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**Exotic Drugs and English Medicine:  
England's Drug Trade, c.1550-c.1800**

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# Exotic Drugs and English Medicine: England's Drug Trade, c.1550-c.1800<sup>1</sup>

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## **Summary:**

What effect did the dramatic expansion in long distance trade in the early modern period have on healthcare in England? This paper presents new evidence on the scale, origins and content of English imports of medical drugs between 1567 and 1774. It shows that the volume of medical drugs imported exploded in the seventeenth century, and continued growing more gradually over the eighteenth century. The variety of drugs imported changed more slowly. Much was re-exported, but estimates of dosages suggest that some common drugs (e.g.: senna, Jesuits' bark) were available to the majority of the population in the eighteenth century. English demand for foreign drugs provides further evidence for a radical expansion in medical consumption in the seventeenth century. It also suggests that much of this new demand was met by purchasing drugs rather than buying services.

What effects did the dramatic expansion in long distance trade in the early modern period have on healthcare in England? European demand for drugs and spices is widely recognised as one of the driving forces of international commerce. While the volume and price of the major spices such as pepper and cloves have been much studied, the impact that increasing levels of trade had on the wider array of primarily medical drugs and its consequences for medical practice is largely unknown.<sup>2</sup> Beyond some import figures for 1567 to 1638 compiled by Roberts, and Davis' aggregate values for drug imports over the eighteenth century, no estimates exist for English imports or consumption.<sup>3</sup> This neglect is

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<sup>1</sup> Acknowledgements to follow. Research Assistance: Carlos Santiago Caballero; Elizabeth Williamson; Carlos Brando; Nat Ishino.

<sup>2</sup> Recent discussions include: Findlay and O'Rourke 2007; O'Rourke and Williamson, 2002; O'Rourke and Williamson, 2009; Halikowksi Smith 2008.

<sup>3</sup> Roberts 1965; Davis 1954; Davis 1962.

surprising given the importance of imported goods such as sugar, tea, tobacco, and calicos to analyses of consumption more generally, and the growing interest in perceptions of exotic drugs and their impact on natural philosophy.<sup>4</sup>

In this paper, I present new evidence on the trajectory of the English medical drug trade between 1567 and 1774 showing that consumption of imported medical drugs exploded in the seventeenth century and continued growing more gradually over the eighteenth century. Medicines flooded in alongside other commodities as England moved from being the last step on a long supply chain that crossed Europe and the Levant to a major entrepôt for the rest of the continent. This account of medical drugs has relevance to general histories of consumption: by considering the full range of old and new medical drugs imported it allows an insight into the significance of novelties in inspiring consumption, and by covering a longer period than most studies it permits longer run trends to be identified. More specifically, understanding the dramatic changes in the volume and type of drugs that were imported between the sixteenth and eighteenth centuries allows us to engage with two central issues in the history of early modern medicine. The first is the timing and scale of the shift in English demand for commercially-supplied healthcare. The second is whether the very significant theoretical changes in medicine in this period were reflected in what people used as drugs: or how quickly, and how extensively, was the character of medicine changing?

The availability of imported drugs offers a distinctive measure of healthcare consumption. Most studies to date have focussed on the personnel supplying healthcare rather than the materials involved,

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<sup>4</sup> On consumption: Peck 2005; Berg 2005; De Vries 2008; McCants 2007. On natural philosophy and exotics: Smith and Findlen 2002; Cook 2008, pp. 191-225; Winterbottom, 2009; Anagnostou, 2007.

exploring the density of practitioners, the activities of particular individuals and groups of medical practitioners, and, more recently, the frequency of resort to practitioners among the seriously ill.<sup>5</sup> By developing this last method, Ian Mortimer has quantified levels of demand for medical services in Southern England over the seventeenth century, concluding that an increase of between 400 and 1,000 percent occurred from 1620 to 1690.<sup>6</sup> Examining drug imports allow us to extend and contextualize Mortimer's analysis: drug imports suggest whether his account of responses to serious illness extends to a wider variety of conditions; they show how the trajectory of consumption developed over the century after his study ends; and they reveal national, rather than regional, patterns. By examining the types of drugs imported, we can also explore one of the main explanatory hypotheses Mortimer put forwards for the increase in consumption that he observed: a shift in the type of medicine used from Galenic to chemical or Paracelsian medicine.<sup>7</sup>

The volume and price of imported drugs is, of course, only an indirect measure of the degree to which the population was utilising a particular kind of healthcare. Medicine also made much use of home-grown drugs and other substances, various plants were domesticated in English physic gardens in this period, substitutes for imported drugs were available, and medicines were only one part of the art of physic, alongside diet, exercise and other non-naturals.<sup>8</sup> Some practitioners appear to have used remedies in only a minority of cases.<sup>9</sup> Nonetheless, foreign drugs were an important part of the therapeutic core of much commercial medicine, particularly in Galenic physic. They were also central to the retail trade in medical substances; they were the mainstay

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<sup>5</sup> Pelling and Webster 1979; Pelling 2003, pp.136-224; Wilson 1995, pp. 161-9; Mortimer 2009.

<sup>6</sup> Mortimer 2009, pp. 39-40.

<sup>7</sup> Mortimer 2009, pp. 65, 90, 207.

<sup>8</sup> Stobart 2008, pp. 153-65; Leong 2006, pp. 98-103; Wear 2000, pp. 46-78.

<sup>9</sup> Kassell 2005, pp. 154-7.

of the remedies sold in the shops of apothecaries, druggists, and other retailers.<sup>10</sup> For a medicine established and fostered around the shores of the Mediterranean, the heartland of the pharmacopoeia inevitably lay far to the south of England's shores. If imports of medical drugs were not arriving in large quantities, then we can reasonably presume that this form of medicine was not being used widely, and vice versa.

### **Sources and Method**

English drug imports and exports are recorded in two main locations: for the sixteenth and seventeenth centuries, Port Books contain undifferentiated lists of the cargoes of ships which were noted down as they entered and left the country; from 1696, overseas trade is summarised in the annual ledgers of the Inspector-General of the Customs. These records were kept as part of the process by which customs' duties were collected. Because of this, both the Port Books and the Ledgers have a number of limitations. Goods imported or exported duty-free were not recorded.<sup>11</sup> The estimates of value they contain were based on dubious prices and calculations. Incorrect entries at the customs house are also an issue: false entries are a feature of the system, particularly for geographical information, where monopolies of colonial trade supplied motives for lying about origins and destinations of goods.<sup>12</sup> More importantly, drugs may have been smuggled to avoid tax, despite its relatively low rate for the early part of the period.<sup>13</sup>

Port Books and Ledgers also present particular practical challenges. First, Port Book survival is geographically patchy.<sup>14</sup>

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<sup>10</sup> Wallis 2002, pp. 194-8.

<sup>11</sup> Willan 1962, p. x.

<sup>12</sup> Clark 1938, pp. 33-37; Hoon 1937, p. 257; Ashworth 2003, pp.133--64.

<sup>13</sup> Ashworth 2003, pp. 165-83.

<sup>14</sup> Several Port Books used by Roberts are no longer fit for production.

Fortunately, survival appears to be best for London, the epicentre of the drug trade. I take London's records as a proxy for national import totals before 1699: extant records for other ports indicate that few drugs entered elsewhere, and at the end of the seventeenth century, when the Ledgers allow us to compare London and the outports, almost 95 per cent of drugs arrived in London.<sup>15</sup> Second, the Port Books are an un-indexed list written in cramped and variable handwriting. Identifying drugs is therefore a slow process that is vulnerable to errors: the figures obtained are, as a result, minimum estimates of the quantities imported.<sup>16</sup>

Third, Port Books only survive for certain years, or even part years. Trade by English and foreign (alien) merchants was recorded in separate volumes, and sometimes only one survives.<sup>17</sup> These years may be unrepresentative, as trade varied with war, economic fluctuations, blockades, epidemics and fires. Such events undoubtedly affected some of the years utilized here, for example 1567 was three years after the disruption caused by the English embargo on foreign shipping (1563-4) and just before political crisis severely disrupted Dutch trade, while 1617 coincides with the Cockayne project.<sup>18</sup>

Survival is poor enough that for 1567 to 1640, I use all accessible surviving Port Books for imports into London. For 1663 and 1669, a set of

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<sup>15</sup> No drugs were listed among imports in the Liverpool port book for 1665 (The National Archives [hereafter TNA], E190/1337/16); in 1709 the port book (TNA, E190/1375/08) recorded imports of Sarsaparilla of 1,533 lb; exports that year included 19lb of apothecary wares: Power, Lewis and Ascott 1998.

<sup>16</sup> Errors and omissions in Roberts' figures meant they could not be relied on here. For the data before 1699, all individual drug consignments that were substantial enough to affect the total for a year (making up >5% of the annual total by value) were re-checked, as were any imports that differed markedly from the norm (by volume) for that product. The net effect of the data cleaning process is to further bias these figures downwards, as excessively large consignments were checked and corrected when errors were found, but low figures were not. As well as similar tests for errors, the data for 1699-1774 was all manually re-checked against the original Ledgers.

<sup>17</sup> Data corrections are summarised in the note to table 1.

<sup>18</sup> De Vries and Van der Woude 1997, pp. 363-4; Dietz 1971.

near-contemporary totals for commodities imported survive.<sup>19</sup> For 1670 to 1699 I examined the 1686 Port Book: a year of peace which Nuala Zahedieh had already worked on for the Colonial trade.<sup>20</sup> Exports and re-exports in the sixteenth and seventeenth century are harder to identify. Fewer Port Books for exports survive, and many only list cloth exports. Where possible, proximate years are averaged to reduce the impact of short-term variations. This has been possible for the 1630s, 1660s and the samples from 1699 onwards. Full details of the Port Books used are given in Appendix A. Fortunately, for the eighteenth century, the Customs Ledgers all survive and I use the three-year sample periods that Davis pioneered: 1699-1701, 1722-1724, 1752-1754 and 1772-1774.<sup>21</sup>

Compiling figures for medical drug imports also presents methodological problems. One crucial question is what counts as a medical drug. The Customs' *Books of Rates* which set out the notional values for goods on which taxes were calculated included a distinct sub-section of 'drugs' from 1604 onwards.<sup>22</sup> However, not every item in that sub-section was used as a medical drug. A number of items were primarily used for other purposes, whether as dyes and pigments (verdigris, cerussa, vermilion), perfumes (ambergris, musk, civet, myrrh), ornament (coral and other precious stones), pleasures (tobacco, pistachios), cooking ingredients (cumin seed, coriander seed, long pepper, green ginger) or for various manufacturing or industrial processes (gum arabic, sticklack, mercury). These items were frequently also used medicinally, but it seems reasonable to assume that it was not medicine that determined the scale of demand for them, and that any changes in consumption of these commodities might well result from quite different

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<sup>19</sup> See Davis 1954, p. 155-7. I use the totals by volume rather than the valuations Davis discusses.

<sup>20</sup> Zahedieh 1994.

<sup>21</sup> TNA, CUST 3, 3-4, 24-26, 52-54, 72-74; Davis 1962.

<sup>22</sup> Commissioners of Customs 1604, Sig.Cv-D2r.



imperatives. Moreover, certain new and unusual drugs were not included in the 'drug' section of the book, wormseed for example, and many drugs were missed out completely and appear in the Port Books with prices estimated 'ad valorem' (at value) on an ad hoc basis.

In order to focus on changes in medical consumption, I sub-divide imports into two sample groups of commodities. The first is based on the 'drugs' section listed in the 1660 Rate Book and the 1725 addendum.<sup>23</sup> This 'Rate Book Drugs' sample includes the full range of medical and non-medical items listed there. The second, 'Medical Drugs' sample includes only those substances that were *primarily* used in medicine. In its fullest form this includes medical drugs that were not listed in the rate book but were imported at value, and excludes those commodities which were heavily used for other purposes. For reasons explained below, the discussion focuses on those which overlap with the Rate Book. The full contents of the samples are listed in Appendix B. The most significant differences between the two samples is the exclusion of dyestuffs, precious stones, perfumes and spices from the 'Medical Drugs' sample. The selection process is inherently subjective – in particular, scents and preservatives overlapped in this period - but the trends described below are robust to changes in the content of the medical drug sample.

Another major problem is measuring the trade in such a highly varied and extensive set of commodities. Imports are largely recorded by volume only until 1699. Both price and volume are available for most imports thereafter. In order to outline long-run trends in drug imports and consumption, I revalue drugs using constant prices taken from the two sets of official customs valuations that were used to define the samples as a rough solution to the problem of aggregating different commodities over a long period of time. Customs' prices theoretically reflect the price

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<sup>23</sup> *A Subsidy granted to the King of Tonnage, & Poundage*, 1660, pp. 44-56; *An Act for Rating Such Unrated Goods*, 1725, pp. 156-9.

of the commodities at first cost in their place of purchase, not the sale price in London, and these values therefore have only a loose connection to the nominal wholesale value of imports in any year.<sup>24</sup> In practice, drug valuations appear to have been higher than the wholesale price, thus increasing the effective rate of tax and inflating the value of imports.<sup>25</sup> The availability of customs' prices is a further constraint. For 207 drugs, I use official valuations taken from the 1660 rate book; these drugs account for the bulk of trade.<sup>26</sup> However, because the range of medical drugs being imported expanded in this period, relying on 1660 prices alone would undervalue imports in the latter part of the period. Many new drugs were assigned official customs valuations in 1725, and another 67 prices are taken from this source.<sup>27</sup> The effect of their inclusion is shown in table 1; as can be seen, the overall trends in imports are not substantially changed until the 1720s, after which they produce a slightly higher growth rate, as one would expect given the chronology of their entry into the Book of Rates. There is some under-counting where volumes were not recorded for drug imports, but the value of these consignments was generally small.<sup>28</sup> The same prices are used here for re-exports and exports. The majority of the data discussed below should thus be taken as being in 1660 prices. In addition, for comparison with other series, data on imports are also presented as valued by customs' officials on entry for the period from 1699.

Unfortunately, customs' valuations were not recorded for all imported medical drugs. Some drugs were too obscure or too new to be

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<sup>24</sup> Davis 1954, pp. 157-8; Schumpeter 1960, pp. 1-9. For a good discussion of the difficulties in valuing trade, see: Smith 1995.

<sup>25</sup> See table 6.

<sup>26</sup> *A Subsidy*, 1660.

<sup>27</sup> *An Act*, 1725.

<sup>28</sup> Including imports without volumes at the nominal value assigned to them by customs on entry would have little effect on the aggregate series. They would contribute more than one percent to a series based on medical drugs with values in the 1660 and 1725 Rate Books on only two occasions: 1609 (2.4%) and 1722-24 (4.2%).

valued. Fortunately, so far as can be established, this has a limited impact on the aggregate pattern, and these drugs can be excluded from the main discussion without substantially altering the overall picture. For those medical drugs without customs valuations, one can estimate the effect they would have on the value of the imports in two ways. Fifteen commodities in the medical drugs sample were imported regularly enough that a valuation can be constructed using the average of the 'Ad Valorem' estimations made by Customs officials in the later three eighteenth century samples (1722-1774).<sup>29</sup> When these values are used, this group of drugs never exceed four percent of the value of all medical drug imports in the eighteenth century, or half a percent in the seventeenth century.<sup>30</sup> For another fifty four medical drugs, customs officials only recorded cash valuations. Although extensive, this group never exceed one percent of the value of imports over the two centuries.<sup>31</sup>

These practical and methodological challenges mean that the data presented should be seen as a set of rough estimates, proxies for a set of real changes that we cannot now fully recover. Although values are discussed for convenience, it is the rates of change that are most reliable. The problems are particularly obvious for the aggregate data on drugs as a category, but even the figures for individual drugs presented in Appendix C need to be treated with care.

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<sup>29</sup> Although notionally actual prices, the Customs' ad valorem estimations quickly became fixed. 1722-74 was a time of relatively little change in official prices (unlike 1699-1701) and therefore gave a large sample from which to work, despite their greater chronological distance from the 1660 rate book: Clark 1938; Davis 1962, p. 285.

<sup>30</sup> In 1699-1701, they would contribute 3.8% to a series based on medical drugs with values in the 1660 and 1725 Rate Books. For 1722-24, 1752-54, and 1772-74, the equivalent figures are 2.6%, 2.4%, 2.5%.

<sup>31</sup> See Appendix B for a full list of drugs imported.

## Drug Imports

Between the late sixteenth and the late eighteenth centuries, English drug imports increased substantially. Annual totals for imports are given in table 1. Both imports of commodities classified as 'drugs' in the rate books and the narrower sample of 'medical drugs' increased massively between 1567 and 1774, rising by around two orders of magnitude. By the 1770s, medical drug imports were running at around £100,000 a year, fifty times greater than the £1,000 to £2,000 a year common two centuries earlier. Drug imports grew much more rapidly over this period than imports in general, which increased by roughly twelve times.<sup>32</sup>

[Insert table 1 near here]

The growth in medical drug imports was concentrated in the seventeenth century. In the second half of the sixteenth century, the quantity of drugs imported was small and relatively stable. In the years for which we have data, 1567, 1588-89, and 1600, the value of imports of medical drugs ranged around one and two thousand pounds a year. There was no obvious trend of growth or decline in the volume of trade in this period, as was the case for English imports in general.

Signs of growth are visible in 1609, and from the 1620s to the 1660s drug imports increased substantially. In 1629, the peak year in our sample before the 1680s, the volume of imports was £25,774, over ten times greater than the average for the late sixteenth century. The figures for 1617-24, 1633 and 1638 suggest a slightly more modest level of imports was normal, but even they were consistently five times higher than the earlier norm. Such annual variations are unsurprising for trade. The data for the 1660s, although based on summary figures, suggest that

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<sup>32</sup> Imports were c. £1 million in 1600, and £13 million in 1772-74: Davis 1962, p.300.

trade in drugs had expanded further. Imports in 1662-8 were higher than had been normal in the 1620s and 1630s (although not dissimilar to 1629). In the later seventeenth century there was a further substantial increase in the volume of medical drugs imported. Although by no means smooth, the rate of growth was high across the seventeenth century as a whole. The level of imports in 1699-1701 was 27 times higher than a century earlier.<sup>33</sup>

Over the eighteenth century, the volume of medical drugs imported grew much more slowly. Imports actually fell between 1700 and 1723. They rose again by the 1750s, before apparently stagnating at around twice the level at the start of the century. Even with three year averages, this oscillation is not surprising given the effect that relatively small volumes of highly priced drugs could have on the totals. Over the century, the growth in medical drugs was much lower than the 217 per cent increase in the level of English imports in general.<sup>34</sup> Imports of the wider customs category of 'Rate Book Drugs' grew at roughly the same rate, with an expansion in the importation of black lead, borax, sandalwood, and turpentine in particular. In 1772-74, these non-medical 'drugs' made up four of the five 'drugs' imported in largest quantities. Rhubarb was the only 'medical' drug among the five most significant drug imports by value, at fifth place.

[insert table 2 near here]

The use of constant prices to aggregate imports makes it important to consider whether the pattern of imports could be an artefact of the price level in 1660. We can explore this in several ways, and their effect

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<sup>33</sup> Calculated using the averages given in table 4. Growth rates were fastest in the first part of the century: 866% for c.1600-c. 1630 compared to 177% from 1665 to c.1700.

<sup>34</sup> Growth calculated from nominal values: Davis 1962, p. 300.

on the level of imports is summarized in table 2. For the eighteenth century, we can measure imports using the nominal value of imports as assessed and recorded by customs officials on entry. These were, in practice, a roughly constant set of official prices from the early eighteenth century (the totals are in table 1, columns 3 and 6). The trajectory of imports over the eighteenth century does look somewhat more optimistic on this measure and the dip from 1700 to 1720 disappears. However, the change in the overall value of imports was little different: the ratio of imports in 1772-74 compared to 1699-1701 was 2.3, compared to 1.8 when estimated at 1660 prices. Note that when imports are totalled using nominal values they are worth only around half the amount when valued at the 1660 prices, indicating a substantial fall in the price that the customs' officers applied to these drugs. We can also compare trends over the full period using official prices from earlier and later in our period. For most frequently imported drugs, we can use the average valuations from the later three eighteenth century samples (1722-1774).<sup>35</sup> As can be seen in table 2, the levels of growth observed in the eighteenth century with these prices are very similar to those found with 1660 prices. The faster rate of growth in the seventeenth century reflects the narrower sample of imports: if we calculate growth rates using 1660 prices for the same sub-sample of medical drugs the ratios are very similar.<sup>36</sup> To see the effect on imports of using earlier prices, we can use official prices from the 1604 Rate Book. In this case, as table 2 shows, the levels of import growth were little different from those found using 1660 prices. Our account of growing drug imports therefore appears to be robust to changes in the price level. This exercise further suggests that growth of imports was not biased towards those drugs that were becoming

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<sup>35</sup> See n. 29 for an explanation of the methodology.

<sup>36</sup> When the medical sample at 1660 prices is restricted to those drugs which appear in the sample with Ad Valorem prices the ratio of imports in 1600:1700 is 60.7, and 1630:1700 is 110.9.

relatively cheaper: if that were the case, we would expect lower estimates of import growth when using eighteenth century prices. Either the fall in price over this period appears to have affected drugs more or less indiscriminately, or demand was relatively unresponsive to price.

On their own, however, import figures are a limited guide to English medical consumption. The crucial issue for our understanding of the drug trade's effect on consumption is the value of re-exports. It was in these centuries that England emerged as an international entrepôt, and many of the drugs and other commodities imported were simply passing through on their way to other destinations.

Re-export levels are obscure before 1700. Nonetheless, some figures can be constructed for a few select years. For the period before 1640, only four surviving Port Books offer a reasonable picture of re-exports and exports.<sup>37</sup> We have no good basis on which to estimate the proportion of trade by English and Alien merchants, so must rely on combining proximate years. Although re-exported imports are not differentiated from English produce in the Port Books, it is possible to identify drugs that were not grown or produced domestically; of course, England could and did import drugs that were also grown there, such as wormseed and saffron. In table 3 these crude estimates for re-exports are compared to the imports discussed above.

[insert table 3 near here]

Around 1600, England seems to have retained only a small share of the medical drugs it imported. Re-exports were worth two thousand six hundred pounds: substantially more than the value of medical drugs imported around 1600, and almost two-thirds of the value of imports in

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<sup>37</sup> An earlier port book for 1576 survives, but it is unclear whether this covers all or some merchants.

1609. Even in the wider Rate Book drugs sample, imports and re-exports roughly balanced. The export Port Book for 1599 records English merchants alone exporting a greater value of medical drugs than would arrive in 1600, largely due to the re-export of large quantities of Sarsaparilla (£1,700) and Benjamin (£483). By the 1630s, re-exports amounted to only around a fifth of the value of drug imports with a much larger share of imports retained for English consumption. The margin of error in these estimates is large given the wide annual variations and unmatched sample years, and the figure for retained imports in the 1630s is probably an over-estimate. Nonetheless, it seems reasonable to conclude that the rate of growth in English drug consumption in these decades may have been even higher than suggested by the import data alone.

From 1640 to 1699 no useful information about re-exports survives. From 1699 onwards, however, the Customs records include extensive data on both exports and re-exports. These remain high. As can be seen in table 3, around half of drug imports were re-exported. However, as the total size of the drug trade had grown substantially, the volume of medical drugs retained for consumption was now much larger. By the start of the eighteenth century, domestic consumption was more than twice the level in the 1630s. Tellingly, given that retained imports around 1600 could not exceed the total of imports, these figures imply that by 1700 the level of English medical drug consumption was at least fifteen times higher than a century earlier.

After 1700, medical drug consumption followed a very different trajectory. From 1699 to 1774, the volume of medical drugs retained appears to have grown slowly, with a decline in the 1720s. The wider rate book drug sample continued to grow rapidly, reflecting the demand for minerals and dyes in England's expanding manufacturing sector. While imports doubled, the volume of foreign medical drugs retained for



consumption in England was only around forty percent higher in the 1770s than in 1700. The crucial transformation in demand occurred in the seventeenth not the eighteenth centuries.

These figures are based on official records. Some of the moderation in growth over the eighteenth century may be in part explained by the striking increase in customs duties in this period. Initially taxed at five per cent of a fixed, notional value, customs duties increased substantially from the late seventeenth century onwards. By the mid-eighteenth century, duties had increased to 20-25 per cent on many drugs.<sup>38</sup> Given drugs' low bulk and high value, they were an obvious target for smuggling; this would be less of a problem for the bulkier and lower value items in the wider rate book drug sample. The Parliamentary Committee set up in the 1780s to examine frauds against the revenue reported that 'a considerable proportion of the Drugs imported from the East Indies and from China is exported to the Continent of Europe for the drawback, in order to be afterwards re-landed clandestinely in this kingdom, together with what can be smuggled also from the Danes, Swedes and Dutch'.<sup>39</sup> Consumption may have risen in the eighteenth century but been concealed from the official record. However, it is unlikely that smuggling could obscure a level of growth of the order of magnitude observable in the seventeenth century. Even if half of the drugs consumed in the eighteenth century were smuggled, this would suggest only just over a doubling of consumption – small beer compared to the explosive fifteen-fold growth in the century before.<sup>40</sup>

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<sup>38</sup> Duties on drugs were complicated. Moreover, as the Ad Valorem estimates from the eighteenth century were generally lower than the earlier Book of Rates valuations the effective rates of taxation may in fact have fallen. For rates and calculations see: Saxby 1757; Baldwin 1770. See also: Davis 1966, pp. 307-11; Ormrod 2003.

<sup>39</sup> House of Commons, 1782-1802, XI, p. 291.

<sup>40</sup> Smuggled tea may have accounted for three times the volume of legal imports, but even if drugs were smuggled at that rate the argument still holds: Ashworth 2003, pp. 176-8.

While foreign imports and re-exports are the most visible part of this story, exports cannot be neglected entirely. Export figures for medical drugs are hard to establish for much of the period and, as far as we can tell, England's ability to produce raw drugs of interest to the international market was limited. Unprocessed drug exports centred on a small cluster of raw or partially processed materials with a wide range of applications, primarily quicksilver, white and red lead. While having medical applications at the time, these mainly served non-medical purposes. From the later seventeenth century onwards we can, however, identify a rise in English exports of processed medicines. These are normally listed in the customs records as 'apothecary's wares'. From other sources we know that proprietary medicines could be entered under that heading, but it is likely that traditional compound medicines and processed simples (non-compounded medicines) were also included.<sup>41</sup> In the 1686 Port Book, a few entries are described as 'medicines', 'spirits of scurvy grass, or compound waters', while in the 1699-1701 Customs Ledgers, 'plague water', Daffy's Elixir, Epsom salt and spirits of scurvy grass, are recorded. Later in the eighteenth century, this level of detail unfortunately disappears. It is difficult to value this trade. In 1663/9, an average of 16,330 lb of apothecary's wares were exported. By 1699-1701 this amount had risen to 70,815 lb (around £1,300 at official prices). The valuation used by the Customs' officers was £2 per hundredweight, but this is far below the wholesale price. For a few items exported by Anthony Daffy, the manufacturer of Daffy's Elixir, we can compare the customs' valuation with the actual wholesale price. Notionally, Daffy should have paid a 5 percent tariff. In practice, he paid between 1 and 1.6 per cent, suggesting the degree of undervaluing at the docks.<sup>42</sup> By the late

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<sup>41</sup> Haycock and Wallis 2005, pp. 24-25.

<sup>42</sup> TNA, E 190/72/1. On 11 July 1677 three consignments of apothecary wares from Daffy are noted (under the name of William Ball, who acted for him in the port): one, for 120 bottles that Daffy priced at £15 was taxed at 4s; the other two Daffy had valued at

eighteenth century, exports of apothecary's wares had grown dramatically. In the 1770s, an average of over 1,300,000 lb. (£23,259 at official prices) was being exported – almost twenty times the amount at the start of the century. Export-oriented drug production had become a reasonably-sized industry in England: by way of comparison, in 1772-74 grain exports were valued at £37,000, hat exports at £110,000, and cottons at £221,000.<sup>43</sup>

Total values for drug imports only tell us so much. The kinds of drugs imported suggest more about London's role in this trade and the characteristics of medical supply and demand more generally. Given London's high re-export rates, and the impossibility of chronologically matching imports and exports before 1699, we cannot assume that this represents changes in English demand. However, it should give some indication of changes in consumption across Europe and its colonial dependencies, given London's role in funnelling commodities into these markets.

One of the obvious features of the medical drug trade was the very wide range of commodities imported. The number of different types of medical drugs imported each year ranges from lows of 4 in 1604 and 11 in 1600 to highs of 142 in 1686 and 174 in 1699-1701. The average number of different kinds of drugs rose over the period from 29 in the late sixteenth century, to 66 between 1620 and 1640, and a remarkable 143 types between 1699 and 1774. Only 15 of the 230 items listed in the drug section of the 1604 Rate Book were not recorded as being imported at

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£28 10s and £30 and both were taxed at 8s (f. 158r). On 17 Sept 1677, one shipment of 'Apothecarys wares' taxed at 4s. which had been priced at £19/10/00 by Daffy (f. 218r). On 2 November 1677, one shipment of 'Apothecarys wares' taxed at 8 s. which had been priced at £24 by Daffy (fol. 265v): Haycock and Wallis 2005, pp. 44, 137, 151.

<sup>43</sup> Davis 1962, p. 302.

some point in the period.<sup>44</sup> In addition to these figures for the number of types of drugs imported in reasonable bulk, we must allow for the importation of smaller quantities of drugs that were not listed individually. The diversity of the early modern published pharmacopoeias was, it seems, reflected in the variety of drugs available.

While consumers' demand for a wide range of medicinal substances was met to some degree, a much smaller group of drugs made up the majority of imports. Table 4 lists the ten leading 'medical drugs' (measured at official values) in each period. Even though the variety of drugs increased over this period, in every period apart from 1699-1701 this small sub-set made up around two-thirds to three quarters of all drugs imported. Indeed, the five most common drugs regularly constituted around half of imports by value.

[insert table 4 near here]

The leading medical drugs imported changed substantially over the period. However, a core of drugs were prominent throughout. Senna featured among the most popular in all periods, and China Roots, Benjamin, Rhubarb and Sarsaparilla were present in all but one or two periods, indeed, rhubarb headed the list three times. All were medical staples of well-known efficacy.<sup>45</sup> Among the other drugs imported in large amounts in the late sixteenth century and early seventeenth centuries, wormseed remained a common import (see Appendix C). The other major drugs (spica celtica, sanguis draconis, agaric, and ireos) in the early period fell away dramatically in importance. This is probably a product of

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<sup>44</sup> These are: Anacardium; Blatta Bizantiae; Cytrauge; Daucus; Generali; Mirabilanes condit; ol Scorpions; Ossa de Corde cervi; Sal alkali; Sandiver; Soldonella; Terra lemnia; Thlaspi semen; Turbith Thapsiae

<sup>45</sup> Grieve suggests that China Root is a synonym for Galangal (Grieve 1931, p. 339), but they were regarded as distinct drugs in the seventeenth century (see: Commissioners of the Customs 1604; Pechey 1694, p. 232).

the low level of trade in the early period making the ranking process rather more volatile than later on. For the only manufactured drug on the list, the plague and poison remedy theriac, which also fell out of the list of leading imports quickly, import substitution was also a real possibility, as was the effect of the decreasing frequency of plagues.

The changes in the kinds of drugs imported into England were thus largely additive. It would be the easy availability of medicines in 1800, not the types of drugs imported, that would have most surprised a physician from two centuries earlier. Four-fifths of the leading drugs imported between 1567 and 1774 were sufficiently familiar that they were listed in the first *Pharmacopoeia Londinensis* published by the College of Physicians in 1618.<sup>46</sup> The most significant change in the types of drugs imported over this period was a product of the development of trade routes, not the result of a shift in medical theory or practice.

The changes in the reported origins of England's drug imports are shown in figure 1. English customs' records only provide the port at which a cargo was embarked for its final passage to England, so this data does not fully capture the shift in the origins of drug imports. Thus, Asian drugs imported by the Dutch East India Company would be recorded as originating in the Netherlands, while early imports from India or the Levant might be recorded as Italian or Flemish. This is less important where drugs originated from England's American and Caribbean colonies, as they were generally imported directly. Drugs from South and Central America, however, would often be transhipped and so appear as 'European'. A further minor complication is that ports of origin were not always recorded or discernable in the original Port Books of the seventeenth century.

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<sup>46</sup> Of 30 'leading drugs' in table 4, 24 were listed (two others were waters): College of Physicians 1618.

Even with these limitations, some of the major changes in the structure of the English drug trade are clear in figure 1. Two new sources of imports emerged, both helping to displace the Northern European axis of Flanders and the Netherlands that had previously dominated English trade. First, from the early seventeenth century onwards, Asian commodities were reaching England directly, in the ships of the East India Company. Large-scale commerce in rhubarb, opium, and olibanum (frankincense) in particular was one of the major changes in the English drug trade. Second, from small beginnings in the late seventeenth century, the Americas became an important source of drugs from the 1720s onwards. The majority of these drugs, such as guaiacum, sarsaparilla and Jesuits' Bark, came from Central and South America; fewer came from the English colonies in North America, although there were a handful of exceptions such as Virginia Snakeroot and Pink root. Among American drugs, one stands out for its exceptional importance: Jesuits Bark, which made up 40 per cent of all direct American drug imports into England over the whole period. Perhaps less expected is the emergence of a substantial trade in mineral waters, both generic 'spa water' and Pyrmont water, notionally from the Westphalian spa town.

What implications did this shift in the availability of foreign medicines have for patients in early modern England? It is difficult to move from aggregate imports to the sick-bed. Medical practices were diverse and there were multiple uses and modes of processing and preparing for drugs. However, some crude impression of the impact of rising drug imports on their availability to the population at large can be obtained from translating imports into courses of treatment. Table 5 uses standard pharmacopeia and medical texts to estimate the number of 'treatments' of five of the most common imported drugs. I consciously use 'treatment' loosely here. The amounts prescribed for different illnesses varied. Some drugs, such as sarsaparilla, were primarily used in

compound form, and it is rarely clear if an author was describing the volume necessary for a cure, for one among a series of doses, or for the production of a medicine that would treat multiple cases. As far as possible, the low and high estimates presented here are the volumes that authors indicated as necessary to treat a case. Even so, achieving a purge with senna or rhubarb is a relatively precise goal compared to treating syphilis with sarsaparilla. Conversely, someone might use purges regularly, whereas they were more likely to use Jesuits bark or sarsaparilla sporadically as occasional illnesses demanded. These estimates are based on the retained imports of these drugs, assuming half are re-exported: re-exports for individual drugs fluctuate wildly even in the eighteenth century.<sup>47</sup>

[insert table 5 near here]

While the figures in table 5 are speculative at best, they do suggest that the increase in the consumption of medicine over this period must have extended far beyond the elite. In the late sixteenth century, even the most common imported drugs, such as senna, were still only arriving in sufficient volume to treat a few thousand people. Only wormseed (on a low dose) offered the possibility of mass consumption in the first half of the seventeenth century and an indigenous production and export trade appears to have emerged for wormseed. Prescriptions, inventories, household accounts and institutional records show that some imported drugs were being consumed in England during the sixteenth century. However, the vast majority of English demand for medicines must have been met by remedies using domestically produced drugs. By the mid-

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<sup>47</sup> Even with three year averages, when imports and re-exports are compared for specific drugs we find that re-exports can exceed imports. In this sample, this occurs with rhubarb (1770s), wormseed (1740s, 1770s), and sarsaparilla (1720s).

seventeenth century, this had changed dramatically: already by the 1660s, senna imports might equate to between thirty thousand and three-quarters of a million purges for a population of around 5.2 million. A century later, an average of almost one (low) dose of senna per every two people was imported into England. The figures for rhubarb and sarsaparilla give similar impressions. Similarly, it is surely indicative of a mass market for Jesuits' Bark that the amount imported in the 1720s and 1750s could have provided between two hundred thousand and a million treatments.

While this evidence of dosages imported indicates the appearance of a mass market for medicines, the ability of the sick to utilize different medical treatments, and the impact of their decision to consume, is a function of price as well as availability. Evidence on the prices of drugs is even scarcer than evidence on levels of imports. However, for the 1660s to the 1730s and for a few years in the 1790s some bulk wholesale prices for drugs sold in the London market are available from surviving *Price Courants*, essentially price newspapers for merchants.<sup>48</sup> Prices for nine prominent drugs are presented in table 6. The prices have been deflated using Allen's Consumer Price Index for London, which contains a basket of food based on a labourers' diet, with 1666-75 taken as the base year.<sup>49</sup> Inflation has little effect until the 1790s.

Despite capturing the last period of rapid expansion in drug imports in the later seventeenth century, there is no clear trend in drug prices between the 1660s and 1700. The prices of Benjamin, Senna, Opium, Scammony were remarkably stable. Wormseed and rhubarb increased in price, the latter by more than 100 percent. The prices of Aloes Socotrina and Sarsaparilla did both fall by roughly a third, but Jesuits Bark was the only drug to see a very large fall in price (although its initial high price is

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<sup>48</sup> Price 1954, pp. 240-9.

<sup>49</sup> Allen 2001.



based on a single price report) of the kind that might be expected when the quantity imported grows so quickly. By the end of the eighteenth century, the real price had fallen for five drugs: Aloes Socotrina, Benjamin, Jesuits Bark, Opium, Sarsaparilla. However, Rhubarb and Senna cost around the same as in the 1660s, while Scammony was twice as expensive and Wormseed was no longer listed. An un-weighted average of the relative change of the drug prices in table 6 suggests that prices in the 1790s were on average 15 percent lower than in the 1660s: a small change when medical drug imports were ten times higher.

Unfortunately, the Price Courant price data only begins after the most dramatic growth in drug imports had ended. Figures from earlier in the century suggest that prices for some drugs may have fallen significantly by the 1660s. In the early 1630s, the wholesale price for Senna (42d/lb), rhubarb (253d/lb), Benjamin (80d/lb), Opium (160d/lb) and Sarsaparilla (80d/lb) were all markedly higher than later in the century.<sup>50</sup> For these five drugs, prices fell on average by around 50 percent between the 1630s and 1660s. As these are wholesale druggists' prices, not port prices, they may overstate the decline, but it seems likely that the initial expansion in drug imports was accompanied by substantial price falls.

## **Conclusion**

Taken together, the shifts in price and imports show the key characteristics of the evolution of the English medical drug trade over this period. In particular, the seventeenth century seems to have been the period of greatest expansion in supply. While drug prices fell initially, it

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<sup>50</sup> Prices: Henry Box, [Account Book], Yale University, Beineke Library, Osborn b211 (average, 1629-33); Anonymous Apothecaries' Stock Lists, Wellcome Library MS 7646. Senna, (n=24), Rhubarb (n=11), Opium (n=2), Sarsaparilla (n=13), Benjamin (n = 4).

seems that the demand for medicines outstripped supply over the last half of the seventeenth century, keeping prices buoyant despite increasing volumes. Large scale domestic consumption of imported drugs was firmly established by the start of the eighteenth century: the use of imported medicines cannot have been restricted to the elite by that point. The next century saw far less change in overall levels of consumption. Individual medicines, such as Jesuits bark, boomed, but more generally both prices and retained imports grew slowly. As the persistent growth in the levels of imports and re-exports underlines, England's involvement in the international drug trade continued to expand rapidly; but this was driven by foreign, not domestic, demand. Over the period, medicinal drugs showed little signs of the relative decline experienced by for the fine spices, or the 'demystification' recently suggested by Halikowski Smith.<sup>51</sup> This chronology of rising medical consumption puts medical drugs among the earliest group of exotic imports to boom: for most other groceries, Shamma identifies the major rise as occurring in the eighteenth century; only tobacco was available in sufficient quantities for mass consumption in the later seventeenth century.<sup>52</sup>

Evidence of a dramatic expansion in drug imports into England provides us with a new perspective on changes in the consumption of healthcare in this period. To the extent that drug consumption offers a rough indicator for wider shifts in demand for medical services, it seems that the turning point in English consumption came in the early decades of the seventeenth century, and the period of greatest growth had ended by 1700. As figure 2 shows, the timing and scale of the change in drug imports closely parallel Mortimer's data on the increasing resort to medical practitioners in Southern England, suggesting that this reflects a national trend, and indicate that his data fortuitously capture the main

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<sup>51</sup> Halikowski Smith 2008, pp. 416-9.

<sup>52</sup> Shamma 1990, p. 77-82. See also: Wallis 2008, pp. 45-9.

transition in consumption. The trajectory of prices sketched out above adds weight to this interpretation, as the rising levels of demand Mortimer found would have helped prevent prices from falling as imports expanded. This chronology also matches the main institutional changes in regulation, notably the establishment of the Society of Apothecaries in 1617 with its aspiration to monopolize the sector, the appearance of bulk contracting for drug supplies for the navy and East India Company, and the mass production of proprietary remedies.<sup>53</sup>

That drug imports and payments for medical goods and services grew in parallel offers another way to interpret the expansion in medical consumption in this period. Mortimer emphasizes improvements in the productivity of medical practitioners, achieved particularly through their easier access to the sick, in his explanation for how the supply of healthcare could keep up with the growth in demand.<sup>54</sup> He also highlights a turn to chemical medicines. However, while the supply of chemical medicines cannot be usefully observed through the Customs' records, given the range of industrial uses of their raw materials, the ongoing popularity of Galenic simples provides little evidence of a change in the content of medicine that might be responsible for shifts in consumption.<sup>55</sup> More significantly, the increasing supply of drugs suggests that much of the increase in expenditure in Probate Accounts may have been due to purchases of medicines rather than services.<sup>56</sup> Economies of scale are easier to achieve in pharmacy than direct medical or surgical assistance, allowing us to assume more moderate increases in the workload of medical practitioners.

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<sup>53</sup> Wallis 2002, pp. 217-21.

<sup>54</sup> Mortimer 2009, pp. 204-5.

<sup>55</sup> Mortimer 2009, p. 65.

<sup>56</sup> Probate Accounts are too terse for this distinction to be made in most cases, and as Mortimer emphasizes the provision of 'physic' was the most common service: Mortimer 2009, p.73.

The kinds of medical drugs imported also changed over this period. However, the changes were mainly an expansion in the pharmacopoeia, rather than a displacement of older medicines by new drugs. There were some significant additions. Notably, in Jesuits' Bark we observe a change that probably increased the objective efficacy of medicine in treating some kinds of disease. But the therapeutic range was marked more by continuity than change. A shift in scale of this kind must, though, have had wide implications. In rapidly becoming widely available in quantities that were radically different to earlier periods, drugs, like other new consumer goods, presented new consumption possibilities and allowed new sensibilities and modes of behaviour to develop. Imported drugs linked domestic and commercial medical practice to extensive supply networks and commercial retailers such as apothecaries and druggists. They separated the materials of medicine from the direct encounters and personal knowledge of farm and field. In use, they intertwined foreign materials with foreign knowledge, increasing the utility of medical practitioners' specialized knowledge. The increasing availability of medicines, old and new, perhaps offers a way to understand why the sick might look to the market rather than to kitchen physic for their health. The emergence of mass drug consumption marked a revolutionary shift in the form, practice and implications of healthcare.

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Table 1: Drug Imports, 1567-1774

	Rate Book 'Drugs'			Medical Drugs		
	1660 & 1725 prices £	Percentage using 1725 prices £	Nominal value at entry £	1660 & 1725 prices £	Percentage using 1725 prices £	Nominal value at entry £
1567	2,412	0		1,807	0	
1588-89	2,291	0		1,385	0	
1600	2,412	0		796	0	
1609	5,813	0		3,929	0	
1617-24	12,858	0		8,002	0	
1629	38,578	0		25,774	0	
1633	28,326	0		17,734	0	
1638	33,815	0		18,678	0	
1662-8	78,304	0		31,346	0	
1685	94,243	1		48,496	2	
1699-1701	115,212	4	51,042	55,383	7	24,215
1722-24	121,227	27	64,906	50,695	20	28,457
1752-54	220,718	10	159,370	96,112	16	58,441
1772-74	233,134	9	174,452	97,089	14	55,093

**Notes:** Imports are valued in sterling using the Price series described in the text. Where Port Books survive for only English or Denizen merchants, annual totals are inflated by the proportions of all trade in the hands of each group. Trade figures are derived from Millard 1956. The multipliers are: 1567, 1.57; 1600, 4.34; 1609, 2.70; 1617, 3.03; 1621, 1.27; 1624, 6.25; 1629, 1.16. In practice, drug imports did not always parallel the share of all trade: in 1633 Aliens imported 12.9% of all commodities rated in the drug section as against 11% of all imports, while in 1637 they imported 3.8% of drugs against 12% of all imports.

For two years, only partial years survive: For 1589, only six months survive and the total was thus doubled; for 1633, only 11 months of the Denizen Book survives and the total was inflated by 1.09.

Several years are combined to provide better estimates. For 1588-89, where proximate years for English and Denizen merchants were available, they were summed to produce an annual total. For 1617-24, the Alien Books for 1617 and 1624 were averaged and summed with the English Book 1624. For 1662-8, an average of the two sets of summary totals is given. For 1699 onwards, three year averages are given.

Table 2: Ratios of Medical Drug Imports Using Different Price Series

	1660 official prices	Nominal values	1722-74 Ad Val prices	1604 official prices
1600:1700	<b>27.2</b>		<b>63.2</b>	<b>31.8</b>
1630:1700	<b>2.7</b>		<b>78.7</b>	<b>2.7</b>
1700:1770	<b>1.8</b>	<b>2.3</b>	<b>2.0</b>	<b>1.8</b>
1720:1750	<b>1.9</b>	<b>2.1</b>	<b>1.9</b>	<b>1.7</b>

**Source:** as described in the text.

Table 3: English Re-exports and Consumption of Imported Drugs

	Rate Book 'drugs'			Medical Drugs		
	Imports	Re-Exports	Retained	Imports	Re-Exports	Retained
	£	£	£	£	£	£
c.1600	3,505	3,053	452	2,037	2,633	-596
c.1630	28,646	5,916	22,731	17,644	3,060	14,584
1699-1701	115,212	67,600	47,611	55,383	23,169	32,214
1722-24	121,227	42,022	79,205	50,695	30,812	19,883
1752-54	220,718	94,981	125,737	96,112	51,272	44,841
1772-74	233,134	74,987	158,148	97,089	51,600	45,489

**Note:**

Re-export figures for the 1600s are based on the 1599 Denizen and 1605 Alien Port Books; figures for the 1630s are based on the 1632 Alien and 1639 Denizen Port Books. Import figures for c. 1600 are an average of 1588, 1600 and 1609, and for c. 1630 are an average of 1629, 1633 and 1638.

The figure for Retained Imports is calculated from Imports less Re-Exports. Negative figures imply an imbalance of trade between sample years. For 1600 and 1630 Exports were assumed to be re-Exports if the commodity was not produced in England. From 1699 onwards, re-exports are separately recorded in the Customs Ledgers.

Table 4: Major Imports, Ranked by Value

	1566- 1610	1617- 38	1662- 68	1685	1699- 1701	1722- 24	1752- 54	1772- 74
Theriac	1							
Sarsaparilla	2	6		6	10		3	2
Wormseed	3	1	5	9	6			
China Roots	4	7	8	3	1	2	10	
Senna	5	5	7	5	7	4	7	5
Spica Celtica	6							
Benjamin	7		2		3	5	4	4
Cassia Fistula	8							
Sanguis Draconis	9							
Agaric	10							
Opium		2	6					
Rhubarb		3	3	1	9	6	1	1
Scammony		4	9	7		9		
Spikenard		8	10					
Ireos		9						
Gum Tragacanth		10						
Aloes Cicotrina			1	2	2	10		
Ambergrease			4					
Manna				4		7	6	8
Aloes Epatica				8		3		9
Storex Calida				10				
Bezoar Stone (of the East Indies)					4			
Oyl Anniseed					5			
Lignum Vite					8		5	6
Jesuits Bark						1	2	7
Sassafras Roots						8		
Jalap							8	
Camphor, Unrefined							9	
Sulphur Vivum								3
Pymont Water								10
Top 10 as proportion of all imports	0.79	0.81	0.83	0.68	0.61	0.76	0.77	0.72
Top 5 as proportion of all imports	0.65	0.70	0.57	0.51	0.40	0.59	0.60	0.49

Table 5: Retained Imports as Dosage, Thousand Doses.

	Senna		Rhubarb		Wormseed		Sarsaparilla		Jesuits' Bark	
	High <sup>a</sup> 3 oz	Low <sup>b</sup> 1 dr	High <sup>c</sup> 2 dr	Low <sup>d</sup> 1 sc	High <sup>e</sup> 2 oz	Low <sup>f</sup> 0.5 dr	High <sup>g</sup> 4 oz	Low <sup>h</sup> 2 oz	High <sup>i</sup> 2 oz	Low <sup>j</sup> 4 dr
1567	2	42	0.5	3	2	76				
1589	0.5	12	0.1	0.6	0.8	27	0.2	0.4		
1617-24 <sup>1</sup>	10	244	35	209	39	1247	3	6		
1630-38 <sup>1</sup>	8	190	49	292	42	1356	5	10		
1662-68	32	757	77	461	46	1,482	2	4		
1685	51	1,213	215	1,289	21	669	25	50	8	33
1699-1701	42	1,002	50	298	53	1,696	17	33	6	25
1722-24	70	1,676	55	330	20	646	2	4	228	913
1752-54	61	1,475	582	3,493	0	0	75	149	296	1,186
1772-74	120	2,880	304	1,823	1	41	110	219	112	449

**Notes:**

Retained imports are based on imports less 50 percent to allow for re-exports: this was the average proportion of drugs re-exported 1699-1774.

1. Figures for 1617-24 are an average of 1617 and 1624, and those for 1630-1638 are an average of 1630, 1633 and 1638

Dosages are from: a. Dube 1704, p. 11; b. Pechey 1694, p. 328; Quincy 1782, p. 163; c. Pechey 1694 p. 320, and Wilson 1709, p. 224; d. Quincy 1782, p. 168; e. Quincy 1782, p. 610; f. Dube 1704, p. 130; g. Wilson 1709, p. 294; h. Pechey 1694, p. 394; i. Wilson 1709, pp. 231-2; j. Dube 1704, p. 238; Monro 1781, p. 664.

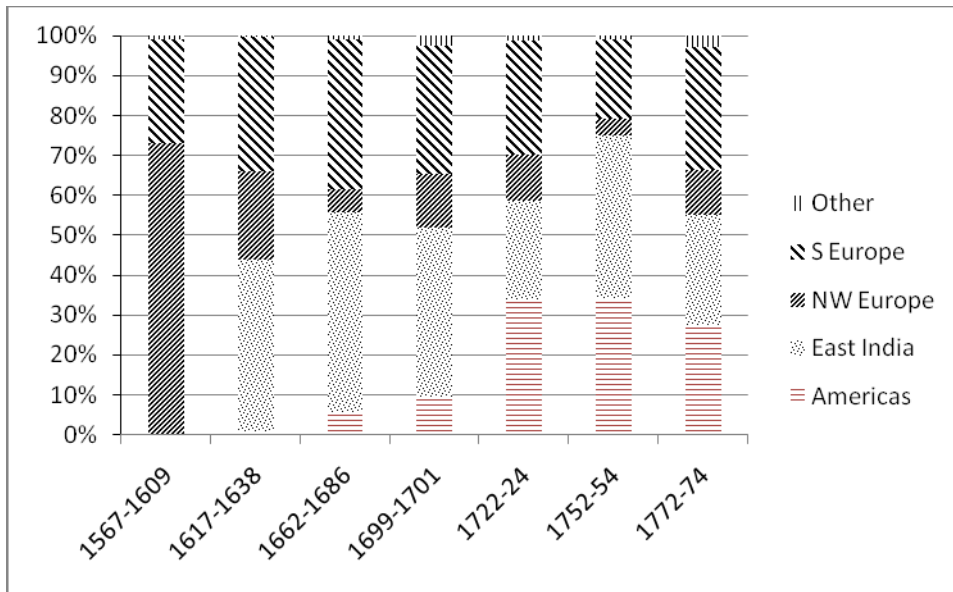
**Table 6: Drug Prices: Official Import Rates and Wholesale Prices**

	Customs Official Prices			Wholesale Drug Prices in London			
	Rate Book 1660 d/lb	Ad Valorem 1722-74 d/lb	1666- 75 d/lb	1676-85 d/lb	1696- 1706 d/lb	1731-35 d/lb	1796-99 d/lb
Aloes Socotrina	60	5.3	30.8 (23)	24.3 (17)	17.3 (29)	34.1 (1)	24.0 (7)
Benjamin	40	6	34.1 (48)	30.2 (25)	33.3 (19)	48.7 (1)	17.5 (7)
Jesuits bark	30	31.4	-	128.5 (1)	60.8 (26)	61.4 (3)	26.5 (38)
Opium	80	31.4	34.1 (25)	30.2 (18)	33.3 (29)	48.7 (30)	17.5 (26)
Rhubarb	240	146	79.7 (23)	200.6 (24)	187.0 (25)	257.4 (30)	81.7 (19)
Sarsaparilla	40	12	33.6 (24)	25.6 (18)	20.3 (28)	39.9 (30)	23.4 (10)
Scammony	160	54	110.3 (24)	126.7 (31)	122.7 (54)	163.6 (2)	240.0 (26)
Senna	30	20	32.3 (51)	19.5 (43)	31.4 (66)	34.1 (1)	35.1 (10)
Wormseed	40	42	30.8 (33)	44.5 (36)	50.5 (46)	54.2 (14)	(0)
<i>CPI</i>			1.00	1.03	1.01	0.93	1.58

**Note:** Number of observations given in parentheses below mean of price for each period. Prices are relative to 1660 levels using Allen's CPI series reported in the last row. Nominal prices can be obtained by multiplying the price by the CPI. The Ad Valorem price is the average valuation made by Customs in the three sample periods from 1722-24, 1752-54 and 1772-74.

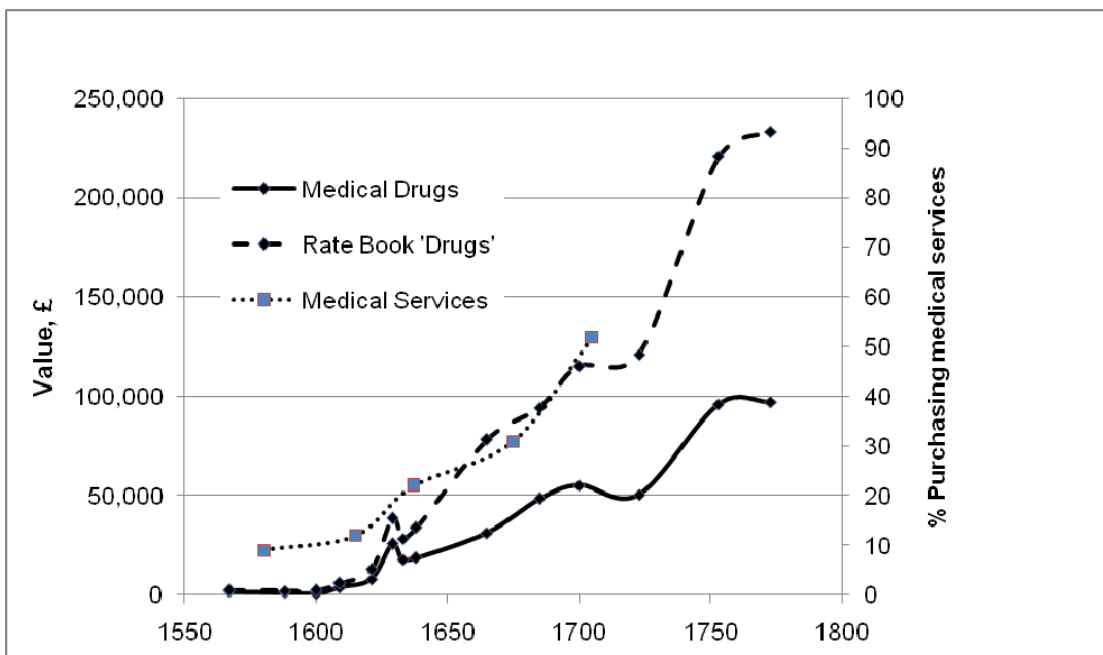
**Sources and periods:** *Prix Courrant des Marchandises a Londres* (1671-3); *Prises of Merchandise in London* (1672-4); *The Merchants Remembrancer* (1680-1); *Le Memorial Des Marchands*, Whiston (1681-5); *Prices of Merchandise in London* (1683); *Prix Courrant des Marchandises a Londres* (1668-1684); *The Prices of Merchandise in London* (1667-1696); *Whiston's Merchants Weekly Remembrancer* (1691-1707); *General Remark or Miscellanies* (1708); *Prix Courant de Marchandises A Londres*, Mahieu (1699-1715); *Weekly Journal or British Gazetteer* (1716); *Proctor's price-courant* (1696-1731); *Gentleman's Monthly Intelligencer* (1731-1735); *Price Current Boston* (1784); *Price Current of Goods Imported from North America* (1798); *Price Current of Leghorn* (1798-9); *Price Current of Goods Exported/Imported* (1781-1799); *Prince's London Price Current* (1796-1799).

**Figure 1: Origins of Drug Imports, by Region**



**Note:** 'Other' includes drugs from Africa, Northern Europe and the British Isles

**Figure 2: Drug Imports to England and Demand for Medical Services**



**Note:** Data corrections given in table 1. Percentage of Probate Accounts of status groups A & B purchasing medical and nursing services in East Kent: Mortimer, 'Medical Assistance', ii, p. 23.

## Appendix A: List of Customs Sources, 1567-1699.

### a. Imports

Year	Period	Reference	Merchants
1567-8	30 Sept 1567-24 Sept 1568	E. 190/4/2 (Dietz, 1971)	Denizen
1588-9	30 Sept 1588 - 6 April 1588; Apr 1588 - 28 Sept 1589	E190/7/8; E190/8/1	Denizen
1589	4 Apr 1589 –25 Sept 1589	E190/8/2	Alien
1599-1600	1 Oct 1599- 27 Sept 1600	E190/11/1 (also E190/11/3)	Alien
1609	29 Dec 1608- 24 Dec 1609	E190/14/5	Alien
1617	30 Dec 1616-24 Dec 1617.	E190/21/4	Alien
1621	29 Dec 1620-24 Dec 1621	E190/24/4	Denizen
1624	1 Dec 1623-24 Dec 1624	E190/27/1	Alien
1630	24 Dec 1629-24 Dec 1630	E190/34/2	Denizen
1633	29 Dec 1632-24 Dec 1633	E190/37/8	Alien
1633	29 Dec 1632-27 Nov 1633	E190/38/1	Denizen
1638	24 Dec 1637-24 Dec 1638	E190/41/1	Alien
1638	24 Dec 1637-24 Dec 1638	E190/41/5*	Denizen
1662-63	Michaelmas 1662 to Michaelmas 1663	CO 388/2, f.7	All
1668-69	Michaelmas 1668 to Michaelmas 1669	CO 388/2, f.13	All
1686	24 Dec 1637-24 Dec 1638	E190/143/1	Denizen
1686	24 Dec 1637-24 Dec 1638	E190/137/2	Alien

NB: I excluded 1574-5 as it contains no 'medical' items, and 1604 which only covers 3 winter months.

\* Significant parts (c.10 per cent) of this book are damaged and illegible

### b. Exports

Year	Period	Reference	Merchants
1576	Easter - Michaelmas 1576	E190/6/4	All
1598-99	Michaelmas 1598- Michaelmas 1599	E190/10/11	Denizens
1605	4 Jan 1604/5- 23 Dec 1605	E190/12/7	Aliens
1622 <sup>1</sup>	29 Dec 1621-24 Dec 1622	E190/25/2	Aliens
1632	29 Dec 1631-24 Dec 1632	E190/37/6	Aliens
1639	Christmas 1638- Christmas 1639	E190/43/6 <sup>2</sup>	Denizens
1662-63	Michaelmas 1662 to Michaelmas 1663	CO 388/2, f.7	All
1664	Incomplete: 12-27 Jan 1663/4; 16 April-2 Sept 1664; 7 -26 Nov 1664.	E190/50/2	Denizens
1668-69	Michaelmas 1668 to Michaelmas 1669	CO 388/2, f.13	All
1686	24 Dec 1685-24 Dec 1686	E193/139/1	Denizen
1686	24 Dec 1685-24 Dec 1686	E193/141/5	Alien

NB: I have excluded 1669-70 Alien exports as it covers a brief period. <sup>1</sup> Another surviving book for this year (E190/25/9) records cloth exports only. <sup>2</sup> This volume is damaged and a significant amount of entries for October (c.25 per cent) and November (c.50 per cent) are illegible or lost

## Appendix B: Medical Drug Sample

### Medical Drugs sample

#### *Medical Drugs with valuations from 1660 Rate Book:*

Acacia; Acorus; Adiantum; Adiantum Album; Agaric; Agaric, Trimmed; Agnus Castus; Alcanet; Alchermes, Confectio; Alkermes Syrrup; Aloes Cicotrina; Aloes Epatica; Ambergrease; Ameos Seed; Anacardium; Angelica; Aristolochia; Asaraum; Aspalathus; Assafoetida; Balaustium; Balsalum Artificial; Balsalum Natural; Bayberries; Bdeium; Ben Album Or Rubrum; Benjamin; Bezoar Stone (E Indies); Bezoar Stone (W Indies); Bolus Communis & Armoniacus; Bolus Venis; Bunkins, Holliwortles, Or Pistolachia; Callamus; Camphor, Refined Or Not; Caneri Oculus; Cantharides; Carolina; Carpo Balsami; Carrabe; Cassia Fistula; Castoreum; Cetrach; China Roots; Ciperus Longus & Rotundus; Civet; Coccus Indiae; Coloquintida; Cortex Guiaci; Cortex Mandragorae; Cortex Tamarisci; Cortex Winteranus; Costus; Cuscuta; Cyclamen; Cyperus Nuts; Cytrauge; Diagredium; Dictamnus Leaves; Dictamnus Roots; Dictamnus, Unspec; Doronicum; Ebustum; Elleborus (Black or White); Epithium; Euphorbium; Fennel Seed; Fenugreek; Flory; Folium Indiae; Fox Lungs; Galanga; Galbanum; Generall; Gentiana; Grana Pinae; Guinea Grain; Gum Animi; Gum Armoniac; Gum Caramen; Gum Carannae; Gum Elemni; Gum Guiaci; Gum Hederae; Gum Juniper; Gum Opoponax; Gum Sandrack; Gum Sarcocoll; Gum Serapium; Gum Taccamahaccae; Gum Tragacanth; Hermodactilis; Hypocistis; Incense; Ireos; Jalap; Jujubes; Labdanum; Lapis Calaminaris; Lapis Contrayerva; Lapis Hematitidis; Lapis Judaicus; Lapis Tutiae; Leaves Of Violet Or Flowers; Lentiscus, Or Xylobalsamum; Lignum Aloes; Lignum Asphaltum; Lignum Nephriticum; Lignum Rhodium; Lignum Vite; Locust; Lupines; Manna; Mastick Red; Mastick White; Mechoacan; Miliun Solis; Mirabilanes; Mirabilanes Condited; Mithridatium Venetiae; Mummia; Myrtill Berries; Nardus Celtica; Nigella; Nitrum; Nux Cupressi; Nux De Ben; Nux Vomica; Ol Amber; Ol Almonds; Ol Bay; Ol Ben; Ol Mace; Ol Petroleum; Ol Rosemary; Ol Scorpions; Ol Spike; Ol Terbinthinae; Opium; Orabus; Orange Flower Ointment; Orcant Or Almiet; Origanum; Osipium Huirredum; Ossa De Corde Cervi; Pellitorie; Perrosen; Pionyseed; Pix Burgundiae; Polipodium; Polium Montanum; Pomegranate Pills; Poppyseed; Psyllium; Radix Contra Yerva; Radix Esula; Radix Peonae; Rhaponticum; Rhubarb; Rose Leaves; Rosset; Sal Germine; Sandaracha; Sandiver; Sanguis Draconis; Sanguis Hirci; Sarsaparilla; Sassafras Roots; Sassafras Wood; Saunders White; Saunders Yellow; Scammony; Scordium; Scorzonera; Sebestens; Seler Montanus; Semen Cumeris or Cucurbis Citru, Melon; Senna; Soldonella; Spermaceti Course Oily; Spermaceti Fine; Spica Celtica; Spica Romana; Spikenard; Spodium; Squilla; Squinathum; Staechados; Stavesaker; Stibium; Storex Calida; Storex Liquida; Sulphur Vivum; Tamarindes; Terra Lemnia; Terra Sigillata; Thlaspi Semen; Tornsall; Treacle; Treacle Of Venice; Trocisci De Viper; Turbith; Turbith Thapsiae; Viscus Quercinus; Wormseed; Zedoaria;

#### *Medical Drugs with valuations from 1725 Rate Book:*

Adeps Ursi; Ambra Liquida; Auriculae Judae; Baccae Alkakengi; Balsam Capivia; Bitumen Judiacum; Capita Papaverum; Chamaepitys; Chelae Cancrorum; Cornu Cervi Calcinatum; Cornu Unicornu; Cortex Cariophyllorum;



Cortex Elutheris; Cortex Limonum Vel Aurantiorum; Cowitch; Cranium Humanum; Dens Apri; Dens Equi Marini; Eboris Rasurae; Eryngo; Flores Chamaemeli; Flores Meliloti; Granadilla Peruviana; Gum Copal; Hungary Water; Hypocacuana; Jesuits Bark; Lapis Hibernicus; Lapis Hyacinthus; Lapis Ostiocolia; Lapis Spongiae; Ol Carui; Ol Chemical; Ol Cimyni; Ol Origanum; Ol Perfumed; Ol Rhodium; Ol Thyme; Ol Cariophyllum; Ol Anniseed; Ol Jessamin; Ol Juniper; Ol Sassafras; Ol Cinamon; Pompholix; Radix Bistortae; Radix Cassumuniar, Not Of The East Indies; Radix Enulae Campanae; Radix Mei; Radix Phu; Radix Tormentillae; Rezina Scamonii; Rezini Jallapi; Rhinhurst; Rosa Solis; Saccarum Saturne; Sal Prunellae; Sal Succini; Sal Tamarisci; Sal Volatile Cornu Cervi; Sevum Cervinum; Snake Root; Spa Water; Spiritus Cornu Cervi; Ungulae Alcis; Water, Cordial; Water, Pymont.

Rate Book Drugs:

*This sample includes the Medical Drug sample listed above, plus these commodities with valuations from 1660 Rate Book:*

Almonds Bitter; Alum Plume; Alum Roche; Amomi Semen; Antimonium Crude; Argentum Vivum; Arsenic (Or Rosalgar); Barley Huld; Black Lead; Blatta Bizantiae; Borax In Paste; Borax Refined; Cambogiam; Cardomomes; Carraway Seed; Carthamus Seed; Cassia Lignea; Cerussa; Chrystal, In Broken Pieces; Ciceres; Cinabrium; Copperas, Blue; Copperas, White; Coral (Red And White); Coral Whole; Corriander Seed; Cortex Caperum; Cubebs; Cumin Seed; Daucus; Gardenseed; Ginny Pepper; Grana Tinctorum; Green Ginger; Gum Arabeck; Gum Lack; Gum Seneca; Isinglas; Juniper Berries; Lapis Lazuli; Lentils; Litharge Of Gold; Litharge Of Silver; Marmelade; Mercury Precipitate; Mercury Sublimate; Musk; Musk Cods; Myrrh; Nutmegs Condited; Olibanum; Orpiment; Panther; Pearl, Beaten; Pepper Long; Pistacias; Precipitat; Prunellos; Quicksilver; Rubia Tinctorum; Sal Alkali; Sal Armoniacum; Sal Niter; Saunders Red alias Stock; Seeds for garden; Sponges; Succus Liquoritiae; Talk, Green; Talk, White; Tumerick; Turpentine Common; Turpentine Of Venice; Umber; Varnish; Verdigrease; Vermilion; Vitriolum Romanum; White and Red Lead.

*And these with valuations from the 1725 Rate Book:*

Aqua Fortis; Barbados Tar; Cinnabaris Nativa, not of the East Indies; Colophonia; Cream Of Tartar; Essence Of Lemons; Fechia; Lapis Magnetis; Lapis Nephriticus; Lapis Rubinus; Lapis Sapphirus; Lapis Smaragdus; Lapis Topazae; Mother Of Pearl Shells, Not Of East Indies; Ol Nucis; Ol Palm; Ol Vitriol; Sal Tartari; Sal Vitrioli; Sal Volatile Armoniaci; Salop; Spiritus Vitrioli; Tartarum Vitriolatum; Turpentine of Germany.

Additional 'Medical' items imported.

These commodities were not rated and are not used in samples:

Alligante; Althea; Amber Water; Angelica Water; Apoplectick Balsome; Balsam Tolu; Balsam, Peruvian; Balsam, Spanish; Bulter Pomatum; Cardas Water; Cascarilla; Cassia Buds; Cassia Stones; Cinamon Water; Cinquefoil Seed; Confection Of Hyacinths And Alkermes; Eagle Stones; Ginseng Root; Goa Stone; Granadilla Wood; Gum Of Almonds; Hartshorn; Lapis Aquilegii; Lapis Ashocula; Lapis Granati; Lemon Water; Nux Indica; Ol Capenia; Ol Cloves; Ol

Medicinal; Oil Physical; Opoponax; Orange Flower Water; Orange Ointment; Origano Oil; Orrass Roots; Orvietan; Oil Cloves; Physick Water; Pink Roots; Quatro Semina Frigidorum; Queen Of Hungary'S Water; Radix Cyprus; Radix Ffsarium; Radix Jessamin; Radix Tiberus; Radix, Columba; Scincus Marinus; Scorpions; Semen Ben; Semen Gingslam; Semen Secelees; Succus Cassia; Surgeon's Instruments; Syrup Of Maidenhair; Treacle Of Genoa; Tuberosse Roots; Vipers; Water, Aniseed; Water, Broom; Water, Citron; Water, Ratafie; Worm Powder.

## Appendix C: Annual Values of Main Imported Drugs

	1567 <sup>i</sup>	1588/89 <sup>ii</sup>	1600 <sup>iii</sup>	1609 <sup>iv</sup>	1617 <sup>v</sup>	1621 <sup>i</sup>	1624 <sup>ii</sup>	1629 <sup>i</sup>	1633	1638	1662-8 (av)	1685 1699-1701 (av)	1722-24 (av)	1752-54 (av)	1772-74 (av)	
Agaric	0	48	145	131	111	46	240	1,573	46	50	0	50	317	920	0	1,773
Aloes Cicutina	0	75	0	63	56	0	0	30	240	220	19,005	22,164	20,394	5,084	5,296	77
Aloes Epatica	0	360	0	0	0	0	0	0	112	0	2,867	15,491	2,007	48,117	17,265	8,650
Ambergrease	0	0	0	0	0	27	0	0	0	0	1,025	274	334	6	185	35,769
Benjamin	0	4	0	580	0	1,111	0	456	482	728	17,737	107	18,679	13,791	26,323	7
Bezoar Stone (E Indies)	0	0	0	0	20	21	0	0	0	0	209	1	1,103	5	593	30,088
Cassia Fistula	0	910	800	0	60	712	410	346	867	2,075	3,805	5,269	4,078	1,043	1,568	0
China Roots	0	30	0	752	50	849	0	417	1,223	244	5,339	10,821	18,271	23,163	6,892	1,886
Gum Tragacanth	0	44	0	0	65	2,930	166	1,818	6,125	2,800	19,900	11,286	4,064	4,628	2,379	18
Ireos	1,176	0	0	0	0	746	490	13,171	18,368	4,844	0	504	9,897	5,431	5,660	9,264
Lignum Vite	2	88	0	0	0	0	0	405	206	0	1,065	358	4,653	591	12,073	6,920
Opium	0	0	0	6	0	1,866	0	12,882	222	1,643	4,074	180	2,007	1,475	629	14,251
Rhubarb	20	4	0	0	12	1,349	92	2,500	325	3,249	3,198	8,952	2,070	2,290	24,258	2,091
Sanguis Draconis	0	569	0	0	0	0	0	448	280	0	0	1,703	2,269	0	738	12,661
Sarsaparilla	0	130	0	3,750	0	1,390	550	400	5,188	4,650	1,315	16,749	11,020	1,262	49,831	3,389
Sassafras Roots	0	0	0	0	30	7,030	0	0	426	0	0	1,736	10,605	188,168	116,005	73,084
Scammony	0	114	0	0	0	100	33	9,870	223	501	1,955	2,898	1,496	2,032	1,036	38,128
Senna	875	245	0	365	0	3,725	1,362	0	7,430	4,470	15,777	25,263	20,884	34,919	30,726	225
Spica Celtica	0	3,696	0	0	0	0	0	0	0	0	0	4,592	0	0	0	59,999
Spikenard	0	5	0	0	8	294	60	2,206	0	0	3,019	0	1,885	825	0	0
Storax Calida	0	0	0	0	0	197	0	120	0	0	180	4,058	1,196	333	250	463
Sulphur Vivum	0	25	0	12	0	0	0	98	0	0	0	0	0	0	46	248
Treacle	7,555	6,700	0	0	84	0	0	0	0	0	0	60	229	0	0	237,678
Wormseed	791	280	0	760	2,232	10,497	265	16,372	16,944	9,068	15,440	6,969	17,663	6,732	3	0
Manna	2	45	0	177	251	360	782	0	2,063	670	0	27,488	6,682	18,068	33,230	426
Oyl Anniseed	0	0	0	0	0	0	0	0	0	0	0	99	12,690	141	631	32,318
Jalap	0	0	0	0	0	0	0	25	240	0	0	0	7,042	6,272	15,694	576
Jesuits Bark	0	0	0	0	0	0	0	0	0	0	0	2,778	2,045	76,071	98,820	2,953
Water, Pyrmont	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37,415
Camphor, Unrefined	0	0	0	0	0	0	0	0	0	0	928	1,711	46	0	24,549	0

**Note:** Drugs included are the 'top ten' drugs by value for the periods given in Table 3. Partial totals for 1588 (English merchants) and 1589 (Alien merchants) are summed. For 1662-8 the total is an average of 1662-3 and 1668-9. For 1699-1774, the three year average for each sample period is given. No other adjustments have been made to compensate for the partial coverage of the early years. i. Port Book only contains imports by English Merchants; ii. Port Book only contains imports by Foreign Merchants.

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