Substitution or Segregation? The Impact of Changes in Employment, Production and Product on Gender Composition in Dutch Manufacturing 1899–1999

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This study focuses on the issue of substitution or segregation in the demand for female labour. Based on an extensive overview of detailed studies, the authors examine fluctuations in the gender composition of the workforce in four major sectors of Dutch manufacturing industry over the past century. Women's share in employment has been stable in the clothing industry, fluctuated in textiles, increased in food production and decreased in Philips Electronics. Changes in the proportion of women in these industries are primarily explained by segregation, that is by fluctuations in employment in the male and female domains. Only a few examples of substitution can be traced. These are primarily driven by labour shortages, and the numbers of workers involved are small. Overwhelmingly, employers prefer to act within gender boundaries.

Keywords: clothing industry, food industry, Philips Electronics, textile industry, The Netherlands

Introduction

Labour markets in the European Union are highly segregated by gender, with women concentrated in certain occupations and industries and men in others. A major aim of the European equal opportunities strategy is to close the gender gaps in the labour market, by, among other things, promoting desegregation (European Commission, 2001). Academic studies have revealed that occupational

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desegregation has been minimal over time, and that occupational segregation ratios appear to be higher at disaggregated levels of analysis, that means at workplace level. At this level, clearly defined male-dominated and female-dominated domains of work exist, and it is likely that these domains will retain their sex stereotypes for quite some time, probably for decades.

Although occupational segregation has been researched extensively, many issues remain to be understood in greater detail, particularly at workplace level. Four questions are still unexplained. First, over the past century industries have faced major changes in production processes, such as mechanization, automation and increases in the scale of production. Do these changes affect the gender composition of the workforce along occupational lines, thus reinforcing segregation? Second, over the past century industries have faced tremendous changes in their product portfolio too. Do these changes affect the gender composition of the workforce along occupational lines? Third, does the business cycle have such effects? Fourth, is there evidence of substitution of men's work by women or vice versa, pointing to processes of desegregation? These issues are addressed in this article.

This study aims to gain a better understanding of processes of occupational segregation or substitution by gender by focusing on major workplace changes. We do so by studying changes in the gender composition of four major manufacturing industries over the past century, 1899–1999, in the Netherlands. This study builds on the argument of Jacobs (1989), that an accurate assessment of historical trends is a necessary starting point for theoretical explanations of occupational sex segregation. In the second section, evidence of occupational segregation and substitution is reviewed. In the third section our assumptions and research methodology are elaborated. We examine in the following section the relationship between the increase or decrease in employment and in the proportion of women in the four industries in the subsequent periods. We then go on to discuss explanations for the changes in the gender composition. In the last section, we finally draw conclusions.

Evidence of Gender-Based Segregation and Substitution

Numerous studies have addressed occupational segregation, both by gender and by ethnicity. A majority of these studies has examined

the impact of occupational segregation, among others as regards wages, career opportunities, or the division of work at home. Other studies have focused on measurement issues by constructing segregation indices. For this article we rely on studies that have examined changes in occupational segregation by sex over time. Studies of the US concluded that segregation declined in the 1970s and to a lesser extent in the 1980s (Blau et al., 1998). Hakim (1994) found for the UK that over a century occupational segregation had declined, but that most of this decline took place in the 1970s and 1980s. For Sweden, Jonung (1998) showed that segregation fell slightly from the 1960s onwards. All authors, however, conclude that the decline in occupational segregation is not as much as would have been expected from the increased labour force participation for women.

Some studies have addressed occupational segregation at aggregated levels, because segregation tends to be higher at disaggregated levels of analysis. At workplace level, the workforce often appears as highly segregated (Jonung, 1984; Hakim, 1996; Kalleberg et al., 1996; Cully et al., 1999). In those countries where segregation at the workplace is measured, the majority of women work in jobs performed by women only, and an even higher percentage of men work in exclusively male-dominated jobs. These figures indicate that women are less likely to enter male jobs than vice versa. A UK study found that employers often saw jobs in terms of men's work and women's work. They perceived the nature of labour supply in gender terms (Hunter et al., 1993: 394). Employers' behaviour seems to be characterized by conflicting rationalism. Looking at wage costs, one would expect employers to prefer women workers, because women's wages are on average far below men's. Bergmann (1989: 43–60), however, argues that it would be costlier for employers to break down the sexual division of labour, because this would undermine existing labour relations.

The persistence of occupational segregation by gender suggests that substitutability between male and female workers is small. On the other hand, the adherents of the flexible labour reserve theory state that in times of recession female workers will be dismissed earlier and on a substantially larger scale than men. As Liff (1986) has argued, this presupposes high (elasticities of) substitution between male and female workers. Yet, labour economics textbooks conclude that in western countries empirical evidence of the extent of substitution between various groups of workers is scarce, and

mostly unreliable because of problems with the disaggregation and comparison of the various categories of labour involved. As far as reliable studies are available, in the majority concerning substitutability between immigrant and native workers, or between new immigrants and older groups of immigrants, the extent of substitutability proves to be very small (Hamermesh, 1993: 105–27; Ehrenberg and Smith, 1997: 117). The only well-documented case of substitution by gender in the 20th-century manufacturing industry we found is the massive influx of women in 'men's jobs' – or, more accurately, the large-scale change of boundaries between 'women's' and 'men's' work – in US manufacturing industry in 1940–4, followed by the reconstruction of 'woman's place' in industry during the demobilization (Milkman, 1987).[1] After 1950, little evidence is present about substitution by gender in manufacturing. In the 1970s, some industries, notably electronics, in the US and Italy showed indications of substitution of women for men, whereas the UK and France lacked such indications (Rubery, 1988). However, the issue remains relevant whether a sex-stereotyped demand for labour will hold under the influence of major changes in production processes, in product portfolios, or in the business cycle.

Assumptions and Methodology

This article aims to explain the gender composition and its changes over time in four sectors of the Dutch manufacturing industry: the clothing industry, the textile industry, the food industry and the electrical engineering industry, especially Philips Electronics[2] – each mainly producing consumer goods. In the period 1899–1999 these are the four manufacturing sectors in which most women have been employed. Table 1 shows the percentages of women in these four sectors in the past century. In the clothing industry, women's share has remained high, fluctuating between 61 and 75 percent. In the textile industry, women's share fluctuated at a much lower level, around 30 percent. In the food industry, women's share increased steadily from 4 to 31 percent, whereas at Philips Electronics, it decreased steeply from 75 to 16 percent. These figures include non-manual (white-collar) labour, an area of growing importance and to a far larger extent a female domain than manual (blue-collar) labour (Tijdens and Goudswaard, 1994: 20). The share of non-manual workers in female labour remained low in clothing. In

the other three industries it grew to a substantial level, although at various periods over the century: in food it had already increased by the 1910s, in textiles, in food again and at Philips between 1930 and 1947.[3]

The explanatory variables in this study are the most important changes in the industries under study. These changes are employment growth or decline, changes in the production processes, such as mechanization, automation and scale increase, and changes in the product portfolio. In examining the relationship between these major changes and the gender composition of the workforce in the industries under study, we question whether these changes affect the gender composition due to substitution by gender or due to segregation by gender. Substitution by gender is defined as replacing men by women or vice versa in the same occupation. We define segregation by gender as (the continuation of) the existence of clearly defined male and female domains of work along occupational lines. In this article, we examine three assumptions.

1. Before testing hypotheses about segregation and substitution, we hypothesize fluctuations in gender composition to be primarily related to employment growth or decline in each of the four industries. In particular, is an increase in women's share explained by an expansion of total (male and female) employment, and a decrease of share by a decline of total employment?
2. In this hypothesis fluctuations in gender composition are assumed to be primarily related to gender-based occupational segregation. In particular, is an increase in women's share explained by changes in production processes and/or in product portfolio that enlarge the female compared to the male domain, and a decrease by such changes enlarging the male domain comparatively? Moreover, what are the roles played by the major external actors, like the state, the clergy and the trade unions? Do they maintain the existing lines of segregation, do they reinforce these lines or, adversely, break them down?

3. In this hypothesis fluctuations in gender composition are assumed to be primarily related to substitution of men by women or vice versa in the same occupations. In particular, is an increase in women's share explained by the replacement of men by women in the same occupation, and a decrease by the replacement of women by men? If so, does this substitution reflect (1) changes

in real or perceived differences in productivity of male and female workers, (2) changes in preferences of employers, or (3) specific economic conditions, especially labour shortages.

The first hypothesis can be studied quantitatively, using data from Statistics Netherlands over the last century. The first reliable Dutch census[4] was held in 1899. The data used stem from the 1899, 1909, 1920, 1930, 1947 and 1960 Occupational Censuses,[5] and from the 1975, 1985, 1990 and 1999 Labour Force Surveys. We concentrate our analysis on nine reference years: 1899, 1909, 1920, 1930, 1947, 1960, 1975, 1990 and 1999. The results are presented in the following section.

We lacked sufficient quantitative data to explore the second and third hypotheses in full detail. We would have preferred to carry out a long-term analysis of the level of segregation in a fixed set of occupations and industries, but this proved to be impossible as Dutch censuses were far from consistent in their classification of occupations over time (also Pott-Buter, 1993: 75). This lack of detailed long-term data forced us to rely on a thorough review of as much descriptive research findings as we could trace. The core was made up of 25 Dutch studies covering one or more industries. In order to categorize these materials we divided the century into four periods: 1899–1920, 1920–45, 1945–75 and 1975–99. These periods partly correspond with census years, and partly with major sociopolitical changes in the Netherlands: important social legislation (1919–20) and the end of the German occupation (1945). In the absence of such events in the postwar period, we chose the year of the first Labour Force Survey (1975). For the sake of brevity, we refrained in this article from cross-country comparisons.

The Impact of Employment Growth or Decline

Industrialization started late in the Netherlands. The Dutch industrial takeoff, giving way to modern economic growth, took place just after 1865 (Van Zanden and Van Riel, 2000: 343–61). According to the 1899 census, manufacturing industry[6] employed nearly 500,000 men and women, 26 percent of the total labour force of 1.9 million. A century later, in 1999, just over 1 million people worked in manufacturing industry, less than 16 percent of the work-

force of 6.7 million. In the course of the 20th century, Dutch industry caught up with its main European competitors. In its first decade, the number of women in manufacturing industry surpassed that of women working in agriculture. In the 1910s, the same happened with men. Yet, then the 1947 census showed that employment in commercial services had surpassed that in manufacturing industry, both for men and for women (Van Zanden and Van Riel, 2000: 388). The country changed from an agricultural society into an industrial one and then, within four decades, into a services society. Regardless of these changes, male workers have always dominated the manufacturing industry. In 1899, Dutch industry employed 410,000 men and 88,000 women, resulting in women's share representing 17.7 percent. In 1999, the comparative figures were 828,000 men and 220,000 women, leading to the record women's share of 21.0 percent. Within the four industries studied, however, the proportion of women has fluctuated substantially (Figure 1).

The first assumption addressed the issue whether an increase or a decline in the proportion of women is related to a respective increase or decline in employment in the relevant industry. For the nine reference years and for each of the four industries, thus altogether for 32 periods, we collected pairs of figures for annual growth of total and female employment (see Table 1). These data do not support the assumption clearly. In 12 out of the 32 periods, employment declined; in five periods employment declined faster for women; in five periods it declined faster for men; and in two the decline was equal. In two out of 32 periods, the total growth/decline was (statistically) zero; in one of these, female employment grew, in one it declined. In 18 out of 32 periods, employment increased; in nine of these periods, male employment grew faster, while in the remaining nine periods female employment grew faster. In the end, there is a total balance. Thus, we can find support neither for the assumption of 'kicking out women in slumps', nor for that concerning 'recruiting extra women in booms'. On the contrary, the correlation between annual growth rates of male and female employment is high (.747, $p < .01$ percent). This indicates that if employment declines, or increases, this is likely to happen for both genders. The detailed data reveal two periods with a decline in total employment but an increase in female employment, and only one period with a decline in total employment, but an increase in male employment. In these cases, the decline in total employment was less than 0.7 percent per year.

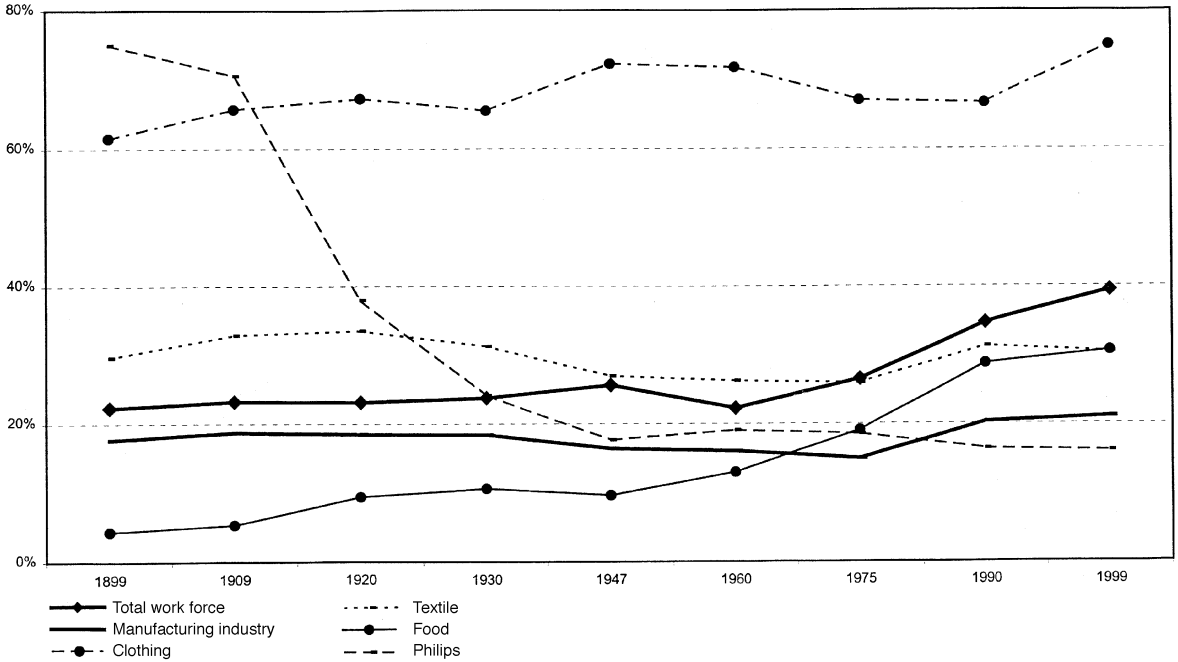

FIGURE 1
Percentage of Women in Total Labour Force, in Manufacturing Industry, and in Four Selected Manufacturing Sectors in the Netherlands, 1899–1999

The Emergence of the Manufacturing Industry, 1899–1920

Some 20 years after the first signs of an industrial takeoff, the Dutch manufacturing industry emerged more clearly and processes of concentration followed suit. Some forerunners moved in the direction of Chandler's 'managerial enterprise', like the margarine company of Van den Bergh, initiating raw-materials research and expensive advertising campaigns in order to create own brand names. Besides this predecessor of Unilever, the era witnessed the foundation of more multinational corporations. In 1890, KMEPNI, one of the founders of Royal Shell, started oil drilling in the Dutch East Indies. A year later, Gerard Philips started a light bulb factory, later to become Philips Electronics. In their footsteps, industries like textiles and cigar production showed a rapid expansion (De Jonge, 1968: 63–4, 83; Van Zanden and Van Riel, 2000: 380–8). Major changes also took place in the labour market and in family life. The combination of rising real wages, a 'civilization' offensive and the growing 'pillarization' of Dutch society led to the emphasis on the breadwinner model. Analysis of the Dutch national accounts shows that around 1890, Dutch married women went in search of paid work to contribute to the family income as soon as their children were old enough. Yet, if 20 years later the children were generating a higher family income, women concentrated on household duties (Van Zanden and Van Riel, 2000: 406–9). Labour market statistics indicate the same phenomenon. Since 1889, the share of married women in the female workforce in manufacturing industry went down, from 16 percent in that year to 9 percent in 1899 and 5 percent in 1920. These figures remained under 10 percent until the 1960 census (11.5 percent) (CBS, 1899, 1920, 1947, 1960). In three-quarters of the century, women's industrial work in the Netherlands was by and large girls' work.[7]

The Clothing Industry

Until 1890, hardly any ready-to-wear clothing was produced in the Netherlands. Domestic clothing production was widespread. Exceptions were the Amsterdam tailors, producing outer garments for the rich at home, with their wives and children partly as 'additional labour' (Schilstra, 1940: 115–16). In the 1890s demand for ready-to-wear clothing soared and the larger towns witnessed the opening

TABLE 1
Total and Female Employment (Absolute Figures, Percentages and Annual Growth) in Four Selected Manufacturing Sectors in the Netherlands, 1899–1999

	1899	1909	1920	1930	1947	1960	1975	1990	1999
Clothing									
Total employment (in 1000s)	71.0	70.9	82.5	87.1	102.0	95.3	39.4	15.0	8
Female employment (in 1000s)	43.7	46.6	55.5	57.1	73.7	68.4	26.4	10.0	6
Proportion of women (in %)	61.5	65.7	67.3	65.6	72.3	71.8	67.0	66.7	75
Annual growth total employment (in %)	–	0.0	1.5	0.6	1.0	−0.5	−3.9	−4.1	−5.2
Annual growth female employment (in %)	–	0.7	1.7	0.3	1.7	−0.6	−4.1	−4.1	−4.4
Textiles									
Total employment (in 1000s)	49.2	60.5	66.5	81.5	80.9	103.7	52.5	22.4	23
Female employment (in 1000s)	14.6	19.9	22.3	25.5	21.8	27.2	13.6	7.0	7
Proportion of women (in %)	29.7	32.9	33.5	31.3	26.9	26.2	25.9	31.3	30
Annual growth total employment (in %)	–	2.3	0.9	2.3	0.0	2.2	−3.3	−3.8	0.3
Annual growth female employment (in %)	–	3.6	1.1	1.4	−0.9	1.9	−3.3	−3.2	0.0

Food									
Total employment (in 1000s)	117.2	136.1	177.5	217.7	186.7	199.2	179.2	174.0	160
Female employment (in 1000s)	5.1	7.3	16.7	23.1	18.0	25.8	34.2	50.0	49
Proportion of women (in %)	4.4	5.4	9.4	10.6	9.6	13.0	19.1	28.7	31
Annual growth total employment (in %)	–	1.6	2.8	2.3	−0.8	0.5	−0.7	−0.2	−0.9
Annual growth female employment (in %)	–	4.3	11.7	3.8	−1.3	3.3	2.2	3.1	−0.2
Philips									
Total employment (in 1000s)	0.4	1.7	4.7	19.9	34.0	75.0	80.0	54.5	38.6
Female employment (in 1000s)	0.3	1.2	1.9	4.8	6.0	14.3	14.8	8.9	6.2
Proportion of women (in %)	75.0	73.2	40.4	24.1	17.6	19.1	18.5	16.3	16.1
Annual growth total employment (in %)	–	32.5	17.6	29.8	4.2	9.3	0.4	−2.1	−4.9
Annual growth female employment (in %)	–	30.0	5.3	15.3	1.5	10.6	0.2	−2.7	−5.1

Sources: CBS, 1899, 1909, 1920, 1930, 1947, 1960, 1975, 1990, 1999 (LFS and EBB are sample surveys); concerning Philips: Van Drenth, 1991; Van der Coelen, 1991; De Groot, 2001; company information. Excluded are persons working fewer than 13 hours (1990, 1999) and 15 hours respectively (1899–1975) .

up of clothing *magasins*, mainly managed by merchants of German origin like the Brenninkmeyer brothers (C&A). Their chain stores asked for clothing in stock, thus creating a clothing industry. This industry was concentrated in Amsterdam (De Jonge, 1968: 82, 91, 121). The new employers were likely to hire women, as they were cheaper than men and well qualified based on their domestic work. In the last decade of the 19th century, male complaints about downward wage competition by women often concerned the clothing industry (Schilstra, 1940: 108). These complaints disappeared in the decades to follow. An explanation may be that the sexual division of labour had meanwhile settled. Then, this division and the related wage differences were perceived as 'natural' (Van Klaveren and Kooistra, 1976: 9). From 1899 to 1920, the proportion of women in the clothing industry increased from 62 to 67 percent.

The Textile Industry

In home textile production, the sexual division of labour had been strict: the men carried out handloom weaving, while the women concentrated on supporting activities like spinning, spooling and 'stopping'. Yet, when the men went into the textile factories, the women took over home cotton weaving. Thus, the employers could also attract female weavers. A parliamentary inquiry on labour conditions showed this to be rather common practice in 1887. However, with the disappearance of home woollen and cotton production female weavers gradually disappeared in manufacturing (De Groot, 2001: 197–9). In the first decade of the 20th century, the use of the automatic loom spread widely and definitively changed weaving into a male domain. Theo Van der Waerden (1911: 138) noted only men and boys working at automatic looms. Automation in this male domain of weaving explains why the demand for male labour lagged behind that for women during two decades. This was only partly compensated for by the expansion of support activities mainly carried out by men: physically heavy activities like lugging and mixing wool and waste; qualified technical tasks like those of smiths and carpenters; and administrative tasks (Van der Waerden, 1911: 152; Plantenga, 1993: 126). By 1920, the percentage of women had increased to 34. The argument that women were not allowed to perform tasks with longer learning times should be qualified.

The 1911 survey hardly shows any differences: three to six months' learning times or even a year were noted for qualified male and female jobs, as was the case for hand printers in cotton production. Qualification grew into a sex-typed criterion when training on the job became insufficient. The craft schools, also within textile companies, admitted only boys. Van der Waerden noted a typical statement by P.J. Van Vlissingen, a large textile employer: 'All male workers that we employ at about the age of 14 are obliged to follow secondary courses in the school connected with the factory' (Van der Waerden, 1911: 162).

The Food Industry

At the turn of the century food manufacturing was still in its infancy. In 1899, bread production/bakeries and cigar production were its two main branches, accounting for 45 percent of total employment in the food industry. Cigar production alone accounted for nearly 30 percent of women's employment here. Job segregation developed in both home and factory cigar production: men executed work that required some craftsmanship, like building up wrappers and sorting, while women moistened and stripped wrappers as well as doing the packing (Schilstra, 1940: 40). A number of cigar producers preferred women because 'they show less inclination to take away tobacco and to drink, and are more economical in using raw material'. Obviously because of this substitution strategy, women's share in cigar production went up from 7 percent in 1899 to 11 percent 21 years later (Van der Veen, 1989: 71–2; CBS, 1899, 1920). New industries took off, like cocoa and chocolate processing. In the factories of Van Houten, Droste and others cocoa beans were burnt and ground into cocoa powder. These processes were carried out exclusively by men, with the exception of the biggest cocoa producer, Van Houten, employing girls in the production departments (Schrover, 1995: 181–2). In further processing, where chocolate bars were poured and wrapped, the machines were generally attended to by girls and women: 'Wrapping is mostly done by girls, supervised by a lady', chocolate producer Driessen told Van der Waerden (1911: 269). With employment in cocoa and chocolate confectionery more than tripling between 1899 and 1920, women's share grew from 21 to 33 percent. Packing jobs had not always been labelled

female. In 1886, Ericus Verkade started his biscuit and bread factory near Amsterdam. For the first 15 years, boys did the packing, and not until they were in short supply did Verkade decide to hire girls (Hogema and Van der Padt, 1997: 10–25). The same happened in the margarine factories of Van den Bergh and of Jurgens. When simple wrapping machines were introduced, some girls joined boys as machine operators and for a smaller proportion replaced them (Schrover, 1991: 98). In the 1899–1920 period, when the workforce in margarine processing also tripled, the share of women workers grew from 3 to 30 percent. In 1920, the food industry as a whole employed over 50 percent more workers than in 1899. Women's share grew from 4 to 9 percent, primarily because the product portfolio changed towards new, small packed products (chocolate bars, biscuits, margarine) and packing as a women's domain grew quicker than men's domains.

The Electrical Engineering Industry

The history of the Dutch electrical engineering industry is mainly the history of Philips Electronics. In 1891, Gerard Philips started a light bulb factory in Eindhoven, in the Catholic south of the Netherlands, a location selected because of its high unemployment and low wages. The company grew quickly, soon outstripping its inland competitors. In 1900, Philips' workforce reached a first peak with 600, two-thirds being female. Gerard Philips was very outspoken in preferring female workers, considering their dexterity to be a major advantage for his kind of light bulb assembly, based on a maximal division of labour. The hierarchical segregation was strict: from 1898 on all supervisors were male (Van der Waerden, 1911: 205–15; De Groot, 2001: 407–15). In 1910, only 10 out of the 1150 women at Philips were married. The Catholic trade union wanted them to quit, arguing that factory work destroyed their family lives. The company did not give in, also because these women were crucial for the continuity of production. Until the First World War, experienced women taught bulb assembly to the new young factory girls (Teulings, 1976: 41–4; Van Drenth, 1991: 59–67; De Groot, 2001: 407–8, 421). During this war, Philips had to build its own glass works, and in 1919 they founded packing materials factories. The company exclusively recruited male workers for these production

lines. As a consequence of these product portfolio changes, women's share in the labour force fell to 40 percent in 1920 (Teulings, 1976: 61; De Groot, 2001: 421–6).

Summary

Between 1899 and 1920, women's share in the workforce in three out of the four industries under study increased, in one it decreased. Changes in production processes were not major factors, except in the textile industry. Here, weaving became an exclusively male domain after the introduction of the automatic loom, but paradoxically enough such automation also decreased this domain. Changes in product portfolio played a role in increasing the female domain in clothing (a booming demand for ready-to-wear clothing) and in food. On the other hand, the broader portfolio of Philips increased the male domain rapidly. Here, in the 1910s a male domain was established in occupations defined as skilled or semi-skilled, a gendered definition linked with the operation of capital-intensive machinery. The same happened in the textile and food industries, although on a comparatively smaller scale (see Table 2).

The Economic Crisis and Women's Labour, 1920–45

In the interbellum period, concentration was the trend in most manufacturing branches in the Netherlands. The share of big firms in sales and profits soared from 1920 to 1935 (Bloemen et al., 1993). During the economic crisis, replacing working women by unemployed 'breadwinning men' became an official target. In 1934, the government published a guideline that all women in civil service should be replaced by men, 'except for typically female jobs', thus confirming occupational segregation. Three years later, a bill putting limits to female labour in private companies had to be withdrawn under strong protest from women's organizations (Blok, 1978: 119–22). In between, a group of 13 prominent Catholic intellectuals, all men, expressed the dominant philosophy: 'being married and working in the factories cannot go together. The place of the married woman is in and around her home' (Van der Veen, 1989: 11). Even a mighty Protestant employer like Philips did not dare to ignore the

TABLE 2
Fluctuations in Total Employment, and in the Percentage of Women Workers in Relation to Changes in Production Processes, in Product Portfolio, in Labour Supply and Substitution in Four Selected Manufacturing Sectors in the Netherlands, 1899–1999

	1899–1920	1920–1945	1945–1975	1975–1999
Clothing				
Women's share	Increase	Increase	Decrease	Increase
Changes in production processes				
In the male domain	–	–	–	–
In the female domain	–	Decrease	–	–
Changes in portfolio				
In the male domain	–	–	Increase	Decrease
In the female domain	Increase	Increase	Decrease	Decrease
Labour supply	–	Destruction of Jewish ind., 1942-4	Girls refuse factory work	–
Substitution	–	Of men by women	–	–
Textiles				
Women's share	Increase	Decrease	Stable	Increase
Changes in production processes				
In the male domain	Decrease	Decrease	–	–
In the female domain	Increase	Decrease	–	–
Changes in portfolio				
In the male domain	–	Increase	–	Increase
In the female domain	–	Decrease	Increase	Increase
Labour supply	–	–	Girls/women refuse factory work	–
Substitution	Mutual	–	Of women by men	–

Food				
Women's share	Increase	Stable	Increase	Increase
Changes in production processes				
In the male domain	–	–	Decrease	Decrease
In the female domain	–	Decrease	–	Decrease
Changes in portfolio				
In the male domain	Decrease	Increase	–	Decrease
In the female domain	Increase	Increase	Increase	Increase
Labour supply	–	–	Girls refuse factory work	–
Substitution	Of men by women	Mutual	–	–
Philips				
Women's share	Decrease	Decrease	Stable	Decrease
Changes in production processes				
In the male domain	–	Decrease	Decrease	Decrease
In the female domain	–	Decrease	Decrease	Decrease
Changes in portfolio				
In the male domain	Increase	Increase	Increase, later decrease	Decrease
In the female domain	Decrease	Decrease	Increase, later decrease	Decrease
Labour supply	–	Girls/women in short supply	Girls refuse factory work	–
Substitution	–	–	–	–

pressure in this direction from the Catholic clergy and the petite bourgeoisie (see Van Drenth, 1991: 89).

The Clothing Industry

In the 1920s, women made up 67 percent of the workforce in the clothing industry. Even during the 1930s, this industry continued to expand, mainly because of the replacement of custom-made clothes by relatively cheap ready-to-wear clothing (De Jong, 1999: 226). The larger employers tried to replace male workers with cheaper girls, solving the problem that these girls were less well trained by rationalization measures. Sewing was deconstructed into simplified and monotonous tasks, carried out exclusively by women. In 1934, Alida de Jong, the only female paid official of the socialist clothing union, stated: 'It's already a long time ago that a seamstress was able to make a whole jacket, or a winter coat. Vocational training and expert know-how do not count . . . any longer' (De Baar, 1981: 200). Specialized 'industrial' sewing machines were introduced, combined with the conveyor belt in order to be profitable. In 1930–3, the four large Amsterdam clothing factories adopted this technology (De Baar, 1981: 200–2). During the Second World War, the German occupation hit the Amsterdam clothing industry, with its large Jewish, relatively large male workforce, severely. First, the many German-Jewish tailor workshops had to close, afterwards the larger factories became Nazi targets (Harmsen et al., 1980: 138). As a result, women's share in clothing increased.

The Textile Industry

In the 1920s, the cotton industry grew rapidly, and concentrated as well geographically in the Twente region, in ownership and in size. In Twente, over half of all female workers were younger than 21 years of age, as opposed to fewer than one-quarter of the men. Another quarter of the men was over 50. This age structure gives a clue about the two strategic options that existed for textile producers. They could opt for hiring more girls, not receiving any vocational training. From 1929 on, nearly all cotton producers chose this option. One of their rationalization measures was to

split off new support functions to be executed by women. Eventually, the expected high labour turnover would no longer cause organizational problems. The second option, hiring more boys and men, required a long-term vision, because these workers expected to stay with the firm for the next 40 or 50 years and if they were fired, resistance was likely. Yet, these trained workers could be prepared for the capital-intensive production of the new woven fabrics. Now, as it is, one has to conclude that relatively few woollen producers chose this second option. In the 1930s, when sales collapsed, textile producers fired comparatively as many men (Van Waarden et al., 1987: 167–71). Yet, in the Tilburg region, over 90 percent of the women working in textiles before the war did not return in 1945, primarily because the employers were no longer willing to accept married women (Happel et al., 1980: 27, 146–64). The proportion of women in textiles declined from 31 percent in 1930 to 27 percent in 1947.

The Food Industry

After the First World War, the food industry benefited from the growth in purchasing power: sales of 'luxury goods' like biscuits, chocolates and alcoholic drinks boomed. The negative attitude of the Catholic clergy towards women's labour could not prevent the growth of a food industry in the south, employing many women. This growth included rather new activities like margarine production, as well as old branches like cigar manufacturing (Van der Veen, 1989: 56–7, 71–85; Schrover, 1991: 185). The boom lasted till 1924. Then, the management of the large Kwatta chocolate plant dismissed a number of 'expensive' adult male workers, and others followed suit. In the course of the 1920s, especially cocoa and chocolate producers replaced adult males by youngsters, mostly girls. Girls tended the new, specialized pouring and wrapping machines, but they also invaded cocoa powder production, although the latter production process hardly changed (Schrover, 1995: 183–5). This is an example of substitution. Women's share in cocoa and chocolate confectionery grew another 10 points to 43 percent in 1930.

In the 1930s recession, Kwatta felt threatened by their competitor de Heer, employing about 50 percent boys and girls aged 14–18. Pressure on Kwatta resulted in a law being passed in 1937, which

stipulated that a maximum percentage of youngsters could be fixed for a number of industries: 25 percent was suggested for the cocoa and chocolate industry. Meanwhile, Kwatta had filled their expansion by attracting over 100 girls and 50 boys, and regretted and condemned any regulation. In the end, no percentage was fixed (Schrover, 1991: 185–7). In 1931, a collective agreement was made in the cigar industry at the instigation of the Catholic Tobacco Workers Union, stating that the employers should not hire married women except for cleaning purposes. Many married women had already been fired in the months before, when the cigar producers were starting to make large losses (Van der Veen, 1989: 71–3). After all, over the 1920–47 period the proportion of women in food remained stable at around 10 percent.

The Electrical Engineering Industry

The labour supply of girls and women was a major constraint for Philips. Already by the early 1920s, Philips had exhausted the stock of girls and young women in the Eindhoven region. Facing this, the company first started a daily shuttle bus service, drawing in both women and men from outside the region. Second, Philips stimulated the migration of poor farmer families from the northern province of Drenthe. These families were entitled to a house in Eindhoven if they could supply at least three girls over 14 (Van der Coelen, 1991: 21; Blanken, 1992: 292–4). Radio production, starting in September 1927, led to a more than doubling of Philips' workforce in the next two years. The firm was now forced to hire more male workers than planned and let them work on the conveyor belt too – although here they were soon allocated other, 'more laborious' tasks than the women. By August 1930, women's share in Philips' workforce had sunk to 24 percent (Van Drenth, 1991: 79; Blanken, 1992: 290–4; De Groot, 2001: 431).

The economic crisis halted the expansion of Philips in the Netherlands and stimulated production abroad. From January 1931 to May 1932, Philips dismissed exactly half of their Eindhoven staff: 52 percent of the men, 43 percent of the women. Young commuters, mostly women, were the first to be dismissed. Then, the many unmarried craftsmen that had board and lodging in Eindhoven were fired (Teulings, 1976: 83; Blanken, 1992: 421–7). The share of women workers went up to 33 percent in 1940, when the company

had concentrated hiring strategies on young women again. In the Second World War, the Philips family tried to show friendly faces both to the Allies and to the Nazis. A major goal was to keep the Eindhoven facilities going, and because men had to serve the German war machinery, deploying women was instrumental in reaching that goal. On 24 March 1943, the company magazine published an article titled 'Dismissal Because of Marriage? Only Possible in Some Cases', although such dismissals had been rather common in the 1930s (Van Drenth, 1991: 136–7; De Groot, 2001: 435–6).

Summary

Between 1920 and 1947, women's share increased in only one industry, clothing, remained stable in food, and decreased in textiles and at Philips. Unlike the first period, changes in production processes now were a major factor, especially in the decrease of the female domains in all four industries. In the late 1920s and the 1930s, the introduction of scientific management and related rationalization measures, together with that of the conveyor belt, sharpened segregation, concentrating women in the domain of 'unskilled' work. Yet, in the clothing and food industries their negative effects were mitigated or even eliminated by changes in product portfolio enlarging the female domains: i.e. the continuing growth of the demand for ready-to-wear clothing and new, packed food products. Contrary to this, portfolio changes in the other two industries obviously had negative effects on the extent of women's domains: i.e. the introduction of woven fabrics in textiles and of radios by Philips. As the Nazis destroyed the Jewish, male-based, clothing industry, this meant a further growth of women's share here. Particular war conditions also marked developments at Philips, whose hiring strategies needed to return to young women. For an overview, see Table 2.

The Rise and Decline of Manufacturing Industry, 1945–75

From 1945 until the 'wage explosion' of 1963–5, the Dutch administration stimulated industrialization by a low-wage policy, with the support and consent of the three 'recognized' trade union confederations. Thus, the first two decades after the war were characterized by labour-intensive growth (Visser and Hemerijck, 1997:

92–3). As a result, women were structurally in short supply for manufacturing work. Directly after the war, a coalition of Christian parties, employers' organizations and trade unions, perceiving these shortages as temporary, stressed that 'the task of married women is in the family'. For the large majority of married women, to become a full-time housewife was inevitable – given the difficult standards of living, with rationing of consumer goods, the long working weeks of their spouses, the lack of part-time jobs, and other unfavourable conditions. For example, till 1957 open wage discrimination continued and married women were banned from civil service (Blok, 1978). In the course of the 1950s, however, the remaining labour pool of young girls showed signs of exhaustion. Once working in manufacturing, working-class girls rapidly developed an orientation towards marriage and family life, preparing the escape from monotonous work. Moreover, girls increasingly preferred jobs in the expanding service sector (Van Klaveren, 1975).

The Clothing Industry

After the Second World War, clothing manufacturers concentrated their production in the industrialized west of the Netherlands, hiring mainly 14- to 20-year-old girls. They took further rationalization measures, especially in the sewing rooms. Consequently, the aversion of women and girls towards the seamstress job grew. In the 1950s, the larger producers tried to maintain their labour supply by transferring sewing facilities to the Dutch periphery, with wages 15 percent lower than in Amsterdam. Yet, within a decade the aversion to factory work became visible here too. The clothing employers' federation advised their members to recruit married women; the larger manufacturers tried half-heartedly, as they did not adapt their organizations to the needs of these part-timers (Van Klaveren and Kooistra, 1976: 15–25). Between 1965 and 1975, employment in the Dutch clothing industry was halved, mainly because of cheap imports from 'runaway' sewing facilities. By 1975, the proportion of women had diminished to 67 percent because of compositional effects: employment in outerwear production, with relatively few women, went down more slowly than employment in other product groups (Van Klaveren and Kooistra, 1976: 74–90).

The Textile Industry

After 1945, the Dutch textile industry went through processes of mechanization and rationalization. Soon, production technology was comparatively advanced. Yet, the dominant managerial orientation was inward (Van Waarden et al., 1987: 97). In the 1950s, 'the golden years' of textile manufacturing, hardly anybody cared. Hiring new staff was a highly competitive business, fought with nice canteens, free sports facilities and the like, but segregation was firmly maintained. The two-shift system prevailing in the Twente cotton industry formally prevented the recruitment of married women: the law did not allow for full-time shift work by women with household responsibilities. Nevertheless, the labour inspection once found 480 married women working two shifts – without permits (Van Waarden et al., 1987: 184). In Tilburg especially, prosperity did not last for long, as from 1959 on woollen manufacturers closed down factories. Five years later, the first mass redundancies took place in the Twente cotton industry. In May 1967, one of the largest manufacturers there, Van Heek & Co., dismissed 1050 workers: 40 percent of all men, 21 percent of the women. Other firms also fired comparatively more male workers (Van Klaveren, 1970: 47). However, because turnover rates were much higher for women, such dismissal policies did not affect the industries' gender composition. The shortages of women even remained when the industry was in decline. Here, we found an example of substitution of women by men. Men were, most likely at the end of the 1960s, retrained for 'women's jobs' under a government-financed scheme. A labour inspector stated: 'Many men found these jobs rather inferior. Yet, we succeeded, especially because the job content was changing due to mechanisation' (Van Waarden et al., 1987: 185).

The Food Industry

Especially when food rationing ended in 1948, the food industry flourished. Until 1960, employment grew, but then it went down slowly. The percentage of women employed in the industry kept on growing, from 10 percent in 1947 to 19 percent in 1975. This was

mainly due to growth in women's domains. Food manufacturers were also confronted with labour shortages as a major constraint to expansion. We traced substitution of women by men, although on a quite limited scale and just for a while. In 1946, Verkade's biscuit factory hired 14- and 15-year-old boys for 'girls' work', mainly for packing (Hogema and Van der Padt, 1997: 73–5, 80). However, even Verkade generally maintained gender boundaries. The firm changed to married women relatively early. In 1961, they were one of the first Dutch companies to start their own day care centre. Moreover, Verkade promoted part-time work, two years later employing over 100 'evening ladies'. The company hired migrant workers: from the very start in 1963 also women. As the last step Verkade transferred their packing facilities to a northern region with high unemployment. At the time, 400 out of 600 women workers were married (Hogema and Van der Padt, 1997: 113–44). The confectionery producers in the south explicitly chose to recruit married women with older children. The public condemnation of married women's factory work was a major argument to exclude those with younger children, even at the end of the 1950s. Then, in the new Liga biscuit factories and at Kwatta's, separate married women's packing departments were set up, led by 'ladies of supervision' (Stegeman, 1987: 46).

The Electrical Engineering Industry

In the postwar years, the electrical engineering industry entered into a period of unknown expansion, with Philips in its first ranks. Already by August 1946, the company was employing 28,500 people, of whom 20 percent were women. One year later, the Philips archives mention 34,500 workers, of whom 6000 were women: a net growth of only 300 women, lowering their share to 17 percent (Van der Coelen, 1991: 43). Recruiting girls for assembly work proved to be the bottleneck. A Philips brochure of 1948 urged the Eindhoven girls to join the company, using the slogan 'girls for girl's work and men for men's'. If they would not come, 'then we have men to do control and fine assembly work and packing bulbs' (Van Drenth, 1991: 148). As this threat did not work, Philips started up factories in the Dutch peripheral regions, where girls assembled radio and television sets, shavers and other consumer appliances. Yet, soon labour problems connected with assembly work became evident

here too. Labour turnover went up again (Teulings, 1976: 152–3; Van Drenth, 1991: 157–9). Like Verkade's, Philips' strategy changed towards hiring married women, although without day care centres: these provisions were still felt to be morally unacceptable. Philips initiated small assembly factories for part-time working married women (Teulings, 1976: 155–6). In 1970, Philips' Dutch workforce reached its all-time peak with 100,900, of whom 18 percent were women. Since then closing of departments and factories has intensified, the main causes being automation, increase in production scale, and 'runaway' investments in Asian assembly plants. For example, Philips' expansion in Taiwan had negative effects on women's employment in their Dutch microchip factories, although in the long run the negative effects of automation on Dutch female employment were larger (Van Klaveren and Vaas, 1983: 78–88). Until 1975, these effects were mitigated by the influx of office women. In that year, Philips employed 14,800 women in the Netherlands, 18.5 percent of their workforce (Van der Coelen, 1991: 101).

Summary

Between 1947 and 1975, women's share increased in food, remained stable in textiles and at Philips, and decreased in clothing. Changes in production processes, mainly automation and increases of scale, had a negative influence on the extent of the women's domain at Philips, but led to a decrease of the men's domains here and in food as well. Changes in product portfolio, especially the 'runaway' investments and imports from Third World countries, led to a large decrease in the women's domain in clothing, but to increases in their domains in textiles, food and, initially, also at Philips (see Table 2). Labour shortages played a major role during this period. They were much larger for women than for men, because turnover rates in the female workforce were high, girls enjoyed longer education, and girls and women developed an aversion to factory work. Facing shortages, some employers aimed at recruiting men to perform 'girl's work'. Generally they modified their sex-stereotyped strategies and aimed at recruiting groups of women not recruited before, widened their geographical recruitment area, and relocated production facilities to regions in the Netherlands with high unemployment and, after the recession of 1967, abroad (clothing, textiles, Philips).

Automation in the Manufacturing Industry: The Importance of Skill, 1975–99

Since the mid-1960s, total employment in Dutch manufacturing industry decreased. However, women's employment showed a remarkable recovery, especially between 1975 and 1990. This recovery rested on employment growth in the food industry, as well as rapid growth in some industries in which women used to be small minorities, notably printing and publishing and chemicals. This influx stemmed especially from office jobs, but the numbers of women in manufacturing and laboratory jobs increased in these branches too (CBS, 1999).

The Clothing Industry

In the 1990s, most of the larger Dutch clothing manufacturers automated design, pattern drawing, cutting and pressing, at the cost of mainly male jobs, after having contracted out sewing activities to abroad. A small number are betting on better products and is experimenting with group work (Peeters, 1995: 85–138). The official figures state that the clothing industry decreased to 8000 workers in 1999, among whom 6000 were women. These figures underestimate employment. The 1970s and 1980s witnessed the growth of an informal clothing industry, especially in Amsterdam, composed of 'modern' sweatshops, small factories and home workers. They operate at the lowest level of subcontracting chains (Braam, 1995: 22–3). Here, the sexual division of labour of the formal clothing industry is turned upside down: most sewing machine operators are men, especially Turks. This informal industry may have reached its peak in 1992, with about 8000 workers. Since then, this number seems to have fallen because of a more strict observance of the law by tax and local authorities and because of more refined international purchasing policies of the department stores (Zorlu and Reil, 1997: 759).

The Textile Industry

Since 1975, the Dutch textile industry developed similarly to the clothing industry. Although many textile factories closed, the indus-

try did not leave the Netherlands entirely. In 1999, it had a workforce of 23,000, less than a quarter of its size in 1960, but women's share went up to over 30 percent. This growth is mainly caused by a composition effect, that is by the growing importance of hosiery and ladies' underwear production, traditionally with a workforce of over 40 percent women (CBS, 1970, 1980). In the Twente region especially, innovative companies survived, producing specialized fabrics with highly capital-intensive and automated techniques. Here, the remaining control work is nearly all carried out in three or five shifts, and consequently women's share is low (*NRC-Handelsblad*, 1996).

The Food Industry

Between 1975 and 1999, employment in the food industry declined, although the growth of women's share persevered, reaching 31 percent in 1999. This growth can be attributed to composition effects. In 1970–89 the percentages of women food workers were highest in strong growers, like fish processing (nearly 50 percent) and bread, biscuit and cookie production (40 percent). In branches where employment diminished most heavily, the percentages of women went down: in tobacco-processing from 42 percent in 1970 to 21 percent in 1989, and in vegetables and fruit-processing from 25 to 19 percent (Van Klaveren and Tom, 1990: 7). Here, as well as in cocoa, chocolate and confectionery production, most female production jobs remained in packing. From the mid-1980s, these jobs but also male jobs in production control were threatened by new technology, first PLC (programmable logic control) guided equipment, later on CAM (computer aided manufacturing). Employers did not always maintain segregation consistently. In packing departments women came to work as machine operators, but their jobs were not classified as such. This was cost saving and diminished male resistance against women entering their domain (Braaksma et al., 1988). In 1996, Verkade employed just 148 women, 22 percent of the workforce: 40 women were working directly at the conveyor belt; another 60, the former belt bosses, were now called machine leaders. The latter had to go on courses in operating equipment, but showed little willingness to do so, presumably because they perceived hardly any chance of entering the male domain. Indeed, the machine leaders became subordinated to

a new and expanding group, the process counsellors. They were all men (Hogema and Van der Padt, 1997: 133–44, 154).

The Electrical Engineering Industry

In the 1975–84 period, Philips' Dutch workforce dropped from 80,000 to 65,900. The proportion of women declined from 18.5 to 15 percent. Up until 1980, this slimming down happened by means of natural turnover. Then, Philips announced mass redundancies in their microchip facilities and closed down the last 'women's factories'. From the late 1980s, Philips invested heavily in flexible automation and in information systems, and strove for the extension of operating hours to have these investments paid off. A flexible circle around the core workforce, made up 90–95 percent by women, took up the extra hours. Segregation between male and female jobs remained virtually inviolable in Philips' manufacturing (Van der Coelen, 1991: 106–8, 116–20). The trade unions succeeded in including an affirmative action clause in the Philips 1988 collective agreement. Soon, a strong top managerial commitment turned out to be indispensable to put this clause into motion and to break the powerhold of the male-dominated middle management. Breaking this power was one of the challenges for chief executive Jan Timmer in 1990, when he started Operation Centurion in order to make the company 'lean and mean' and to boost shareholders' returns. Indeed, Philips' profits went up, but the power of middle management continued to worry Timmer's successors. The huge reorganization weakened the position of women at Philips, who represented 16 percent in 1999. The personnel director of a large Philips plant frankly stated: 'Because of Centurion, all plans for women have actually suffered a backlash' (Elias, 1993: 43).

Summary

Between 1975 and 1999, women's share increased in clothing, textiles and food, and decreased at Philips. Changes in production processes, mainly automation and increases of scale, made women's domain decrease in the food industry and at Philips, although the same held true for men's domains. Changes in the product portfolio

had a positive effect on women's domains in textiles and food, but decreased these domains in clothing and at Philips (see Table 2). After 1975, the female subdomain of 'unskilled' assembly work was highly vulnerable to automation and worldwide sourcing of multinational companies, although surprisingly this domain (including packing) did not decrease before 1985 (CBS, 1975, 1985). In the last decade and a half, the female subdomain of skilled work grew also in the manufacturing industry: 90–95 percent of the skilled women that entered manufacturing did so in non-manual, this means administrative, supervisory and laboratory, jobs (calculations based on CBS, 1990, 1999).

Conclusion

We followed two lines of reasoning in explaining fluctuations in the gender composition in the workforce in the four selected industries in 1899–1999: the one based on segregation, the other on substitution. Concerning segregation, changes in gender composition are primarily explained by changes within the male and female domains in the workforce. Our analysis shows that an overwhelming majority of the changes over time in the gender composition of the industries involved can be attributed to segregation: women's and men's domains had their own dynamics. We have to add that occupational segregation mostly took 10–30 years to settle in new activities. For example, by 1920 the majority of assembly and packing jobs in clothing, food and electronics engineering were definitely labelled female. In the course of the century, the definition of 'skill' appeared of growing importance for the sex-typing of new manufacturing occupations: men working in skilled occupations and women in unskilled ones. This definition was and is nearly always linked with the operation of capital-intensive machinery.

Concerning substitution, changes in gender composition are related to breakthroughs in the sex-typed domains, mostly realized by the hiring and firing strategies of firms. We could only trace a small number of substitution cases:

- In the first decade of the 20th century: of men by women in the cigar industry, in packing jobs in a bread and biscuit factory and in margarine factories;

- In the late 1920s and 1930s: of men by women in the production of cocoa powder and presumably wider in cocoa and chocolate processing;
- In the 1930s: presumably of married women by men in the tobacco industry;
- In 1946: a bread and biscuit producer hired boys for 'girls' work' in packing;
- In the late 1960s: men entered 'women's jobs' in the textile industry after being retrained;
- In the 1980s: women came to work as machine operators in food packing departments.

The relative size of these moves was small, and they hardly influenced the gender composition in the four industries. As we expected, specific conditions made the moves likely: labour shortages were the main impetus. Certainly until well into the 1950s, larger and more substitutions were prevented by pressure of the state, the clergy, employers' organizations and even the trade unions. As far as the available documentation allows us to conclude, changes in real or perceived differences in productivity of male and female workers hardly played a role. Our final conclusion has to be that throughout the 20th century, the employers in Dutch manufacturing industry acted within gender boundaries.

Notes

This study originated from a chapter in a Dutch book that reviewed women's lives and work in the 20th century (Pott-Buter and Tijdens, 1998). This chapter led to a detailed study referring to as many sources as possible, including comments on these sources (Van Klaveren and Tijdens, 2001). The current article does not include references in such detail.

1. See C. Fields' documentary film *The Life and Times of Rosie the Riveter* for striking testimonies of this reconstruction.
2. Of course, Philips Electronics is not really a 'sector'. Unfortunately, the sector distinguished in the official statistics, metal industry and shipbuilding, is large and heterogeneous. Within this sector, electronic engineering has only been distinguished since 1947.

3.

Non-Manual Female Workers in Percentages of Total Women in the Workforce of Four Manufacturing Sectors

	1899	1909	1920	1930	1947	1960
Clothing	1.2	1.6	1.6	1.0	3.3	7.3
Textiles	0.4	0.5	1.8	3.2	11.2	20.6
Food	3.9	4.1	12.5	14.7	27.1	38.6
Philips	0.0	1.6	–	11.3[a]	45.4	42.0

Sources: CBS (1909, 1920, 1947, 1960); concerning Philips: De Groot, 2001 (1899, 1909, 1930); Van Drenth, 1991 (1947, 1960).

The distinction between manual and non-manual labour withint industries was no longer maintained in the official Dutch statistics after 1960. During the 1960, wage scales for these categories were 'integrated' in many Dutch collective agreements.

[a] = 1934.

4. Reliability does not apply to the extent of home work. Home workers, especially married women, have been underrepresented in official statistics, notably in the 1899 and 1909 censuses. See Leydesdorff (1977: 107–10), comparing the 1909 census with the results of the 1909/10 Government Inquiry on Home Work, and Schrover (1995: 171–3).

5. CBS (Statistics Netherlands) did not systematically publish occupational and branch information from the 1971 census, the last census held in the Netherlands.

6. During the whole period under review, we exclude the building trade, as well as gas and electricity production (the latter classified under public utilities).

7.

Women Younger than 25 Years of Age Participating in Workforce (%)

	1899	1909	1920	1930	1947	1960	1975	1990	1999
In manufacturing industry	60.9	61.8	65.2	66.3	64.8	78.2	46.1	33.5	13.7
In total workforce	49.7	48.6	52.3	52.0	46.4	49.9	39.7	24.0	14.4

Source: CBS (1909, 1920, 1947, 1960, 1975, 1990, 1999).

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