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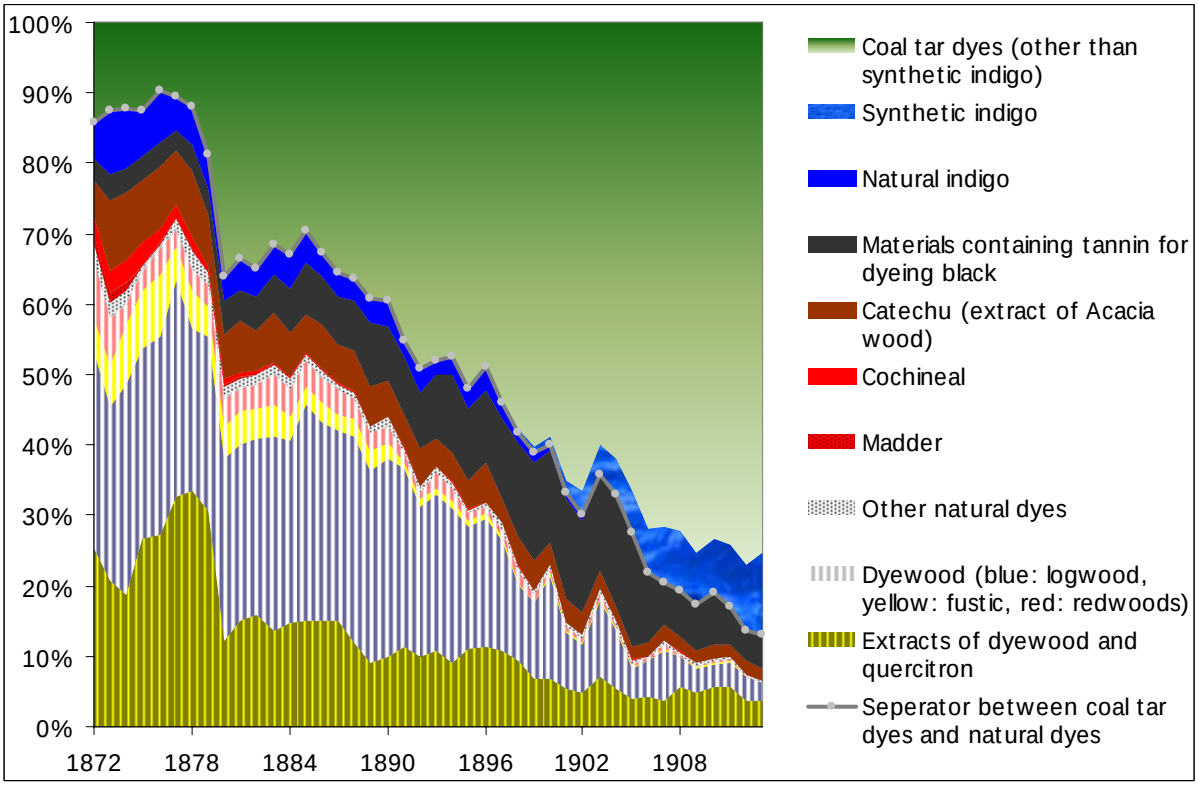
From traditional networks to modern companies

The transition of the markets for dyestuffs in the 19th century

In the late 19th century, the textile industry saw a shift from natural towards artificial dyes. This was not merely a technological development, the institutional and organisational background of the production and marketing of dyestuffs also changed. Natural dyes were mainly produced in colonial economies, whereas artificial dyes were manufactured by newly founded chemical companies. Consequently, the creation of markets for new articles was conducted differently in both contexts. The paper seeks to elucidate the transformation of market construction brought about by the emergence of modern companies. In other words, it traces the beginning of modern marketing.[1]

Market shares of dyes in Germany, according to the amount of textiles dyed with, 1872–1913



Source: Taken from the PhD thesis of the author, where the computations are explained in detail. The figures are based on German trade statistics on imports and exports of dyes and sources on German dye production. The amount of textiles that could be dyed with a certain amount of a certain dye was calculated by analyzing several hundred dyeing recipes from a large number of contemporary handbooks.

1 Hollander (2005). Regarding periodisation issues of the history of marketing: Blaich (1982); Fullerton (1988); Rossfeld (2004).

It has been suggested, especially within the academic discipline of marketing science, that marketing is a concept that evolved in the 1960s and 70s. This is true only inasmuch marketing is conceived as a deliberate, theoretically reflected business strategy to organize an enterprise entirely according to the requirements of the market. In a broader sense, marketing refers to all considerations and measures by which a producer aims to mediate its own supply and the according demand of potential buyers. As this is not done automatically by an abstract market mechanism, at heart marketing efforts are inseparable from any market participation of sellers. However, this paper suggests that there exist such grave differences between pre-modern and modern markets that only in the second half of the nineteenth century circumstances allowed for, as well as required, permanent marketing activities in a modern fashion familiar to us.

Previous studies on the practice of 19th century marketing focussed first and foremost on consumer goods.[2] In this perspective, the appearance of modern marketing seems to have been a consequence of the beginning of mass consumption in the wake of the industrial revolution. To put this connection to a test, the example in this paper is drawn from early industrial goods marketing. The emergence of the business-to-business marketing of dyestuffs cannot be explained by drawing on arguments from the history of consumption. It will also be seen that industrial goods marketing did not originate from an unreflected transfer of routines from consumer goods marketing. Instead, the key lies in a development that until now has not received proper attention[3]. It is the structural transformation from pre-modern to modern markets.

In the first section, the characteristics of pre-modern markets for dyestuffs are portrayed. It will then be asked as to what extent marketing activities were possible and necessary in such a context. The third part of the paper describes the fundamental transformation of the markets for dyestuffs in the 19th century: When new factory-made 'artificial' dyestuffs challenged the traditional agricultural produce of natural dyes, a new type of actor – the chemical company – entered the scene. The fourth section deals with the consequence of this development and shows that the action framework of the market was deeply altered.

(1) The pre-modern markets for dyestuffs

Pre-modern markets for dyestuffs, and markets for many other goods as well, differed from modern markets in four ways.

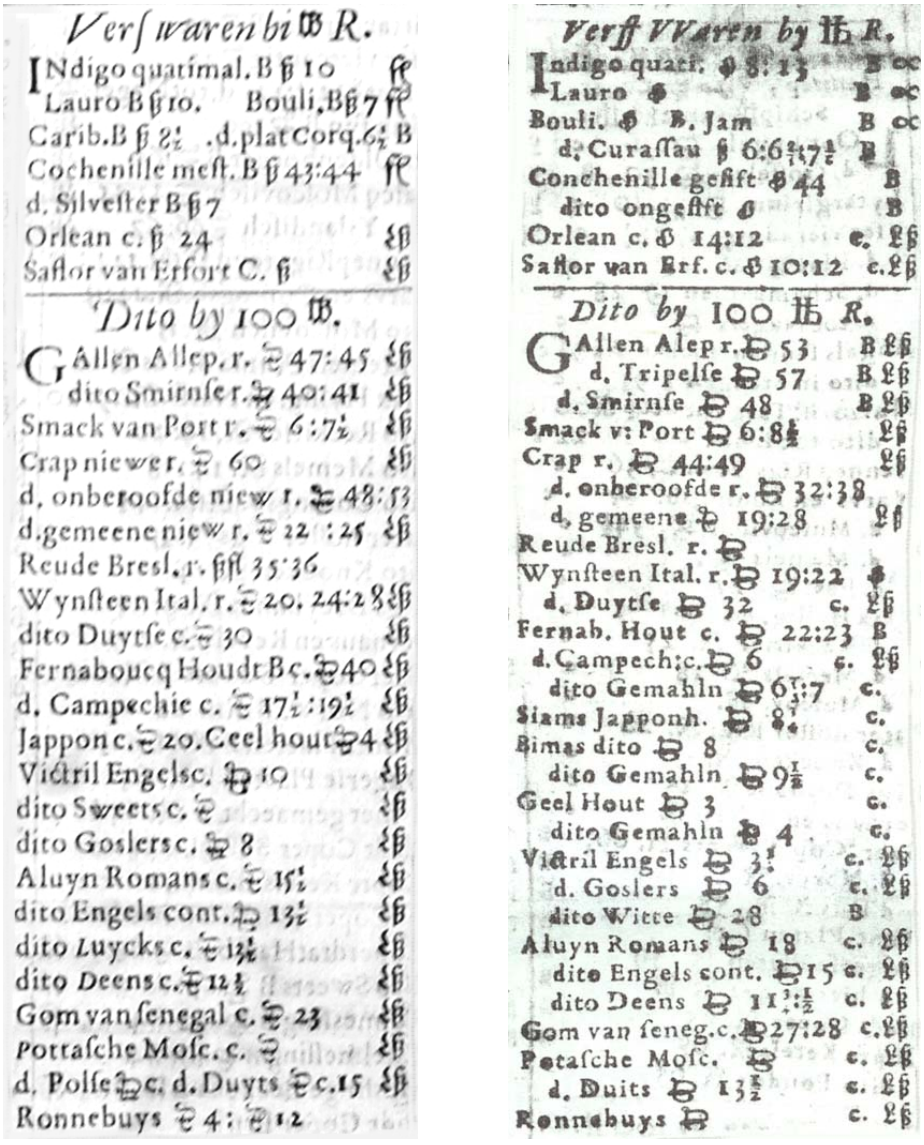
First, pre-industrial markets were decisively less dynamic in their evolution, as far as the goods are concerned. Market structures remained static for fairly long periods of time. This

2 Tedlow (1990); Tedlow (1993); Fitzgerald (1995); Laird (1998).

3 An interesting exception: Porter/Livesay (1971).

observation, it has to be emphasized, does not refer to the long-standing but wrong belief that people in the age of guilds were averse to competition and sought to regulate markets.[4] On the contrary, the formation of prices usually took place without any effective interference, yet within a comparatively static economy.[5] This can be illustrated for example by comparing a Hamburg price current from 1672 with one from 1728.

Prices of materials for dyeing, printed in Hamburg price currents from 1672 (left) and 1728 (right)



Verſ waren bi ℔ R.

INdigo quatimal. B ß 10 ß
Lauro B ß 10. Bouli. B ß 7 ß
Carib. B ß 8½ .d. plat Corq. 6½ B
Cochenille meſt. B ß 43:44 ß
d. Silveſter B ß 7
Orlean c. ß 24 £ß
Saflor van Erfort C. ß £ß

Dito by 100 ℔.

GAllen Allep. r. ℔ 47:45 £ß
dito Smirnſe r. ℔ 40:41 £ß
Smack van Port r. ℔ 6:7½ £ß
Crap niewe r. ℔ 60 £ß
d. onberoofde niew r. ℔ 48:53 £ß
d. gemeene niew r. ℔ 22 :25 £ß
Reude Bresl. r. ßß 35:36
Wynſteen Ital. r. ℔ 20. 24:28 £ß
dito Duytſe c. ℔ 30 £ß
Fernabouc q Houdt B c. ℔ 40 £ß
d. Campechie c. ℔ 17½:19½ £ß
Jappon c. ℔ 20. Ceel hout ℔ 4 £ß
Victril Engelsc. ℔ 10 £ß
dito Sweets c. ℔ £ß
dito Goslers c. ℔ 8 £ß
Aluyn Romans c. ℔ 15½ £ß
dito Engels cont. ℔ 13½ £ß
dito Luycks c. ℔ 12½ £ß
dito Deens c. ℔ 12½ £ß
Gom van ſenegal c. ℔ 23 £ß
Pottaſche Moſc. c. ℔ £ß
d. Polſe ℔ c. d. Duyts ℔ c. 15 £ß
Ronnebuys ℔ 4: ℔ 12

Verſſ VVaren by ℔ R.

Indigo quatr. ℔ 8: 13 B ∝
Lauro ℔ B ∝
Bouli. ℔ B. Jam B ∝
d. Curaſſau ß 6:6 13/17 B
Conchenille geſift ℔ 44 B
dito ongeſift ℔ B
Orlean c. ℔ 14:12 c. £ß
Saflor van Erf. c. ℔ 10:12 c. £ß

Dito by 100 ℔ R.

GAllen Alep r. ℔ 53 B £ß
d. Tripelſe ℔ 57 B £ß
d. Smirnſe ℔ 48 B £ß
Smack v: Port ℔ 6:8½ £ß
Crap r. ℔ 44:49 £ß
d. onberoofde r. ℔ 32:38
d. gemeene ℔ 19:28 £ß
Reude Bresl. r. ℔
Wynſteen Ital. r. ℔ 19:22 ℔
d. Duytſe ℔ 32 c. £ß
Fernab. Hout c. ℔ 22:23 B
d. Campech: c. ℔ 6 c. £ß
dito Gemahln ℔ 6 7/8:7 c.
Siams Japponh. ℔ 8 1/4 c.
Bimas dito ℔ 8 c.
dito Gemahln ℔ 9½ c.
Geel Hout ℔ 3 c.
dito Gemahln ℔ 4 c.
Victril Engels ℔ 3 1/4 c. £ß
d. Goslers ℔ 6 c. £ß
dito Witte ℔ 28 B
Aluyn Romans ℔ 18 c. £ß
dito Engels cont. ℔ 15 c. £ß
dito Deens ℔ 11 3/4:½ c. £ß
Gom van ſeneg. c. ℔ 27:28 c. £ß
Petaſche Moſc. ℔ c. £ß
d. Duits ℔ 13½ c. £ß
Ronnebuys ℔ c. £ß

Source: Nederlandsch Economisch-Historisch Archief, Bijzondere collecties 472, inv. No 1.01 [01/11/1672]; Bergarchiv Clausthal, Alte Saline Lüneburg, A: Generelle Nachrichten, Fach 1409, vol. 2 [18/06/1728].

Price currents are extensive lists of the common wholesale prices for up to a few hundred goods at a certain place. Since the beginning of the 17th century, they were published at

4 Brandt/Buchner (2004).

5 Gerhard (1998); Gerhard/Engel (2006).

least weekly in centres of trade like Amsterdam, London or Hamburg.[6] The sections shown here apply to „Verf.waren“, i.e. materials for dyeing. It is evident that the listing of goods had hardly changed over a period of 56 years. This is not due to inattentiveness of the publishers, but points to the fact that the market structures, as far as it regards the range of tradable goods, remained essentially the same for two generations. The prices developed dynamically, the limited range of goods did not. This was true not only for dyestuffs, but also for foodstuffs or textiles.

Second, pre-modern markets for dyestuffs were exceptionally polypolistic. Single actors like planters, merchants and dyers dominated the market. Apart from monopolistic trading companies like the East India Company (EIC) or the Vereenigde Oostindische Compagnie (VOC)[7], hardly any permanent enterprise could be found in the market. Consequently, hardly any participant could control more than a tiny share of the market and – even if a business was often handed down from father to son – managed to stay permanently in the market.

Third, combined with the limited contemporary means of transport and communication, the fragmentation also meant that pre-modern markets for dyestuffs were organized in a particular way. A distinctive third sphere, the sphere of trade, separated the spheres of production and consumption[8]. European dyers and textile printers on the one hand and the producers of the main dyestuffs in the Americas and Asia on the other did not interact directly; instead they were linked by independent merchants. These intermediaries usually traded in a broad variety of goods. Whereas modern specialist suppliers excel in their profound knowledge of a certain good or group of goods, the skills of early modern universal merchants lay in the initiation and realisation of transactions in an opaque and legally uncertain business world.[9]

Finally, due to the high number of small producers and their separation from the demand side of the market, dyestuffs and most other goods in the pre-industrial European economy were commodities in a narrow sense, as opposed to specialities. Whereas specialities like branded products are defined by their producers and identifiable to the buyer as made by a certain producer, commodities like copper or crude oil are defined by their utility to the buyer, regardless of by whom it is produced and supplied. In general, specialities have a higher degree of processing than commodities and are thus more likely to be attached to a certain producer than the latter.

6 On price currents: McCusker/Gravesteijn (1991). On the Hamburg currents in particular: Baasch (1902); Gerhard/Kaufhold (2001).

7 In general: Emmer/Gaastra (1996); Prakash (1997); Chaudhury/Morineau (1999). On the VOC: Glamann (1958); Steensgaard (1974). On the EIC: Chaudhuri (1965); Chaudhuri (1978).

8 Kriedte (1994).

9 Denzel (2002); Engel (2000); Engel (2002).

(2) Marketing in pre-modern markets for dyestuffs?

Obviously, permanent marketing efforts in pre-industrial markets for dyestuffs would have been quite inane. As the few goods in the market were commodities, not specialities, single producers would have had a hard time to promote their products as being unique and different from those of other producers. Anyway, any producer of a natural dyestuff held only a tiny share in the market and therefore had very limited latitude and leverage. Intermediaries on the other side, including the monopolistic trading companies, usually operated with a broad and flexible assortment of merchandise. They did not bank on the success of a single commodity and hence showed little inclination to invest extensively into the marketing of specific goods.

Yet even in pre-industrial times, opportunities for a confined set of marketing measures occurred. Market structures were comparatively static, but not immutable. On the one hand, in the course of the centuries some new dyestuffs appeared that seemed promising for commercial use. On the other hand, and this happened more often, a new producing region for an already available dyestuff could try to enter the market. In both cases, the new good or, respectively, the new variety had to be established in the market.

New varieties were often marketed by imitation, i.e. one tried to copy those features of the outer appearance of commercially successful sorts of the same good, by which these were identified in trade. This can be seen for instance in the attempts by the East India Company in the period from about 1780 to 1810, to install a European-lead production system for indigo in India.[10] Indigo, a highly concentrated extract from leafs of the indigofera plant, was the main blue dye in early modern times and an important substance for dyeing textiles black.[11] In terms of value, it covered about 30 to 40 percent of the entire British market for dyestuffs in the second half of the 18th century. To establish a new variety of indigo in the London market, it was not sufficient to achieve the quality standards of the Spanish and French indigos from the Americas, which dominated the market. For years, the London headquarters of the East India Company gave written feedback to their Bengal office as to how the article was received in the London market, which varieties had the best prospects, and in what way the indigo lumps had to be fashioned in order to increase their sales potential. Attached to the letters, indigo samples and cut pieces of wood were send to illustrate statements like the following[12]:

10 For the emergence of British rule in India that resulted from a political vacuum and the presence of the EIC (which until the middle of the 18th century confined itself to commercial interests): Förster (1992); Sen (1998); Wild (1999). On the history of the European-lead indigo manufacture in India see ann. 34.

11 von Georgievics (1892); Vetterli (1950); Haller (1950); Seefelder (1982); Sandberg (1989); Balfour-Paul (1998).

12 British Library, India Office Records, E/4/628, pp. 491-624, East India Company in London to Governor in Council in Fort William (Bengalen), 11/04/1785, here: pp. 568, 607-608.

"[W]e have selected a number of Samples of the quality most approved, to which you will not fail to pay the strictest attention. […] We are confident, that with care in selecting the Qualities which will suit this Country it might as we have before observed prove beneficial, as the article is generally esteemed […]. At present there is a prejudice against it from its shape and appearance, which We conceive might be easily remedied by making it in Squares of about 1 ½ to 2 inches like the Sample No 2 which will make it resemble and answer every purpose of that which is made by the French at St. Domingo which is in high estimation; If in forming or drying the Indigo the Sand and Dirt which adheres to the Outside could be avoided, it would render it more pleasing to the eye and more saleable".

The less frequent cases of the introduction of whole new dyestuffs can not always be sharply distinguished from the promotion of new varieties. A good example is the way in which Europeans in the 16th century selectively adopted American dyestuffs known in pre-Columbian dyeing. The logwood[13] from the Bay of Campeche resembled brazilwood, which was already in use in European dyeing in the late middle ages. The former could be employed in dyeing in the same way as the latter; the difference being in the outcome, i.e. that logwood provided fugacious blues and fast blacks, whereas brazilwood gave reds and browns. Likewise, the cochineal dye[14] made from scale insects in the Oaxaca region in New Spain was similar to the Kermes dye[15] prepared from European scale insects. Both could be applied analogously; again only the result differed, as red from cochineal was more brilliant than red from kermes.

A special, but revealing case is the introduction of quercitron into European dyeing at the end of the 18th century. The trade name 'quercitron' refers to the bark of the North American black oak, whose property of dyeing fast yellow was discovered in the 1770s by a physician called Edward Bancroft.[16] Not only did he promote the new dye and receive a grant to act as sole English importer for some years, he also became one of the most prominent experts in the theory of dyeing and wrote the best known English book on the matter[17]. Unsurprisingly, remarks on his discovery occupied a large part of the publication[18]. The knowledge of quercitron soon spread in the colouristic and commercial literature. In other words, the marketing for the new dye took the form of rewriting the common knowledge about what the range of feasible natural dyes consisted of. Something similar will be observed later on in this paper, when the marketing of coal tar dyes is addressed.

13 Wilson (1936); Ponting (1973); Schleich (1988); Offen (2000).

14 Born (1936); Lee (1951); Dahlgren de Jordan (1963); Donkin (1977).

15 The similarity also shows in the denomination, as "grana cochinilla" means "small grains of kermes".

16 Bancroft (1798).

17 Bancroft (1794), here: vol. 1, pp. 319-405.

18 This part was immediately translated into German: Bancroft (1795).

In terms of the classical marketing mix, the examples given above almost exclusively represent product management. That there are hardly any cases of pre-industrial marketing by pricing, promotion or distribution policy ("placing") is due to the idiosyncrasies of pre-modern markets. The distribution of dyestuffs to the dyers and textile printers was not accomplished by the producers themselves, but by a network of independent merchants. In general however, the latter did not specialize in a single commodity, and therefore there was no particular strategy regarding product-specific distribution channels. Furthermore, as a rule, information and knowledge about a commodity on the one hand and the commodity itself on the other were disseminated separately and by different groups of persons. The promotion strategy of Edward Bancroft is an exception, inasmuch as he united both functions by acting as an entrepreneur as well as a scientific expert on colouristic and commercial knowledge. Finally, there was little leeway for pricing measures. The participants in the highly polypolistic markets had virtually no market power at all, and as dyestuffs were commodities and as such valued more by there utility than by who produced them, pricing was very much done on the demand side of the market, according to the relation of supply and demand.

(3) The transformation of the markets for dyestuffs in the 19th century

Since the middle of the 18th century, the conception of a dyestuff as a holistic, unalterable gift of divine creation increasingly gave way to a new interpretation. Now, dyestuffs were seen as manipulable compositions of certain, more basic substances, of which only one carried the property to give colour in dyeing. In the attempt to isolate and separate those true colouring matters, the products of trade were exposed to a variety of analyzing procedures like distillation, filtration, and crystallization.[19] This academic practice of deconstruction had an immediate technological and economic impact, as the analyzing techniques could be employed on a commercial scale to get more pure and homogenous dyes. In the later 18th century, dyewoods were leached out with water to fabricate tinctures and 'dye broth'.[20] More elaborate products appeared in the 19th century. One of the most successful was an extract called garancin, which was obtained by treating madder root with sulphuric acid.[21]

19 Nieto-Galan (2001), pp. 94-100.

20 Extraction was propagated by a number of textbooks on dyeing. Exceptionally zealous and not confined to dyewoods: Gülich (1779-1799), here: vol. 4 (1786), pp. 144-149 (galls), p. 216 (brazilwood), pp. 253-254 (annatto), pp. 264-265 (turmerick), p. 273 (yellow berries), p. 320 (logwood).

21 The production of garancin was started by Robiquet and Colin, who had discovered alizarin, the main colouring matter of madder. To manufacture garancin, they simply employed their analyzing technique on a commercial scale: Travis (1994). More detailed and also on other preparations of madder: Schützenberger (1868-1870), here: vol. 2, pp. 133-168.

Traditionally, the processing of dyes was done either in connection with the cultivation of dye plants, as it was the case with indigo making, or in the dye house, when dyers pulverised or solubilised dyeing material in order to ease its application. Now, a third technological sphere emerged, independent of and in between dye plant cultivation and dye application. A new group of specialists, often merchants with experience in the dye trade, took over the refinement of natural dyestuffs. They also started to offer blends and preparations.[22] Given the growing complexity of the dye business and taking into account that the global business world became ever more established and transparent in the 19th century, the tasks of merchants shifted. Whereas it got less problematic to initiate and realize transactions over long distances, the importance of commercial and technological expert knowledge increased. Universal merchants turned into special suppliers[23] and concurrently took over the business to further process, refine and combine dyes.[24] From time to time, especially since the 1840s, wholly new dyes appeared as a result of the tentative treatment of natural dyes or even of chemical experiments not concerned with dyes at all. The best known representatives of these 'artificial' substances are the aniline dyes, which were derived from coal tar. They entered the markets from the late 1850s onwards.[25]

The distribution of natural dyes as well as the production and distribution of extracts, preparations, and artificial dyes were often all carried out in a single business. The successful Swiss company Geigy for instance started as a supplier for natural dyes, but incorporated a dyewood mill, an extraction plant and a factory for making coal tar dyes.[26] Prominent German chemical companies like Bayer and Hoechst were co-founded by merchants originally trading in natural dyes.[27] The BASF, after a few years in existence, merged with the two trading houses that had already organized the distribution of BASF-products and thereby acted like an, albeit external, sales department.[28] As far as it regards artificial dyes, the sphere of independent intermediates vanished, when industrial dye manufacturers began to sell directly to dyers and textile printers, and a handful of larger companies ousted the

22 Lowengard (1999).

23 For the United States, Porter and Livesay propose a "division of the history of nineteenth-century marketing into three distinct periods. The first was the age of the all-purpose merchant [...]. Next came the age of the specialized wholesaler, which continued into the 1870s. Finally came the era of the manufacturer": Porter/Livesay (1971), pp. 4-5.

24 Schuster (1973); Fox/Nieto-Galan (1999).

25 In 1856, William Henry Perkin accidentally came across an aniline dye that produced a mauve colour on silk. Although often quoted as a break-through discovery, 'mauveine' was not the first fully synthetic dye, not even the first known aniline dye. On Perkin: Garfield (2001). On early artificial dyestuffs: Farrar (1974); Schweppe (1993), p. 144.

26 Bürgin (1958).

27 Bäumler (1989); Nieberding (2003).

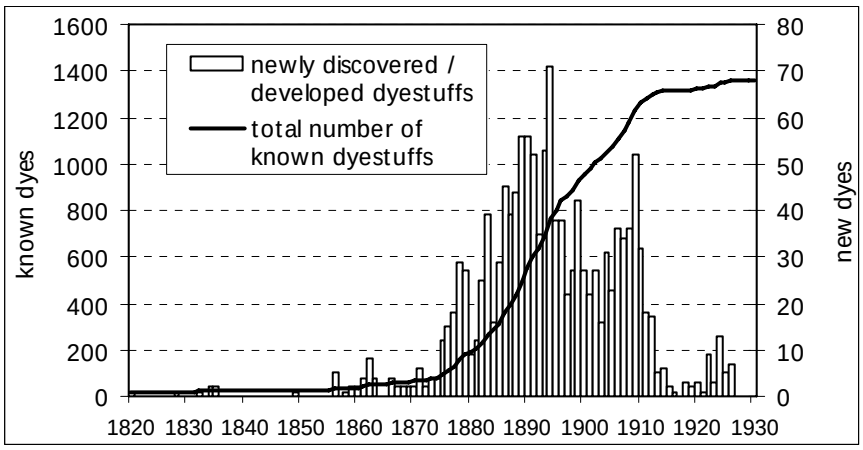
28 Abelshauser (2002).

multitude of small producers. The pre-modern polypolistic market with its three distinctive spheres of producers, intermediates, and consumers was superseded by an oligopolistic market, in which only two spheres remained, suppliers and buyers.[29]

Concurrently, the power of defining goods devolved to the modern industrial companies and the chemists they employed. Dyestuffs were no longer distinguished and defined by there utility in application, but by their chemical constitution. In pre-modern times, a new dyestuff was regarded as a new find in nature's collection of ready-made goods. A newly developed dye of the 19th century, on the other hand, passed for a human, not a divine creation. The creator of the new dye could claim exclusive rights to it, as certified in the new legislation on patents and trademarks.[30] The chemical companies accordingly put up laboratories and employed well-trained chemists not so much for research and development, but to be able to handle infringements of industrial property rights.[31] When the power to define dyestuffs changed from the demand-side to the supply-side of the market, their character as trade goods altered. They turned from commodities into specialities.

The transition to modern markets was completed by the disappearance of the first characteristic of pre-modern markets mentioned above, the narrowness and constancy of the range of goods:

Number of commercially feasible dyestuffs, 1820–1930



Source: Computed from the listings in Schultz, Gustav, Farbstofftabellen, 7.A., Leipzig 1931.[32]

29 The evolution of the chemical industry as far as it regards the dye business is analysed by Murmann (2003). Also instructive: Beer (1959); Fox (1987); Travis (1993).

30 On patents: Seckelmann (2006); Streb (2006). With a focus on the chemical industry: Zimmermann (1965); Kuczynski (1970); Fleischer (1984). On trademarks: Wadle (1977-1983); Wilkins (1992).

31 Homburg (1992).

32 The chart shows the number of chemically different substances, different products and brands based on a substance are not counted separately. There are maybe up to a few hundred dyestuffs of unknown chemical constitution, these are also not accounted for. To date the appearance of a new dye, the year of discovery as

In the course of the 1870s, the chemical companies institutionalized efforts to constant innovation and creation of new dyes.[33] There had been no more than about 15 to 20 commercially viable dyestuffs for centuries, but from the late 1870s to the outbreak of World War I, the number of tradable dyes increased yearly by up to a few dozens. The chart above illustrates the development of known, chemically distinguishable substances for dyeing. The number of branded products available in the market was much higher, as a single chemical substance was usually sold as part of different blends, and often marketed by different companies.

(4) Necessity and limits of dyestuff marketing in the late 19th century

The hundreds upon hundreds of new products were not self-explaining; they could never have 'sold themselves'. Therefore the suggestion of some older studies on the history of marketing has to be rejected, that companies in the late 19th century were generally product-driven[34], i.e. that in developing new products they were mostly ignorant towards what was demanded by the buyers. As the German and Swiss dye makers were either rooted in the traditional dye trade or had merged with such enterprises, merchants had a strong say in the company policy and strategy. Therefore there was a tendency to act sales oriented or even customer oriented. As regards the understanding of marketing as the producer's mediation of its own supply and the according demand of potential buyers, one could define customer orientation as the attempt to adapt the own supply to the demand, and sales orientation vice versa as an effort to affect demand in order to fit it to the own range of products. The chemical companies tried both.

With respect to their extensive distribution network and the widespread deployment of travelling salesmen, dye makers were cheek by jowl with their customers. Other than in the case of pre-modern markets in which producers and consumers where separated by the sphere of independent intermediates, there was a strong bi-directional communication link between the dyers and the chemical companies, who were responsive to feedback of the buyers and modified their range of products accordingly. The producers of natural dyes increasingly conceived the lack of such feedback as a serious drawback. Again, the manufacture of indigo in India is an illustrative example. India had become the global market leader in indigo production early in the 19th century,[35] and indigo was one of those natural

stated by Schultz is used. In the few cases in which no year of discovery is given, the publication date of the oldest scientific reference to the dye cited by Schultz is resorted to instead.

33 Meyer-Thurow (1982); Hornix (1992); Reinhardt (1997).

34 Also critical of such a 'product orientation': Fullerton (1988), pp. 108-125; Rossfeld (2004), pp. 17-39.

35 On India's economy in the 19th century: Sinha (1967); Rothermund (1985); Chaudhuri (2002). On the indigo production in India: Asiaticus (1912); Ghosh (1944); Shukla (1993); Pouchepadass (1999); Ray (2004).

dyes that could keep a significant share in the market of dyestuffs even during the rise of coal tar dyes. In 1897, the BASF launched the sale of synthesized indigo.[36] Natural indigo now stood in a sharp competition, and it did not perform too well.[37] Consequently, the Behar Indigo Planters' Association (BPA), the most important lobby group, discussed the idea to levy an export duty on indigo in order to finance a marketing board. Such a strategy had been pursued by representatives of Indian and Ceylonese tea planters since the 1880s, to keep Japanese and Chinese competitors at bay.[38] Although in the end an indigo marketing board was not realized, the discussion of the very idea reveals a lot about the market situation in which the planters found themselves. One of the suggested fields of activity was the employment of salesmen, which was thought could remedy the disadvantage of not having a bidirectional communication link to the customers: "Our commercial travellers besides pushing our stuff might also act as an intelligence department which is sorely needed. They could keep us informed as to the work being done by the Badische [Anilin- und Soda Fabrik, i.e. BASF; A.E.]. Might possibly tell us what their bottom price was. Whether the report that the Synthetic people were making indigotin at a loss was true or false. They might also advise us as to whether the suggestion, often put forward, that we should sell some of our indigo in powder or paste would really find to increase consumption or not".[39]

Yet the potential to develop customized products was limited, not only regarding natural dyes, but also in the case of the coal tar dyes. It posed no serious problem to combine different dyestuffs into a blend and to present a dye as powder or paste, but chemists were far from able to design dyes with pre-defined processing attributes, colour shade, and fastness characteristics. Thus the strategy of the industrial makers was an unrestrained diversification; hundreds upon hundreds of dyestuffs were launched and their marketability tested in practice. This was a rational procedure, as the costs of development and of taking up production was usually fairly low.

A decisive factor for the growing success of coal tar dyes over natural dyes was not so much to create a supply suitable for the demand of the dyers, but to alter the needs of the dyers. This can be described in theoretical terms of industrial marketing. According to Klaus Backhaus[40], four basic forms of industrial goods marketing can be distinguished, depending

36 On this innovation from the viewpoint of the history of science: Reissert (1898); von Baeyer (1900). An excellent economic analysis by a contemporary: Jenke (1909).

37 Kumar (2001); Engel (2005).

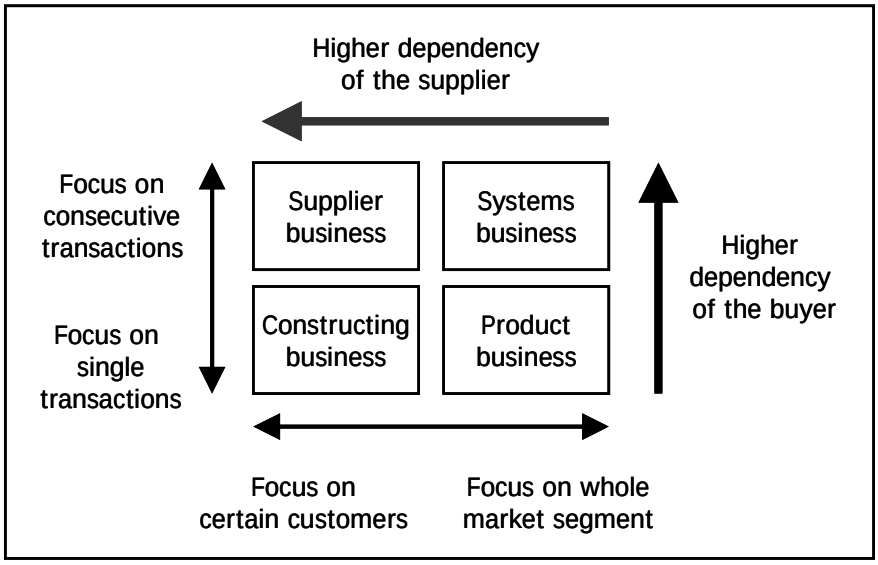
38 Ramamurthy (2003).

39 British Library, India Office Records, L/E/7/522, No 2662, Memorandum of the Sirsiah Research Committee, Sirsiah Research Station, 07/11/1906.

40 Backhaus (2003).

on the one hand on whether the product aims at special customers or whole segments of the market, and on the other hand whether a transaction is self-contained or tends to entail further transactions due to path dependencies. In each of the four resulting cases, sellers and buyers bear a different degree of dependency on each other.

Types of industrial (goods) marketing



Source: Own design, following Klaus Backhaus, Industriegütermarketing, München [7]2003, p. 324, E15.

Originally, the dye trade is product business. The dyestuffs aimed at whole market segments, not just special customers, and to buy a batch of dye did not mean that the next batch had to be bought from the same supplier. Yet the manufacturers of coal tar dyes tried to make a shift towards systems business, in order to increase the dependency and thus the loyalty of customers. To that end, they enhanced the specificity of their products by, so to speak, bundling the dyes with expert knowledge on their application. Before offering a new dye for sale, the chemical companies fathomed its dyeing and fastness characteristics by intense testing in their probationary dyeing departments, to develop advantageous standardized procedures to employ it. These techniques were conveyed to the customers in instruction courses[41] and, similar to the case of quercitron, in manuals.[42]

In following the instruction, dyers had to invest in new equipment and to subdue to external expertise in switching from being masters in the art of dyeing to being users of the science of dyeing. Yet on the other hand, this change yielded better dyeing results and secured to the dyers a hitherto unknown customer service by the chemical companies. Natural dyes with their undetermined dyeing characteristics that changed from batch to

41 Higgins (1907).

42 For example: BASF (1896a); BASF (1896b); BASF (1900, [2]1907); Farbwerke ([2]1901); Leopold Cassella (1905); Leopold Cassella ([3]1906); Farbenfabriken (1911); Leopold Cassella ([2]1911-1914).

batch were rather less suitable for the new kind of standardized industrial dyeing. In enriching their products with knowledge and in creating technical path dependences, the coal tar dye manufacturers succeeded in pushing the dye trade towards systems business and to shake off, to a certain degree, the producers of natural dyestuffs.

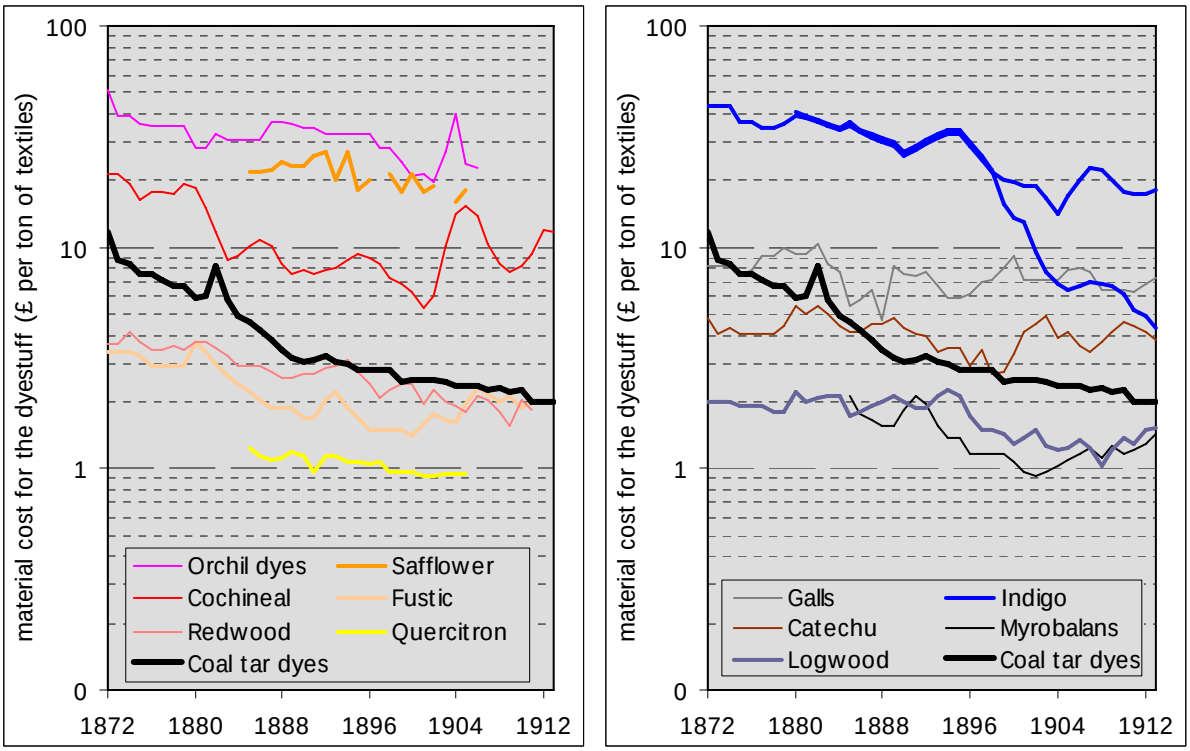
(5) Conclusion

The markets for dyestuffs underwent a fundamental transformation in the 19th century. Following the scientific deconstruction of natural dyes, dye production and dye trade became more complex. Barriers to entry increased markedly, and in lieu of a varying multitude of single small producers and independent merchants, a few larger, integrated companies engaged permanently in the market. Then again, the range of goods that had been comparatively static until the middle of the 19th century became highly dynamic. One might exaggerate and state that a thousand short-lived suppliers for just a few long-lived products were replaced by a just a few long-lived suppliers for a thousand short-lived products. Concurrently, the definition of dye products by the producer supplanted the traditional definition according to their utility to the buyer. This transition from a static world of commodities to a dynamic world of specialities resulted in a new framework of action, in which marketing turned from an occasional possibility to a permanent necessity.

The breakthrough of this transition came in the 1880s, after German dye makers had institutionalized the constant innovation of new dyes by setting up the first ever R&D laboratories, flanked by an according patent law since 1877. The parallel development of permanent marketing endeavours secured the market success of the ever growing multitude of new products. But the ousting of the natural dyes was not, as it is often stated, accomplished overnight. As can be seen in the chart at the beginning of this paper, even in 1913 natural dyes had a market share in Germany of about one seventh; despite the fact that the German coal tar dye makers were global market leaders, which makes it probable that in no other country the share of natural dyes was so low. Also it is not the case that artificial dyes were vastly cheaper than natural dyes, and hence could beat them first and foremost in price (see chart on following page).

As the coal tar dyes changed from being niche products for luxury items and became articles for the dyeing of all kinds of textiles, their average price decreased more markedly than the prices of the majority of natural dyes. But it is notable that a number of traditional dyes managed to stay cheaper than the artificial products. In any case it is obvious that cost is not the main argument in the triumphant advance of the factory-made dyes. Rather, the changing nature of the market and the ability of the modern, integrated chemical companies to outmanoeuvre the traditional producers and merchants in this new action framework are at the heart of the story.

Material cost for dyestuffs according to the prices of the German trade statistics, 1872–1913



Source: Taken from the PhD thesis of the author, where the computations are explained in detail. For coal tar dyes, the export price is shown, for natural dyes the import price. Regarding indigo, the upper branch shows the export price of artificial indigo, the lower branch the import price of natural indigo.

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