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## The Reuse of Textiles in the Roman World

*John Peter Wild*

### INTRODUCTION

In this chapter I propose to open a series of test-pits rather than conduct an open-area excavation on the topic of textile reuse. Two principal sources of evidence will be considered: archaeology and the written record. Typical of the archaeological evidence are the rags from rubbish deposits at Berenike, a Roman port on the Red Sea coast of Egypt, and (at the opposite corner of the empire) from ditches and occupation layers in the fort of Vindolanda close to Hadrian's Wall.<sup>1</sup> Survival of textiles, it need hardly be emphasized, is wholly dependent on climatic and microclimatic conditions, leading to a skewed distribution pattern across the ancient world.

A quotation from Cato's *De Agricultura* gives an instance of what formal literature occasionally reveals:<sup>2</sup>

*vestimenta familiae. tunicam P.IIIS, saga alternis annis. quotiens cuique tunicam aut sagum dabis, prius veterem accipito, unde centones fiant. sculponias bonas alternis annis dare oportet.*

(Clothing for the slaves. [Give] a tunic three and a half feet [long] [and] cloaks in alternate years. As often as you give each a tunic or cloak, first take back the old one, from which *centones* (patchwork) should be made. One should give a good pair of wooden pattens in alternate years.)

His recommended policy therefore is to issue a new tunic and cloak to farm-workers every second year, not a very generous provision. What he calls *centones* will be examined below (see pp. 77–80).

<sup>1</sup> Wild and Wild (2000); Wild (2011).

<sup>2</sup> *Agr.* 59.

In general, my approach to textile reuse will echo that of Theodore Peña's pioneering investigation of pottery reuse and recycling, but with some modification of the modifications which he himself made to Michael Schiffer's 1972 scheme.<sup>3</sup> I suggest that the life cycle of a textile comprises six phases: manufacture, primary use, maintenance, primary reuse, secondary reuse, and discard. The topics will be considered in that order.

## MANUFACTURE

I am aware that the processes of textile manufacture can seem baffling to many.<sup>4</sup> A summary chart may not help (Table 3.1), but it can be used to emphasize just two points. Ranged down the left-hand column are entries for the three principal fibres current in antiquity: (sheep's) wool, flax, and silk. Ranged horizontally the standard processes for their conversion into cloth are noted. In fact, the chart shows three separate industries, distinguished by their raw materials and the particular methods of processing them developed through time. This threefold division was still present when the end products were being sold.

More significant is a second point: a Roman textile was given its identity on the loom, anticipated when its warp and weft were being spun, if not before. Garments and furnishing items were woven in one piece on the loom, regardless of the type of loom being used (Fig. 3.1).<sup>5</sup> That is true not only of rectangular cloaks or blankets, but of sleeved tunics, too.<sup>6</sup> In later Roman times sleeved tunics might be woven in three parts on the same warp, and sewn together afterwards.<sup>7</sup> Identical items also could be woven in succession on the same warp.<sup>8</sup>

By contrast, medieval weavers wove and sold cloth in anonymous bolts, and it was the tailor and cutter who gave a textile artefact its identity.<sup>9</sup>

Fulling and dyeing do not appear on the chart of manufacture (Table 3.1) because they are essentially optional extras, fulling to give a dense soft finish to wool cloth,<sup>10</sup> and dyeing for coloristic effect. Dyes could be applied to raw fibre, spun yarn, or ready-woven textiles.<sup>11</sup>

<sup>3</sup> Schiffer (1972: 158, fig. 1); Peña (2007: 6–16, esp. 8–9); cf. Tomber (2008); Jervis and Kyle (2012).

<sup>4</sup> Wild (1970, 2008); Grömer (2016). <sup>5</sup> Granger-Taylor (1982, 1983).

<sup>6</sup> Verhecken-Lammens (1994); Pritchard (2006: 45–6, 49).

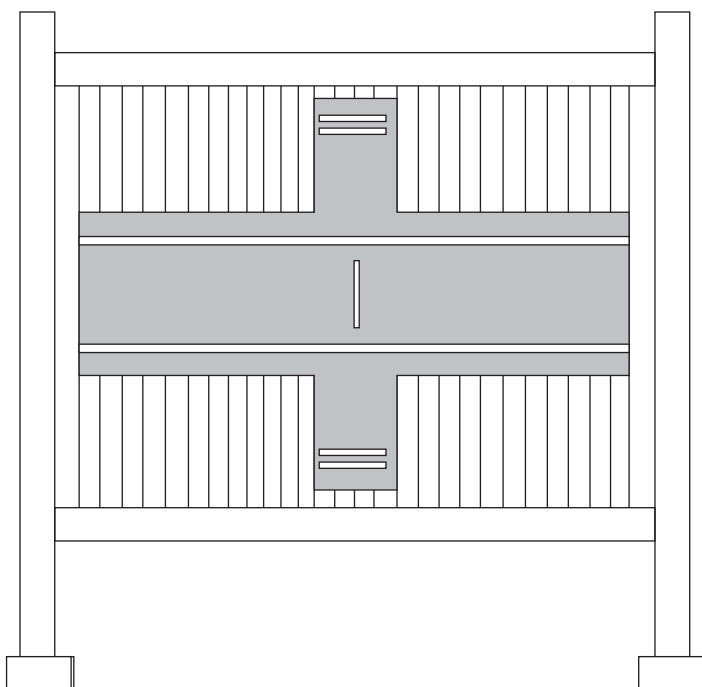
<sup>7</sup> Hofmann (2002: 28, Abb. 2 (T207); Verhecken-Lammens (2010); Orfinskaya and Tolmacheva (2017: fig. 13).

<sup>8</sup> van Raemdonck et al. (2011: fig. 13). <sup>9</sup> Cardon (1999: 579–93).

<sup>10</sup> Flohr (2013); for *colorator* see Wild (1992a). <sup>11</sup> Cardon (2003: 15–18).

**Table 3.1** Chart summarizing the processes of textile manufacture in the Roman period

Fibre	Preparation	Spinning	Weaving
Wool	plucking/shearing > (sometimes) combing	twist-insertion with suspended or supported spindle	vertical warp-weighted or two-beam loom
Flax	pulling > breaking > scutching > hackling (= combing)	(as above)	(as above)
Silk	reeling > throwing (= combining filaments)	little or no twist-insertion	vertical two-beam loom with/without patterning devices



**Fig. 3.1.** A sleeved one-piece tunic shown in place on the vertical warp of a vertical loom. The subsidiary horizontal rods to which the warp for the tunic body was attached are of uncertain form and omitted here. Drawing: John Peter Wild.

### PRIMARY USE

Since this is *not* meant to be an account of Roman clothing fashion, I will make just one observation. Early Roman clothing was essentially simple, with

minimal decoration. The expansion of Rome's horizons and contact with foreign modes of dress led to a transformation: by the fourth century new, practical, garments from north-west Europe and garments with rich polychrome decoration from the Partho-Persian sphere came to dominate.<sup>12</sup> The new fashions would have appalled Cato and his contemporaries.

## MAINTENANCE

Prominent Romans were much concerned with the image which their clothing presented. The shining white toga of the *candidatus* became a cliché. The necessary support services were provided in the fuller's workshop, easily recognizable archaeologically in the towns of Italy and attested epigraphically across the empire. The fuller washed, bleached, and raised the nap on wool garments to a soft finish, and applied chemicals to disguise stains.<sup>13</sup> The famous fuller's tombstone from Sens (Yonne) in Gallia Lugdunensis illustrates washing by treading underfoot (Fig. 3.2) and cropping a raised nap (Fig. 3.3).<sup>14</sup> Garments were carefully folded and pressed for storage on shelves or in wooden chests, and the creases that resulted were proudly displayed.<sup>15</sup>

The fuller and *colorator* (valet) recognized two textile conditions: fresh from the loom (*de tela, rudis*) and 'used' (*ab usu*).<sup>16</sup> The clothing inventories from Roman Egypt have a more nuanced vocabulary, ranging from *kainós*, 'new' to *hemitribés*, 'half-worn' and *mesotribakós*, 'moderately worn', to *tribakós*, 'worn out'.<sup>17</sup> A papyrus of c.AD 205, for example, lists a worn-out cushion cover, a half-worn one, and brand-new items.<sup>18</sup> We find references to the need to replace worn-out clothing,<sup>19</sup> and also documents that suggest that there was a lively trade in part-worn garments. The recipient of a fifth-century letter, for instance, is instructed to buy for the writer on the second-hand market in

<sup>12</sup> Wild (1968: 234, 1985: 409–13); Croom (2000: 33–9); cf. Sumner (2002) with Sumner (2003).

<sup>13</sup> Bradley (2002: 29–30); Flohr (2013); see now Radman-Livaja (2014) for a corpus of fullers' labels.

<sup>14</sup> Wild (1970: 179 fig. 73); Flohr (2013: 32 fig. 8). <sup>15</sup> Granger-Taylor (1987).

<sup>16</sup> *Ed. Diocl.* 7.54–63 (*colorator*); 22.1–26 (repetition of *rudis* implies that soiled garments were also fulled, but at a price that did not exceed the permitted maximum); cf. Radman-Livaja (2010).

<sup>17</sup> Drexhage and Reinard (2015: 16–21). <sup>18</sup> *P. Lugd. Bat.* 6.49.

<sup>19</sup> *SB* 6.9026.10–15 (second century AD); Bagnall and Cribriore (2006: 356–7); Bogensperber (2016: 261).

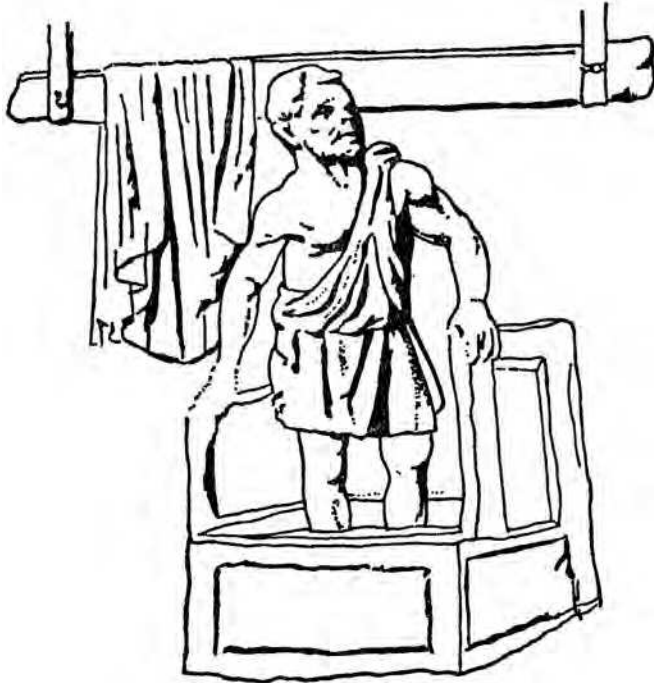


Fig. 3.2. A fuller shown washing clothing by treading it underfoot on a funerary stele from Sens (Yonne) in Gallia Lugdunensis (Wild 1970: 179).



Fig. 3.3. A fuller shown cropping the raised nap on fulled cloth as depicted on a funerary stele from Sens (Yonne) in Gallia Lugdunensis (Wild 1970: 179).



Fig. 3.4. A long-sleeved shirt with tapestry-woven decoration from Roman Egypt, now in the Museum Kunstpalast, Düsseldorf (inv. no. 12746). Photo: Museum Kunstpalast, Düsseldorf—Artothek.

Alexandria a long-sleeved shirt with tapestry-woven decoration ‘with minimal wear’ (*apò olíges chréseos*) (Fig. 3.4).<sup>20</sup>

Archaeologically it is feasible to characterize and quantify objectively the degree of wear on a surviving textile, as W.D. Cooke and I were able to demonstrate some years ago in a project supported by the Leverhulme Trust on the Flavian-Trajanic wool textiles from Vindolanda.<sup>21</sup> As wool yarns degrade through wear, their constituent fibres can be seen under the scanning electron microscope to develop classifiable markers of fatigue—like the so-called ‘brush-ends’ on broken fibres on a piece of a soldier’s blanket from the fort (Fig. 3.5). By counting the incidence of different markers per square millimetre, a chart representing the relative degree of wear can be presented. To establish the absolute degree of wear we submitted a replica of a Vindolanda textile to artificial wear on a Martindale Abrasion Instrument. After

<sup>20</sup> Drexhage and Reinard (2015: 25); *P. Fouad*. 1.74 (with *BL* 11.82) (late fifth century).

<sup>21</sup> Lu (1995); Cork et al. (1997: 27); Wild et al. (1998: 86–9); for procedures Cooke and Lomas (1990).



Fig. 3.5. Scanning electron micrograph of a soldier's wool blanket from Vindolanda (VIN88 472) showing 'brush ends' on broken fibres. Photo: Lucy Lu, for the Vindolanda Textile Project.

sustaining 8,000 rubs the replica showed a fair resemblance to that on the creases of the Vindolanda blanket (Figs 3.6, 3.7). Frustratingly, restricted funding meant we were unable to take the investigation further.

Maintenance of clothing included the repair of worn and damaged items, for which there is an abundance of archaeological and a modicum of written evidence.<sup>22</sup> I will select some pertinent examples.

### Patching

A small patch repairing a hole in a soldier's detached sleeve at Vindolanda can only be described as rough and ready (Fig. 3.8); but it is typical of finds on military sites both in Britain and Egypt.<sup>23</sup> The pieces of cotton sail found at

<sup>22</sup> For the role of the *epetes*, later *rhaptēs* ('sewer'), in Roman Egypt see Bogensperber (2014: 343; Drexhage and Reinard (2015: 32–3).

<sup>23</sup> Inv. no. VIN85 025 (unpublished); for mishandled patching see *Ev. Matt.* 9.16.





Fig. 3.6. Scanning electron micrograph of a replica of the Vindolanda blanket after 8,000 rubs on a Martindale abrasion instrument. Photo: Lucy Lu, for the Vindolanda Textile Project.

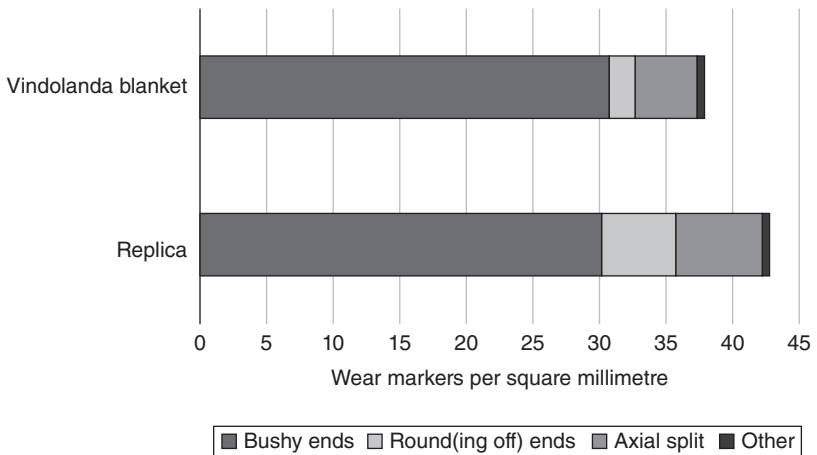


Fig. 3.7. Bar charts of wear on Vindolanda blanket (VIN88 472) and on its replica after 8,000 rubs. Data from Lucy Lu, for the Vindolanda Textile Project.





Fig. 3.8. Patch on wool garment at Vindolanda (VIN85 025). Photo: John Peter Wild.

Berenike by contrast exhibit repairs of a higher order; for sailors' lives depended on the quality of the work (Fig. 3.9). In one example the square patch close to a sail's reinforcing strips has been secured in the traditional manner with face-to-face sewing on the first edge, and has then been folded over and secured neatly on the other three sides with over-sewing (Fig. 3.10). The rough edges of the hole were tacked down on the back.<sup>24</sup>

### Repairing Edges

The edges of clothing are particularly susceptible to abrasion. To quote an instance, a sleeveless wool tunic in a superior damask weave from Roman Egypt, now in the Abegg-Stiftung collection in Bern, probably served several

<sup>24</sup> Inv. no. BE98 0103; cf. Wild and Wild (2003).

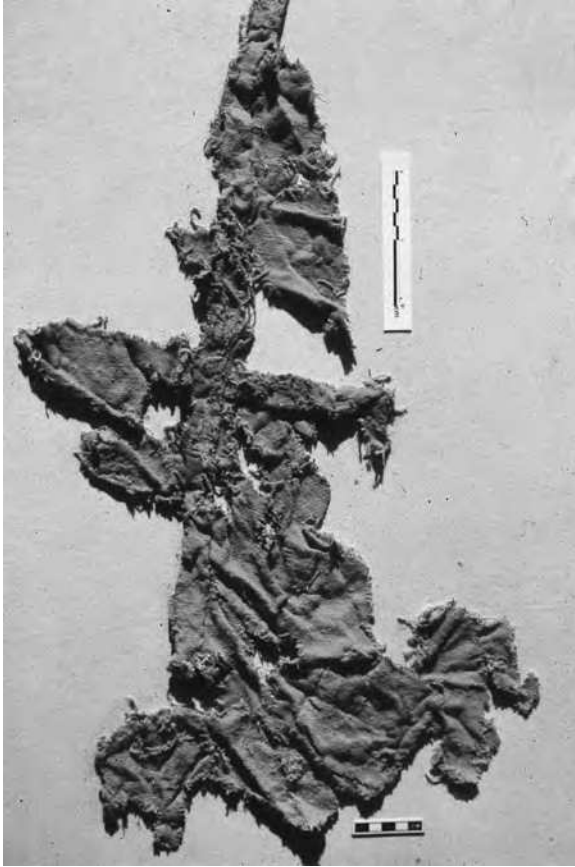


Fig. 3.9. Cotton sail fragment from Berenike (BE97 0103). Photo: John Peter Wild.

generations of wearers: the ends of the neck slit had to be sewn up repeatedly (Fig. 3.11), and the surrounds of the armholes received attention, too (Fig. 3.12).<sup>25</sup>

Another, more refined, technique for protecting raw edges is attested in the Roman period and later. It has been called ‘footweaving’. As the diagram in Fig. 3.13 shows, a narrow band of warp threads was placed against the raw edge of the textile, and weft on a needle was passed over and under the warp and through the thickness of the cloth.<sup>26</sup> A good example has been recorded on a fragment of twill from Didymoi, a fort guarding the road down the Wādī

<sup>25</sup> Abegg-Stiftung Inv. Nr 4219; Wild (1994).

<sup>26</sup> Collingwood (1987: fig. 155); Østergård (2004: 104–6, fig. 76a, b).

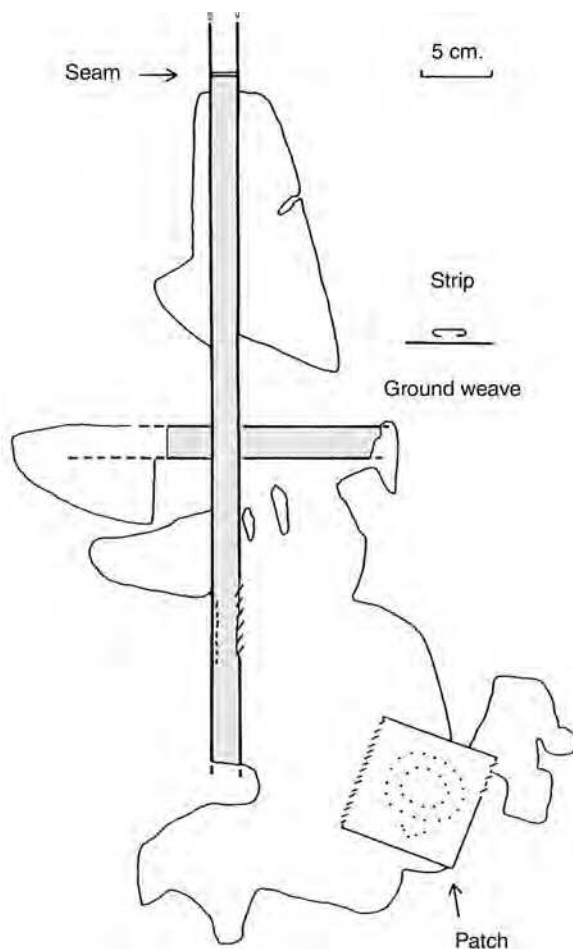


Fig. 3.10. Diagram of the cotton sail fragment from Berenike (BE97 0103) and its patch. Image: John Peter Wild.

Hammâmât in the Eastern Desert of Egypt (Fig. 3.14),<sup>27</sup> and another on a comparable twill from Vindolanda (Fig. 3.15).<sup>28</sup>

More thorough-going refurbishment of edges is attested on a number of Roman cloaks and capes. The worn lengths were simply cut off, and the resulting raw edge oversewn or stabilized with ‘footweaving’.<sup>29</sup> Indeed, a

<sup>27</sup> Inv. no. D98 1431 (4): Cardon et al. (2011: 340, pl. 26c, d).

<sup>28</sup> Inv. no. VIN88 471.001-002. A Vindolanda leaf-tablet (*T. Vindol.* 3.607) may refer to this technique.

<sup>29</sup> Cardon et al. (2011: 323, 336-41).



Fig. 3.11. Repairs to the neck slit on the tunic inv. no. 4219 in the collection of the Abegg-Stiftung, Bern. Photo: Christoph von Viràg, © Abegg-Stiftung, CH-3132 Riggisberg, 1992.

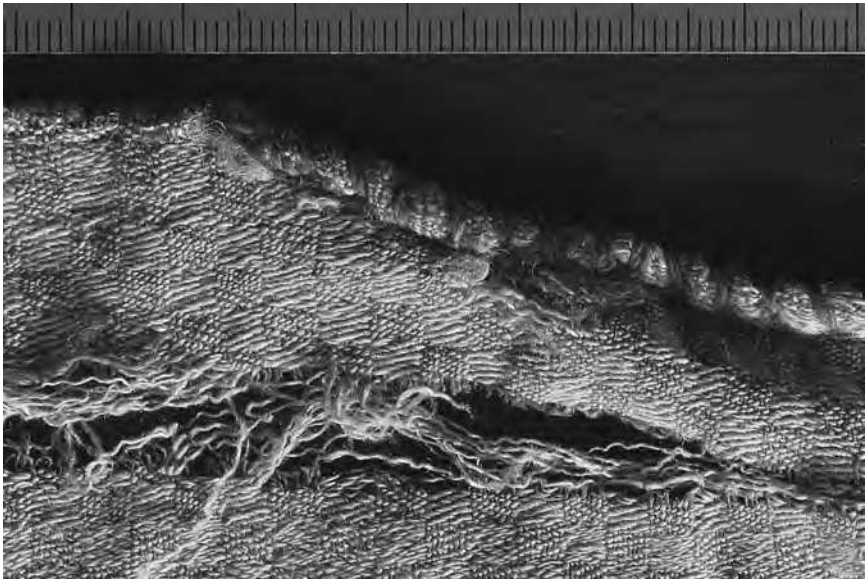


Fig. 3.12. Repairs to the wrist zone on tunic inv. no. 4219 in the collection of the Abegg-Stiftung, Bern. Photo: Christoph von Viràg, © Abegg-Stiftung, CH-3132 Riggisberg, 1992.



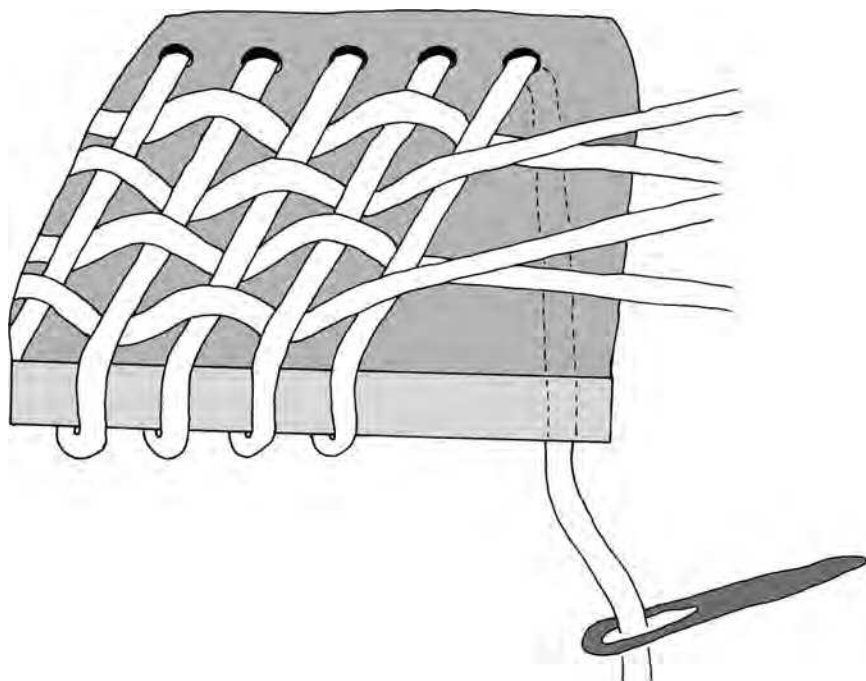


Fig. 3.13. Diagram of basic form of 'footweaving' recorded on Roman textiles. Image: John Peter Wild.



Fig. 3.14. 'Footweaving' on edge of a twill textile from Didymoi (D98 1431) in the Eastern Desert of Egypt. © Dominique Cardon.

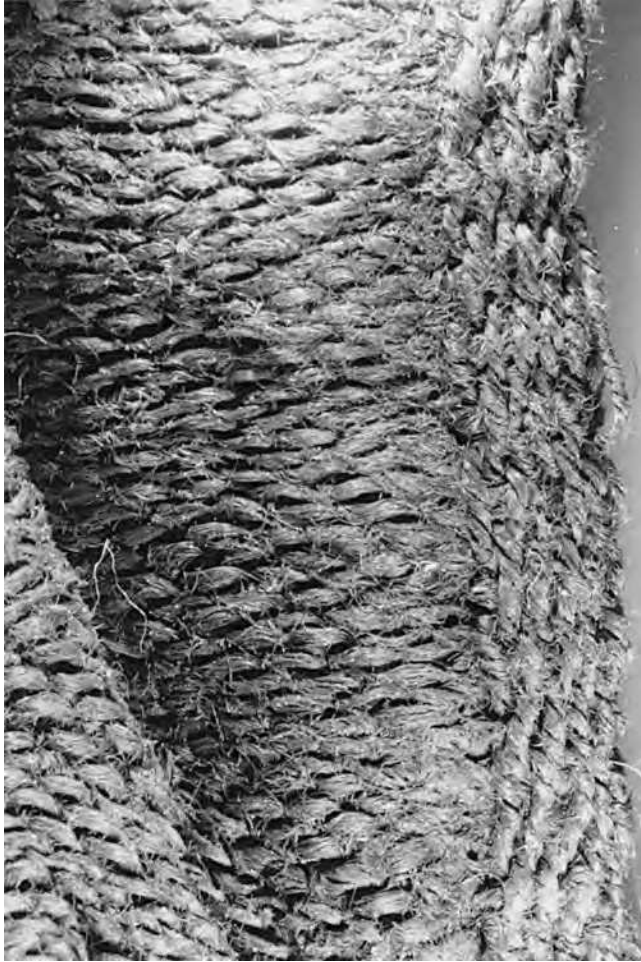


Fig. 3.15. ‘Footweaving’ on a twill textile from Vindolanda (VIN88 471.001, 002). Photo: W.D. Cooke, for the Vindolanda Textile Project.

professional service registered in Diocletian’s Edict (*apertura cum subsutura*) may refer to just such a procedure.<sup>30</sup>

When maintenance reaches its limits, the next phase in a textile’s life may be immediate discard. But many—perhaps most—items saw some form of reuse. I have distinguished *primary reuse*—the conversion of one or more webs of cloth into a new garment or furnishing fabric—from *secondary reuse*, in which new artefacts are created from old rags.

<sup>30</sup> *Ed. Diocl.* 7.49, 50, but referring to silks.

There is, however, an interesting side issue: the fashionable modern concept of *upcycling*, the conversion of a worn garment into one of higher value by the addition of extra bits of fabric.<sup>31</sup> This was not entirely unknown in antiquity. Caravans reaching the end of the Silk Road in Sasanian territory faced a levy in kind, paid in silk, for the right of passage. Local tribal leaders had some of this prized material sewn as facings to their kaftans to enhance and advertise their status, an old Iranian practice.<sup>32</sup> During a brief Sasanian occupation of Egypt (AD 616–20) a number of the intruders were buried at Antinoë wearing their silk-embellished riding coats, and it is possible to argue that the very late Roman vogue for sewing decorative bands along the edges of garments is an echo of this fashion.<sup>33</sup>

### PRIMARY REUSE

Trousers are one type of garment that could not be woven on the loom in one piece—or even in two or three. They had to be cut and tailored by a *bracarius* from any handy rectangular textile. The practice can be illustrated by a pair of linen trousers from Egypt (Fig. 3.16), now in the Museum Kunstpalast, Düsseldorf, created from a large towel or the like (Fig. 3.17).<sup>34</sup> Rectangular wool cloaks decorated with a tapestry-woven gamma-shaped motif in each corner were frequently cannibalized.<sup>35</sup> The prefect at Vindolanda in Period III (c.AD 97–103/4), Flavius Cerialis, had evidently owned such a cloak, but it was remodelled to make a different garment, perhaps for one of his children (Fig. 3.18). Dye analysis shows it to have been originally dark red with paler red gammas.<sup>36</sup> Another of Cerialis's possessions (a wool twill), found in the *praetorium*, had been converted into socks for teenage-sized feet.<sup>37</sup>

Helmet liners were traditionally of felt, but segments of stout wool cloth would serve just as well.<sup>38</sup> A colourful cap from Didymoi (Fig. 3.19), probably a helmet liner, even incorporates a piece of pile mat or bedspread.<sup>39</sup>

<sup>31</sup> Defined at <https://en.oxforddictionaries.com/definition/upcycling>, accessed 18 Oct 2017.

<sup>32</sup> Ierusalimskaya and Borkopp (1996: 9–16, 22–5); Fluck and Vogelsang-Eastwood (2004).

<sup>33</sup> Fluck and Vogelsang-Eastwood (2004).

<sup>34</sup> von Falck and Lichtwark (1996: 293 Kat. Nr. 332); cf. Schlabow (1976: 79–80, Abb. 191) for an example of the practice in the Roman Iron Age in north Germany; Kwaspen and De Moor (2013: 255–6, fig. 4).

<sup>35</sup> Szymaszek (2015: 170, fig. 4, 2017).

<sup>36</sup> Inv. no. VIN88 545; Wild (1992b, 1993: 79–80). Dye analysis (unpublished) by Ina Vanden Berghe of the Musées Royaux de la Patrimoine, Brussels.

<sup>37</sup> Inv. no. VIN87 316; Wild (1993: 83, pl. 12 [above]).

<sup>38</sup> Sumner (2009: 166, pls 22, 25); cf. Wild (1970: 102 A53).

<sup>39</sup> Cardon et al. (2011: 393, pls 29a, b). Ammianus Marcellinus (29.8.8.) would call this confection a *cento* (see below).





Fig. 3.16. Front view of a pair of late Roman linen trousers from Egypt in the Museum Kunstpalast, Düsseldorf (inv. no. 12754). Photo: Museum Kunstpalast, Düsseldorf—Artothek.

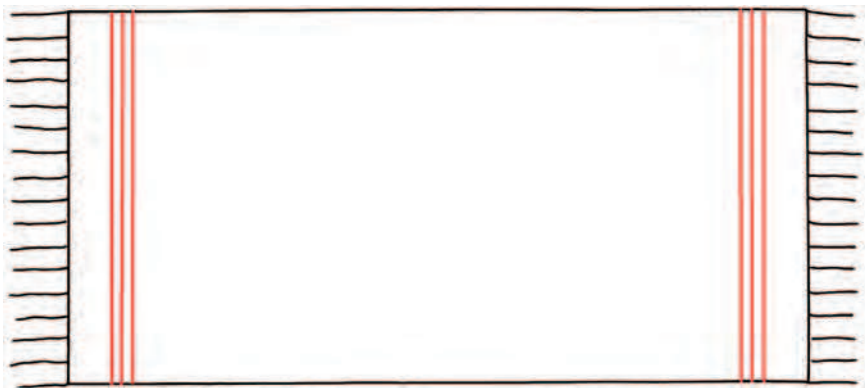


Fig. 3.17. Reconstruction drawing of the form of linen towel from which the pair of trousers in Düsseldorf was tailored. Not to scale. Drawing: John Peter Wild.

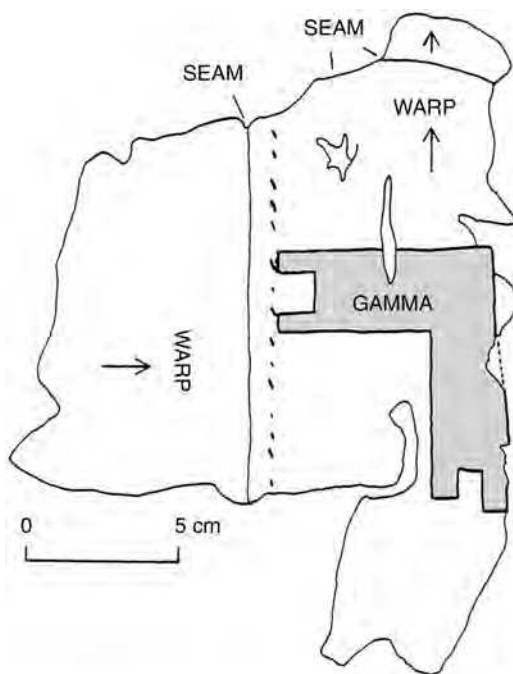


Fig. 3.18. Drawing of the re-used cloak (VIN88 545) with gamma motifs found in the Period III *praetorium* at Vindolanda. Drawing: John Peter Wild.

Tunics and cloaks in the later Roman period were enhanced with integral, tapestry-woven panels, roundels, and *clavi*, already mentioned. As the most expensive parts of the garment, the panels and roundels were often cut out for reuse, to be sewn in the appropriate position on a fresh, undecorated, item of clothing.<sup>40</sup>

Some might consider the use of textiles in burial, either as clothing for the cadaver or as its outer wrappings, as a secondary use. That is a moot point. The issue is tangential to the focus of the present chapter, and deserves separate treatment elsewhere.<sup>41</sup>

## SECONDARY REUSE

Attention was drawn in my introductory paragraph to Cato's advice on the biennial provision of clothing for farm workers. He adds that their worn-out

<sup>40</sup> For example, see Linscheid (2015: 115 Kat. Nr. 136, Taf. 78).

<sup>41</sup> Wild (2012).



Fig. 3.19. Cap from Didymoi, probably a helmet liner. Photo: © Dominique Cardon.

clothing should be reclaimed and turned into *centones*,<sup>42</sup> patchwork, and that the sewing of *centones* should be done in wet weather on the farm.<sup>43</sup> But *centones* were also processed professionally by *centonarii*, to whose *collegia* Jinyu Liu has devoted an important study.<sup>44</sup> As she recognizes, however, there

<sup>42</sup> Cato, *Agr.* 59; cf. Columella, *Rust.* 1.8.9.

<sup>43</sup> Cato, *Agr.* 2.3; see Heilporn and Worp (2007); Drexhage and Reinard (2015: 38–9).

<sup>44</sup> Liu (2009).

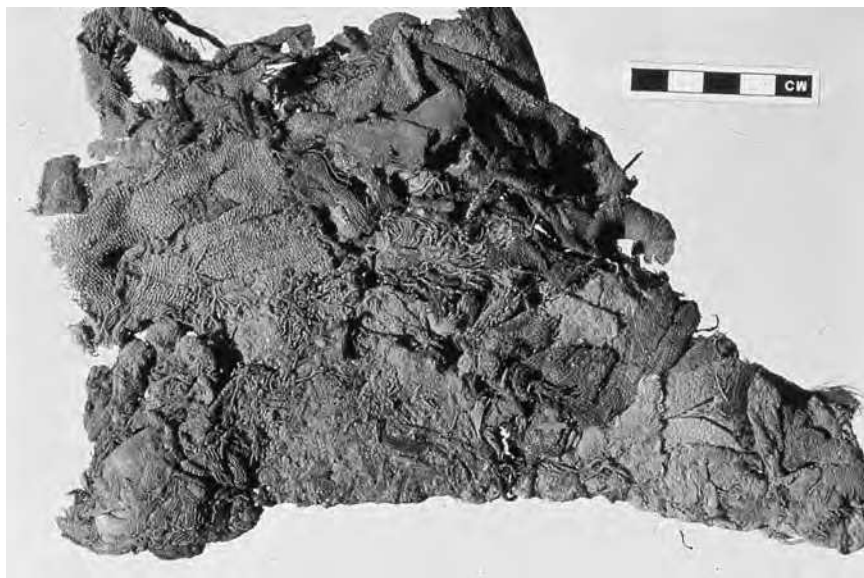


Fig. 3.20. Amalgam of rags (*cento*, *kentron*) from Berenike (BE97 117). Photo: S. E. Sidebotham.

is no direct, independent, evidence for what the *centonarii* did, apart from the name; their *collegia* were primarily social institutions for networking.<sup>45</sup> They may have had a role in the textile industry, but it was not as central as Liu would have us believe.<sup>46</sup> That said, the poor depended on *centones* for everyday wear, as is amply attested in the written sources.<sup>47</sup>

Archaeological evidence for *centones* is sparse, since they disintegrate into an unrecognizable heap of rags, which may or may not have once had a common function. Nevertheless, thick but shapeless amalgams of wool rags, sewn together with goat-hair string and sometimes covered with goat-hair fabric are frequently found on Roman sites in Egypt.<sup>48</sup> The middens at Berenike have yielded some good examples (Fig. 3.20).<sup>49</sup> Their purpose is debated, but they presumably served as some kind of padding, in connection, perhaps, with easing the load for pack animals.<sup>50</sup>

The written sources reveal a wide variety of possible roles for *centones*.<sup>51</sup> They could act as heavy curtains to block doorways, for instance.<sup>52</sup> Their value in protecting military hardware against fire and missiles was recognized

<sup>45</sup> For networking in the textile industry in Phrygia see Dross-Krüpe (2017).

<sup>46</sup> Pace Liu (2009: 80, 83, 116, 295–301, 2013: 133).

<sup>47</sup> Drexhage and Reinard (2015: 8–10). <sup>48</sup> Cardon et al. (2011: 276–81).

<sup>49</sup> Inv. nos BE97 0117; BE98 1106 (unpublished). <sup>50</sup> Cardon et al. (2011: 276).

<sup>51</sup> Passages conveniently assembled in Liu (2009: 395–8).

<sup>52</sup> Petronius, *Sat.* 7.2; Dickey (2012: 226–7).



by both Caesar and Vegetius.<sup>53</sup> There is reference in the documents from both Vindolanda and Berenike to an arming doublet, the *subarmalis* or *malthakterion*, worn under armour as a shock absorber or even as a separate padded jacket.<sup>54</sup> *Centones* would be the ideal material for that, though hardly elegant.

## DISCARD

After the disintegration of patchwork, only discard can follow. Outside the forts along the Wādī Hammâmât stand prominent middens full of organic rubbish. Dated *ostraka* from the principal midden at Maximianon/Al-Zerkah suggest that the garrison habitually dropped their litter underfoot, but periodically conducted a spring clean and deposited their refuse on the mound outside.<sup>55</sup> The garrison at Vindolanda was less tidy.<sup>56</sup> Urban dwellers faced a greater problem of rubbish disposal. A solution in Roman Egypt was to dump it on a neighbour's property—still a practice in many parts of the world.

Consideration of the above strategies for prolonging the life of a textile raises an obvious general question: why were textiles reused and recycled?

## CLOTHING SHORTAGES

A possible driver for textile reuse is that there was a clothing shortage, either in a specific context or more widely. That might well be the view—and the experience—of a Roman auxiliary on a distant frontier posting. For example, lines of supply to places such as Berenike and its associated forts in the Eastern Desert were tenuous: it took twelve days by road from Berenike to the Nile Valley,<sup>57</sup> and still longer to reach the principal clothing manufacturing centres on the Lower Nile and in the Fayum oasis.<sup>58</sup> The situation was even more constrained at the remote quarrying sites of Mons Claudianus and Mons Porphyrites in the heart of the desert.<sup>59</sup>

<sup>53</sup> Caesar, *BCiv.* 2.9; 2.10.6; Vegetius, *Mil.* 4.14, 4.15; Martino (2007; 264–5).

<sup>54</sup> For *subarmalis* see Sumner (2003: 45, pl. C2); Speidel (2007); for *malthakterion* see Bagnall et al. (2005: 80–1, no. 193.6–7).

<sup>55</sup> Adam et al. (2003: figs 117–18); Wild (2007: 22 fig. 5).

<sup>56</sup> Birley (1994: 18 fig. 6 (section); 41 fig. 19 (plan); 19–25).

<sup>57</sup> Pliny, *HN* 6.26.103; Sidebotham (2011: 126 fig. 8.1, 149).

<sup>58</sup> Dross-Krüpe (2011: 74 Abb. 7, 75 Abb. 8).

<sup>59</sup> Peacock and Maxfield (1997); Maxfield and Peacock (2001: 413–31); Sidebotham et al. (2008: 72–82); for further literature see Sidebotham et al. (2008: 384–5); for textiles see Bender Jørgensen (2000: 253–6); Handley (2001).

In theory the government accepted responsibility for clothing the army, and a famous Geneva Latin papyrus has been taken as a sign of this.<sup>60</sup> But the system was erratic, at best. Papyri reveal the approved channels through which the army ordered textiles from Egyptian weavers; but the latter were unreliable, even after advance payment.<sup>61</sup> It is no wonder that members of the garrison at Vindolanda and of the fleet at Alexandria are on record as receiving clothing from their friends and families.<sup>62</sup> In AD 301 Diocletian issued an Edict on Maximum Prices with the avowed intention of preventing his soldiers being ripped off by local suppliers.<sup>63</sup> The near-contemporary establishment of state production units for wool and linen clothing (*gynaecea* and *linyfia* respectively) represents another attempt to tackle the same issue.<sup>64</sup>

The vast majority of the civil inhabitants of the empire, however, did not face such problems: there are no explicit references to clothing famines, and purely domestic craft production was always available in the background. Clothing shortage alone, therefore, is unlikely to be the sole reason for reuse.

## COST OF CLOTHING

It has been claimed that Roman clothing and furnishing fabrics were expensive.<sup>65</sup> In fact one cannot make a credible *ex cathedra* statement: there are too many variables, reflecting differing geographical and climatic situations, changing economic conditions, chronology and, not least, the preconceptions of the person raising the question.

A key document is Diocletian's Edict on Maximum Prices, which I have mentioned already. Promulgated late in AD 301, it sought to cap prices on all goods and services throughout the empire—and it lists as comprehensive a spectrum of them as the compilers could establish in the short time they were allowed for the completion of the exercise.<sup>66</sup> It is instructive to compare prices internally. Some items, like the pure silk shirt with genuine purple wool decoration, priced at just over 50,000 *denarii*, were exceedingly expensive;<sup>67</sup> but the owners of the great estates and the urban elite could afford them, as the

<sup>60</sup> Fink (1971: 243–9, no. 68); cf. Cuvigny (2000: 132–4 [*O. Claud.* 432, 6 November AD 137]).

<sup>61</sup> Dross-Krüpe (2012a: 220, 2012b); for the later *vestis militaris* levy see Sheridan (1998).

<sup>62</sup> Vindolanda: *T. Vindol.* 2.346; Alexandria: *P. Mich.* 8. 467, 468, 471, 477; Cavenaile (1958: nos 250, 251, 254). Cf. Dross-Krüpe (2011: 247 n. 14); *P. Turner* 18. Propertius (4.3. 18, 33 (34 may also be relevant, but the text is corrupt)) records an officer receiving a cloak made by his wife.

<sup>63</sup> *Ed. Diocl., praefatio* (Lauffer (1971: 90–7); Speidel (2009); for the Edict in general see Wild (2015).

<sup>64</sup> Wild (1976).

<sup>65</sup> Bagnall (1993: 33 n. 124); Drinkwater (2012: 14–15).

<sup>66</sup> Herz (2016).

<sup>67</sup> *Ed. Diocl.* 19.18.

clothing remains in their graves are increasingly revealing.<sup>68</sup> They belonged to Scheidel's wealthiest sector of the population.<sup>69</sup> Demand was driven by elite competition, and imperial attempts to restrain it had little effect.<sup>70</sup>

More down to earth is the cost of a plain wool shirt of the type prescribed for the *vestis militaris*, clothing levy, at 1,250 *denarii* each.<sup>71</sup> It would take a farm worker fifty working days to earn enough to buy one,<sup>72</sup> and a stonemason 25 days.<sup>73</sup> That does not sound unreasonable to me, assuming that such operatives could find employment for most of the year. The cost could be brought down if the buyer purchased the raw materials, hired skilled labour, provided the equipment, and commissioned a shirt to be made. Using the Edict's figures, I estimated some years ago that it would have been significantly cheaper to have the Abegg-Stiftung's damask wool tunic, mentioned above, woven in-house than to buy it over the counter.<sup>74</sup> The prices quoted in the Vindolanda tablets<sup>75</sup> and on the wall of Nebuchelos's house in Dura-Europos<sup>76</sup> invite similar exercises; but the outcome would not bring greater clarity, I suspect.

## CLOSING REMARKS

If there are no recorded instances of a clothing famine in the Roman world (except on military and other state-managed sites), and if clothing bought on the open market or made in the home was not prohibitively expensive, the two most immediate explanations for the phenomenon of textile recycling do not by themselves answer the leading question raised on p. 80: why were textiles reused and recycled on such a large scale?

Other common archaeological materials are worth considering in tandem with textiles, for they offer potentially rewarding avenues to explore for further clues. At Vindolanda, for instance, leather from tents no longer serviceable saw a multitude of secondary uses. Sound components of old leather shoes

<sup>68</sup> Wild (2014). <sup>69</sup> Scheidel and Friesen (2009: 75–91).

<sup>70</sup> *Cod. Theod.* 15.9.1; 15.7.11; 10.21.1; 10.21.3.

<sup>71</sup> *Ed. Diocl.* 19.3; for linen shirts in same price-range: *ibid.* 26.28–30. On textile prices in the Edict see Morelli (2004: 57–62).

<sup>72</sup> *Ed. Diocl.* 7. 1a (*operarius rusticus*, paid 25 *denarii* per day, plus keep).

<sup>73</sup> *Ed. Diocl.* 7.2 (*lapidarius structor*, paid 50 *denarii* per day, plus keep). For a critical assessment of wage levels in Egypt and beyond, with an extensive bibliography, see Freu (2015).

<sup>74</sup> Wild (2003: 39–40). Morelli (2004: 60 n. 9) questions some of my estimates, but on the basis of early modern figures, the relevance of which is dubious.

<sup>75</sup> Bowman and Thomas (2003: 15–16).

<sup>76</sup> Ruffing (2000). Nebuchelos seems to have dealt in relatively expensive clothing according to Ruffing (2000: 88).



were cobbled together and given a second lease of life; for footwear wore out surprisingly fast.<sup>77</sup> Glass makers depended on access to cullet, broken glass, to re-smelt, since raw glass, particularly in the western provinces, was in short supply.<sup>78</sup> The list of material categories to review could easily be lengthened, but their evidence would not necessarily help us to identify the underlying driver(s) for the practice of recycling in the Roman period.

To dismiss recycling as a feature of all underdeveloped or developing societies—the Roman empire has been consigned to this category, cruelly but accurately—is merely to sidestep the issue. Romans may appear to display an ingrained ‘make do and mend’ attitude, although such a mindset seems to be at variance with the consumerism which scholars have detected in some Roman contexts.<sup>79</sup> The whole topic manifestly deserves closer scrutiny in the future.

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<sup>77</sup> Carol van Driel-Murray, pers. comm.

<sup>78</sup> Caroline Jackson, pers. comm. See also Degryse, Chapter 9, this volume; and Duckworth, Chapter 10, this volume.

<sup>79</sup> Greene (2007); van Driel-Murray (2016).

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