstructed: the copper *duit*, the copper *oord*, the silver *stuiver*, and the silver *dubbeltje*. All other small denominations were produced only in very small numbers for a limited number of years. Further, as a rule production figures are lacking. For these two reasons the following types have not been included here:⁶⁹ the *dubbeltjes* and *stuivers* minted by the Geocrooieerde Munt van Enkhuizen 1675-1677 (WF 84 – WF 92), the $\frac{1}{2}$ *stuiver* by Utrecht 1627 (Su 10), the $\frac{1}{2}$ *stuiver* by Nijmegen 1602-1603 (Nij 27) and 1619-1620 (Nij 23), the silver *oord* by Overijssel 1607 (Ov 67), the $\frac{1}{2}$ *stuiver* s.a. (1629) by Deventer (De 51), the silver *duit* s.a. (1602) by Deventer (De 53), the silver *oord* s.a. (1600) by Friesland (Fr 81), and the silver *duit* s.a. (1600) by Friesland (Fr 85), and from Groningen the silver $\frac{1}{2}$ *stuiver* 1604-1649 (Gr 16), 1627 (Gr 14), 1682 (Go 12), the silver $\frac{1}{4}$ *stuiver* 1600-1649 (Gr 18), and the silver $\frac{1}{8}$ *stuiver* 1600-1629 (Gr 20). Further, all obsidional mintage and coins produced by some small towns have been excluded.
- For the remaining major denominations (*dubbeltje*, *stuiver*, *oord*, *duit*) the published *production data have been combined with the coin types* known from the numismatic catalogues, from which follows for which years as they appear on the coins no production data are available in the literature.⁷⁰
- *Recalculation* of production figures available in ‘marks of pure silver’ or numbers struck *into guilders of account*.
- *Where missing, estimate of production figures* on the basis of known figures for other years and mints (mostly needed for copper coins, for which annual production figures from the late sixteenth century have also been taken into account).
- *Reconstruction of levels of coin exports overseas*, mainly through the VOC to Asia.

69 Coin types after Purmer and van der Wiel, *Handboek*; D. Purmer and J.B. Westerhof, *Handboek van de Nederlandse provinciale muntslag 1568-1795*, vol. I (s.l. 2006); D. Purmer, *Handboek van de Nederlandse provinciale muntslag 1568-1795*, vol. II (s.l. 2009); H.E. van Gelder, ‘De geocrooieerde munt te Enkhuizen 1671-1679’, *Jaarboek van het Koninklijk genootschap voor munt- en penningkunde* 36 (1949) 61-78.

70 The necessity of this step may seem strange, but as a rule publications on coin production and circulation on the one hand and coin catalogues on the other are totally separate bodies of literature, which, with a few exceptions (e.g. Lucassen, ‘Loonbetaling en muntcirculatie’ and Scheffers, *Om de kwaliteit*), have not been combined so far.

- The net result of coins produced and not massively exported may be taken as the best proxy of coin circulation in the northern Netherlands, calculated for the following cross sections: 1600, 1650, 1700, 1750, 1800, 1840, 1890, 1940.

2.1. Silver money: *dubbeltje* (2 *stuivers* or 1/10 *guilder* = fl. 0.10)

Menno Polak has published production figures expressed in marks of pure silver, in so far as these are available from the periodic checking of the *muntbuis*. A comparison between these figures and the actual figures for the production of *dubbeltjes* by the Dordrecht minters from June 1730 to May 1740 demonstrates that these *muntbuis* data are reliable.⁷¹ Missing production figures have been estimated by me. These estimates (8.8 percent of total production) mainly concern a few issues from the first decade of the seventeenth century and the issues by Friesland (24 years for which figures are unknown), Groningen (*idem* 8), Zutphen (10), and Nijmegen (4).

All these figures, noted by Polak in ‘marks of pure silver’ (1 mark Hollands Trois = 246.08 grams⁷²), have to be converted to guilders of account in order to make comparisons possible with other denominations and with export figures. For this purpose, Polak used the *muntequivalent* (ME), which he defines as ‘the value in guilders of account of a mark of pure silver, minted into coins of a certain type’.⁷³ However, total production was about 2.5 percent higher than his ME, as may be demonstrated by the following detailed account for 1614 that has survived from the West Frisian mint house.

71 M.S. Polak, *Historiografie en economie van de “muntchaos”. De muntproductie van de Republiek (1606-1795)*, 2 vols. (Amsterdam 1998) II, 103-168; Pol, ‘Tot gerieff 189-192.

72 J.C. van der Wis, ‘Mark’, in: E.J.A. van Beek (ed.), *Encyclopedie van munten en bankbiljetten* (Houten 1986ff) M29-31, M30; Polak, *Historiografie*, 64.

73 Polak, *Historiografie*, 66.

Table 10. Production costs of *stuiver* and *dubbele stuiver*, West Friesland, 1614, per mark of pure silver

	In money of account (guilder: <i>stuiver</i> : mijt)	In guilders of ac- count (decimal)	Muntequivalent (ME) according to Polak
To the supplier of the silver	23:11:00	23.5500	
<i>Sleischat</i> (government tax)	0:02:00	0.1000	
<i>Gezellenloon</i> (labour wage)	0:08:24	0.4250	
Unknown*	0:06:20	0.3208	
Subtotal		24.3958	24.381
<i>Brassage</i> (gross profit mint master)	0:11:40	0.5917	
Total production costs	24:19:36	24.9875	

NB 1 guilder = 20 *stuivers*; 1 *stuiver* = 48 *mijten*.

Scheffers, *Om de kwaliteit van het geld*, 322-324.

* In the published source we find the *sleischat* (2 *stuivers*) and the *gezellenloon* (8½ *stuivers*) added together to give a total of 14 *stuivers* 44 *mijten*, which implies the omission of 6 *stuivers* and 20 *mijten*. The other additions are correct however; cf. Polak, *Historiografie*, II, 95

One can conclude that there were four recipients of coin: the merchants who supplied the silver to the mint master received the vast majority of them (over 94 percent) in order to put into circulation, the mint master himself might have kept 2.5 percent, while the journeymen and the government received the rest, which they undoubtedly also put in circulation. Consequently, I had to add 2.5 percent to the ME given by Polak in order to arrive at a proper multiplier in order to convert marks of pure silver into guilders.

There is, however, another problem to be solved in order to convert marks of pure silver into guilders of account, as this multiplier was not constant between 1600 and 1800; it varied over time because of the periodically changing weight and purity specifications for the smaller denominations (*stuiver* and *dubbeltje*) analysed here.⁷⁴ Combining the specifications provided by three authorities (van Gelder,⁷⁵ Grolle,⁷⁶ and Polak⁷⁷), we arrive at the following ME data (Table 11).

74 Polak, *Historiografie*, II, 66 and 95-102; cf. also Scheffers, *Om de kwaliteit*.

75 Van Gelder, *De Nederlandse munten*, 248-249, 265-267, 272, 294.

76 J.J. Grolle, 'Stuiver', in: E.J.A. van Beek (ed.), *Encyclopedie van munten en bankbiljetten* (Houten 1986ff) S149-152, S150.

77 Polak, *Historiografie*, II, 94-102.

Table 11. *Muntequivalent* (ME) for *stuivers* and *dubbeltjes* in the Dutch Republic, 1580-1799

	The majority of the mint houses			Exceptions
	Grams of pure silver per stuiver	ME	ME + 2.5 per cent	
1580-1613	0.46656	[24]	[24.6]	
1614-1618	0.471-0.490	24.381	25.0	
1619-1669	0.560	28	28.7	St WFR 1624 (ME 24.943); St UTR 1626-1628 (ME 27)
1670-1737	0.5186	25.843	26.5	DSt FRL 1672-1694; St/DSt GRO 1681-1691; NIJ 1681-1685 (ME 27.086)
1738-1799	0.472 (<i>pijlstuiver</i>)	[24.5]	[25.1]	(<i>dubbele</i>) <i>wapenstuiver</i> (ME 25.843)

Between square brackets: my estimates (DSt = *dubbeltje*; St = *stuiver*; FRL = Friesland; GRO = Groningen; NIJ = Nijmegen; UTR = Utrecht, WFR = West Friesland.)

To sum up: I have used the multiplier ME + 2.5 percent to convert the production of *dubbeltjes* as expressed in 'marken fijn zilver' in the sources into guilders of account (see Table 12). It should be noted that until 1680 there were no guilder coins in the Dutch Republic. It was only from that year onward that real coins of that denomination were struck (weight 10.61 grams, with a fineness of 0.917). This guilder, the *gulden courant*, had a value five percent less than the guilder of account (*bankgulden*).⁷⁸

Table 12. Production of *dubbeltjes*, 1600-1799 (*guldens* of account x 1,000)

	1600-1649	1650-1699	1700-1749	1750-1799	1600-1799
Holland	706.1	1,007.6	10,991.6	2,344.5	15,049.9
West Friesland	186.2	149.8	3,499.4	1,181.1	5,016.5
Zeeland	955.4	249.9	3,811.8	90.4	5,107.5
Utrecht	101.1	11.9	46.1	260.8	419.9
Gelderland	244.2	63.6	1,177.1	201.1	1,686.0
Overijssel	583.7	382.1	30.6	0	996.4
Friesland	36.3	1,024.7	768.5	0	1,829.5
Groningen	96.9	0	0	0	96.9
Kampen	0	186.5	0	0	186.5
Deventer	11.8	44.5	17.9	0	74.2
Zwolle	35.6	62.4	0	0	98.0
Zutphen	11.9	0	0	0	11.9
Nijmegen	3.1	7.7	0	0	10.8
Republic Total	2,972.3	3,190.7	20,343.1	4,077.9	30,584.0

⁷⁸ E.J.A. van Beek, 'Gulden', in: Idem (ed.), *Encyclopedie van munten en bankbiljetten* (Houten, 1986ff) G89-G94, G90 and G94.

Having reconstructed production in the Republic, this cannot, however, be equated to actual circulation, as a considerable part of production was exported by the VOC to Asia. The available data on precious metals and copper coinage allotted annually to the VOC for dispatch have been published by Bruijn, Gaastra, and Schöffner. In a detailed analysis of the decades 1720-1740, Pol has shown that – with small deviations of up to ten percent per denomination – these data reflect actual exports fairly accurately in the long run.⁷⁹ Apart from these official exports, individual crew members took Dutch coins aboard, though the rare evidence we have of this private export relates almost exclusively to thaler-size silver coins.⁸⁰

Estimates for *dubbeltjes* exports in the seventeenth century are problematic as detailed figures for *dubbeltjes* and *stuivers* (together or separately) are given only for nine years, whereas we know for 37 years how much *payment* (i.e. *schellingen* of 6 *stuivers*, *dubbeltjes*, and *stuivers* together) was allotted. From 1720 onward data become more abundant, and from 1749-1750 onward they are complete. Furthermore, in 1694 the Estates General forbade the coinage of *payment*, with the exception (from 1698) of coinage for the VOC.⁸¹ In principle, from now on all *dubbeltjes* issued by Dutch mint houses were destined for the VOC. On the basis of these data it is possible to reconstruct rough estimates of total exports of *dubbeltjes* and *stuivers* (Table 13).

Table 13. Exports of silver *payment* (*schelling*, *dubbeltje*, *stuiver*) by the VOC to Asia (*guldens* of account x 1,000)

	Schelling (6 stuiver)	Dubbeltje (2 stuiver)	Stuiver	Total silver payment
1600-1649	638.5	1,011.1	139.0	1,788.6
1650-1699	8,662.6	4,279.8	126.0	13,068.4
1700-1749	15,273.7	17,009.5	103.5	32,386.7
1750-1799	2,290.5	5,038.9	5.0	7,334.5
Total 1600-1799	26,865.3	27,339.3	373.5	54,578.2

Source: my reconstruction on the basis of J.R. Bruijn, J.R., F.S. Gaastra, and I. Schöffner, *Dutch-Asiatic Shipping in the 17th and 18th Centuries*, Vol. I (The Hague 1987) 223-245.

79 Bruijn, Gaastra and Schöffner, *Dutch-Asiatic shipping*, 223-245; Pol, 'Tot gerieff.

80 NA, VOC 9350-9351 (Criminal court Batavia 1729, Parts 1-2): court case concerning goods and coins rescued from the VOC ship *Zeewijk*, wrecked on 9 June 1727 on Gun Island in the southern part of the Houtman Abrolhos on its way from Zeeland to Batavia: the coins belonging to crew members were mainly *ducatoons*, a few were half *ducatoons*, with just a few *schellingen*. I am preparing an article about this case with Matthias van Rossum.

81 Pol, 'Tot gerieff', 97.

From production minus exports we arrive at production available for domestic circulation, but we also have to take account of losses, which, for small coins over half a century, may be set at about 50 percent [of the total sum of the previous cross section plus the production of the previous 50-year period (cf. Tables 8-9)]. Consequently, circulation in 1650, 1700, 1750, and 1850 consisted of the circulation at the previous cross section, plus coins put newly into circulation during that half century, but after deducting 50 percent of that total to cover for losses. For the first half of the seventeenth century we may suppose that more or less all coins issued in the previous period bearing the name and/or the effigy of King Philip I had vanished from circulation. That is why for the first cross section (1650) we have taken into account only what was produced during the previous 50-year period. Finally, the circulation of *dubbeltjes* per capita can be calculated (see Table 14).

Table 14. Production, exports, and domestic circulation of *dubbeltjes*, 1600-1799 (gulden of account x 1,000)

	Per half century					At the end of the period (1650, 1700, 1750, 1800)	
	Production	Exports	Production minus exports	Domestic circulation, including remainder from previous period	Loss	Net domestic circulation	Gulden per capita*
1600-1649	2,972	1,011	1,961	1,961	981	981	0.52
1650-1699	3,191	4,280	-/ 1,089	-/ 108	0	0	0.00
1700-1749	20,343	17,009	3,334	3,334	1,667	1,667	0.88
1750-1799	4,078	5,039	-/ 961	706	353	353	0.18
1600-1799	30,584	27,339	3,245				

* Population c. 1600, 1650, and 1700: 1.9 million; c. 1800: 2 million.

2.2. Silver money: *stuiver* (1/20 guilder = fl 0.05)

Stuiver production (see Table 15; 22.8 percent of which has been estimated) and exports (see Table 13) were reconstructed using the same method as that employed for *dubbeltjes*. It is important to note that from 1738 onward *stuiver* production was intended exclusively for domestic circulation and was emphatically of a type (the *pijlstuiver* or *bezemstuiver*) different from

the *stuivers* produced until 1737 and exported to the East (the *wapenstuiver*).⁸²

Table 15. Production of *stuivers* 1600-1799 (*guldens* of account x 1,000)

	1600-1649	1650-1699	1700-1749	1750-1799	1600-1799
Holland	120.7	0	268.5	19.5	408.7
West Friesland	76.3	0	219.2	15.1	310.6
Zeeland	695.2	86.2	71.6	52.2	905.2
Utrecht	60.6	28.3	22.7	6.6	118.2
Gelderland	33.0	0	33.1	37.3	103.4
Overijssel	35.5	10.2	31.4	9.2	86.3
Friesland	104.8	52.4	10.5	0	167.7
Groningen	210.4	97.1	16.2	16.2	339.9
Kampen	0	0	0	0	0
Deventer	0	13.9	0	0	13.9
Zwolle	0.8	0	0	0	0.8
Zutphen	0.8	0	0	0	0.8
Nijmegen	0.8	0	0	0	0.8
Republic Total	1,338.9	288.1	673.2	156.1	2,456.3

Also, the actual circulation at four points in time (Table 16) has been calculated using the same method as that employed for *dubbeltjes*.

Table 16. Production, exports, and domestic circulation of *stuivers*, 1600-1799 (*guldens* of account x 1,000)

	Per half century					At the end of the period (1650, 1700, 1750, 1800)	
	Production	Exports	Production minus exports	Domestic circulation, including remainder from previous period	Loss	Net domestic circulation	Guldens per capita*
1600-1649	1,339	139	1,200	1,200	600	600	0.32
1650-1699	288	126	162	762	381	381	0.20
1700-1749	673	103	570	951	475	475	0.25
1750-1799	156	5	151	626	313	313	0.16
1600-1799	2,456	373	2,083				

* Population c. 1600, 1650, and 1700: 1.9 million; c. 1800: 2 million.

82 Pol, 'Tot gerieff, 98; Scheffers, *Om de kwaliteit*. The *pijlstuivers* were produced in six mints: Dordrecht (1738-1740, 1760-1764), West Friesland (1738-1739, 1764-1766), Zeeland (1738-1739, 1760-1765, 1791), Utrecht (1738-1739, 1760-1765), Gelderland (1738-1739, 1759-1765), and Overijssel (1738-1739, 1765-1769).

2.3. Copper money: *oord* (1/4 *stuiver* = fl 0.0125)

In the seventeenth century the *oord* was produced in the Northern Netherlands in the provinces of Zeeland (1601-1671) and Friesland (1608-1649), as well as to some extent in Kampen (1607) and in Huissen (1609 and 1611).⁸³ They circulated beyond these areas though.⁸⁴ Production data are scarce, so it is difficult to present acceptable production estimates. Based on the average annual *oord* production at Nijmegen and Middelburg at the end of the sixteenth century, I have estimated the average annual production per mint house in the seventeenth century at 100,000 pieces, or 3.5 million pieces for 35 production years of all four mint houses together. This equals 43,750 guilders of account. On one occasion, we know that 5,000 guilders worth of *oordjes*, most probably produced in Zeeland, were exported via the VOC.⁸⁵ The net result, minus the losses (here, too, put at 50 percent over 50 years), yields a circulation in c. 1650 of nearly 20,000 guilders, or fl. 0.01 per capita. The result for 50 years later (the Zeeland mint had four production years in the 1650s, two in the 1660s, and one in the 1670s) are therefore negligible.

2.4. Copper money: *duit* (1/8 *stuiver* = fl 0.00625)

Like *oordjes*, copper *duiten* were not a regular feature of the *muntbody* records, and they are therefore not given in the production figures published by Menno Polak. Nevertheless, some authors⁸⁶ provide occasional data, including those for the late sixteenth century, which are sufficient to get an impression of mint capacities and practices. These enable us to make the necessary extrapolations for the other years in which, according to the very precise catalogue drawn up by Dick Purmer and Henk van der Wiel⁸⁷ (who, remarkably, provide no production figures at all), this de-

83 Purmer and van der Wiel, *Handboek*, 62-63, 96-98, 119-125, 134.

84 It is remarkable that between 1625 and 1642 the dues payable to the Amsterdam guild of *korenmeters* and *korenzetter*s for the obligatory measurement of grain in lighters and warehouses were expressed in *oordjes*. Apparently these coins were collected in small tuns (*tonnetjes*). See I.H. van Eeghen, *Inventarissen der archieven van de gilden en van het brouwerscollege* (Amsterdam 1951) 68.

85 Brijn, Gaastra and Schöffer, *Dutch-Asiatic shipping*, 231 gives a figure for 1653-1654 of fl. 5,000 in *oordjes*, or 400,000 pieces.

86 De Voogt, *Geschiedenis*; Besier, *De muntmeesters*; Sassen, 'De Hollandsche en Westfriesche duiten'; Van Gelder and Hoc, *Les monnaies*; Scheffers, *Om de kwaliteit*.

87 Purmer and van der Wiel, *Handboek*.

nomination was minted. Data are available for Gelderland until 1720 and for three subsequent years,⁸⁸ for the Zeeland mint mainly for the second half of the seventeenth century,⁸⁹ the mints of Holland⁹⁰ and West Friesland⁹¹ mainly for the eighteenth century, for some issues of the mint houses of the provinces of Utrecht⁹² and Overijssel,⁹³ and for the Zutphen mint.⁹⁴ All these scattered data have been compiled in Table 17, supplemented with estimates for those years for which no production data are available.⁹⁵

Table 17. Production of *duiten*, 1600-1799 (number of pieces and *guldens* of account x 1,000)

	1600-1649	1650-1699	1700-1749	1750-1799	1600-1799	
Holland	9,062.1	0	47,039.6	12,062.2	68,163.9	
West Friesland	4,962.1	5,000.0	11,405.6	6,252.8	27,620.5	
Zeeland	1,400.0	12,855.0	15,000.0	42,000.0	71,255.0	
Utrecht	7,500.0	18,020.0	32,380.0	58,000.0	115,900.0	
Gelderland	1,894.0	3,893.0	8,803.0	19,600.0	34,190.0	
Overijssel	2,000.0	0	990.0	6,680.0	9,670.0	
Friesland / Groningen	4,200.0	4,000.0	3,000.0	1,500.0	12,700.0	
Kampen / Deventer / Zwolle / Zutphen / Nijmegen	750.0	831.0	0	0	1,581.0	
Republic	number of					
Total	pieces	31,768.2	44,599.0	118,618.2	146,095.0	341,080.4
	Guilders	198.551	278.744	741.364	913.094	2,131.753

88 Van Gelder and Hoc, *Les monnaies*, 101, 103, 124-126, 137; Besier, *De muntmeesters*, 9-11, 13-17, 20; De Voogt, *Geschiedenis*, 4, 28-29, 42-44, 47-49, 53, 60-61, 63, 67, 156-158, 172 (total of 8,188,175 pieces for the subperiod 1626-1693, although his own figures add up to 5,785,510 pieces. I take this as an error in addition, either by de Voogt or by his source); Scholten, *De munten*, 23, 51.

89 Van Gelder and Hoc, *Les monnaies*, 103, 137-138; Besier, *De muntmeesters*, 59-60.

90 Besier, *De muntmeesters*, 24; Scheffers, *Om de kwaliteit*, I, 173-176, 197-311; II, Appendix 16.

91 Besier, *De muntmeesters*, 39-40, 42, 44; Scheffers, *Om de kwaliteit*, I, 173-176, 211-311; Scholten, *De munten*, 69-71.

92 Scheffers, *Om de kwaliteit*, I, 198, 201, 203, 225.

93 Besier, *De muntmeesters*, 106; Scheffers, *Om de kwaliteit*, I, 292-293 (consent for 12,000 *pond* in 156 pieces).

94 Besier, *De muntmeesters*, 118.

95 These estimates vary considerably: for Holland and West Friesland only 6 percent, for Gelderland 41 percent, for Zeeland 82 percent; for Utrecht and Overijssel the data are poor; virtually all other production data had to be estimated. As the provinces of Holland, Gelderland, and Zeeland were prominent *duit* producers, about 60 percent of national production had to be estimated.

From 1726 onward the export of *duiten* was confined to pieces bearing the iconic VOC mark, and recorded separately. We know of Dutch *duiten* being ordered by the VOC on only two previous occasions: first for fl. 6,000 in *duiten* in 1626, and half that sum in 1724-1725, of which the greater part was returned the following year once proper VOC *duiten* had arrived on Java.⁹⁶ Applying the same principles as that used for the other small denominations, we can now estimate the domestic circulation of *duiten* (see Table 18).

Table 18. Production, exports, and domestic circulation of *duiten*, 1600-1799 (gulden of account x 1000)

	Per half century					At the end of the period (1650, 1700, 1750, 1800)	
	Production	Exports	Production minus exports	Domestic circulation, including remainder from previous period	Loss	Net domestic circulation	Gulden per capita*
1600-1649	199	6	193	193	96	96	0.05
1650-1699	279	0	279	375	187	187	0.10
1700-1749	741	1	740	928	461	461	0.24
1750-1799	913	0	913	1,374	687	687	0.34
1600-1799	2,132	7	2,125				

*Population c. 1600, 1650, and 1700: 1.9 million; c. 1800: 2 million.

⁹⁶ Scheffers, *Om de kwaliteit*, I, 174; Bruijn, Gaastra and Schöffer, *Dutch-Asiatic shipping*, 238; Scholten, *De munten*, 44; Pol, 'Tot gerieff', 99.