

# Gender-Specific Labour-Market Convergence and Family Stability in Scandinavian Countries (1886-2007)

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**ABSTRACT.** This paper investigates the possible link between gender-specific labour market convergence and family stability. By drawing on new Norwegian data, it maps the historical development of marriages, divorces, fertility, wages and labour participation rates between 1886 and 2007. Along with changing family relations, we quantify the closing of the gender gap by converging trends for labour participation rates and wages. We conclude there is a clear correspondence between labour market gender convergence and family fragility.

## Introduction

ALONG WITH THE INCREASE in the standard of living in the Western world during the last one hundred and fifty years, the family as a social unit has become more fragile, with increasing divorce rates and, more recently, cohabitation as a substitute for (early) marriage. One hundred and fifty years ago, the family was the core unit of society, both in social and in economic terms. Marriage was the only established and accepted way of cohabitation, divorce was rare and fertility rates were high. The family provided individuals with the necessary social network and security. The family household, i.e. members of a family living in the same house or related houses, in many ways was considered a production or

labour unit. The members were together responsible for labour supply and product demand, which was sufficient to cover their essential living expenses. Since then, the standard of living has increased dramatically. Women are more involved in paid work outside their home and the huge gender gap in income that existed 150 years ago has been substantially reduced, and is nowadays only of minor significance.

Alongside this development, the stability of the family has been considerably reduced. Marriage is no longer the only way of organizing a family, because cohabitation has become common. Divorce rates have rocketed during the last decades and fertility has dropped considerably, despite a moderate revival in some countries during the last two decades. The number of abortions and births outside marriage has increased substantially. A shock to the family, e.g. a divorce, often affects the family in terms of financial and personal distress. For society at large, family structure and stability affects the participation rate in the labour force and the financing and costs of social-security services.

### **Definition of the Issue**

THE PRESENT PAPER DESCRIBES aspects of family structure from the last part of the nineteenth century until the present day, in order to quantify how this structure has been changing over time and how the family interacts with the labour market. Our hypothesis is that growth in wealth, together with wage convergence between genders, has made the family as an institution more fragile in terms of divorce rates and births outside marriage.

In order to study this phenomenon we use a data set for Norway which, to a large extent, is new, reporting detailed gender-specific wage series and demographic data linked to these. In particular, we analyze five time series and the interaction between them. The series we are examining are the marriage rate, the divorce rate, the birth rate, labour participation rates and the female to male wage ratio.

In the next section we describe different scholars' approaches to the family as an economic unit. Secondly, we discuss the institutional framework of the family as a unit of income. Thirdly, we discuss results of previous Norwegian research on this subject. Fourthly, we discuss our data set before we give a description of the Hodrick-Prescott filter used to analyze the trends in family structure. Fifthly, we go on to discuss labour-market gender convergence by looking at the female to male labour participation ratios and the female to male wage ratios. Finally, we apply impulse response functions in order to study the interaction between shifts in the time series variables.<sup>1</sup>

### **The Family as an Economic Unit**

IN HIS BOOK *A Treatise on the Family*, Gary S. Becker approaches the family as a kind of small production unit, producing units of meals, health, skills, children, and self-esteem. The production factors for the family are, according to Becker, basically domestically-produced input factors, market goods and the human capital of its members.<sup>2</sup> Historically, marriage was a contract between a man and a woman, which had important economic, social and juridical implications. Couples were married according to family contracts often set up by others than themselves. Economic matters and considerations were important motivators in these arrangements.<sup>3</sup> According to Becker, marriage and the establishment of the traditional family household as a core economic unit was also important in order to avoid economic gender discrimination.<sup>4</sup>

1. Bremmer, Dale and Randy Kesselring (2004), "Divorce and Female Labor Force Participation: Evidence from Time-Series Data and Cointegration" in *Atlantic Economic Journal*, Vol. 32, No. 8, pp. 175-190.
2. Becker, Gary S (1991), *A Treatise on the Family*, Harvard University Press.
3. Becker, Gary S (1976), *The Economic Approach to Human Behavior*, University of Chicago Press.
4. Becker, Gary S (1971), *The Economics of Discrimination*, University of Chicago Press.

According to Coontz, who also looks at marriage basically as an economic contract between two parties, it was not until the end of the 1700s that the “personal choice of partners had replaced arranged marriage as a social ideal, and individuals were encouraged to marry for love” in Europe.<sup>5</sup> This old tradition was reflected in the historical practice where clergy and (other) civil servants often had to marry the widows of their predecessors in order to secure the household as a production and consumption unit.

From a historical neoclassical economic view, one of the major benefits marriage brought was increased specialization. A typical historical example would be that one of the spouses, preferably the wife, worked at home, being responsible for the daily life of the household and for the children’s upbringing, whereas the other, preferably the husband, worked outside the home in order to provide the family with financial resources. This specialization has potentially huge effects on productivity which increased the family’s economic performance.

In the large agricultural sector, the labour specialization between spouses was more limited. However, in this sector the family provided an economy of scale.<sup>6</sup>

Other economic explanations for marriage, and in a broader sense for the family, are the provision of public goods, social security, the pooling of risk and credit, and the coordination of investment activities.<sup>7</sup> On the personal level, marriage, of course, brings other benefits. For example, married people tend to have better health, a lower risk of mortality at any point in life, more pleasure, higher wages and a better private

5. Coontz, Stephanie (2005), *Marriage, a History*, Penguin Books, p.145.

6. Blau, Francine D., Ferber, Marianne A. and Winkler, Anne E. (2006), *The Economics of Women, Men, and Work*, 5th edition, Pearson Prentice Hall.

7. Weiss, Yoram (1997), “The Formation and Dissolution of Families: Why Marry? Who Marries Whom? and What Happens upon Divorce?” in Rosenzweig, Mark R. and Stark, Oded, (eds), *Handbook of Population and Family Economics*, Volume 1A, Elsevier, North Holland. Chapter 3, pp. 81–123.

economy.<sup>8</sup> Thus, marriage and the concept of the family in general have positive effects on wellbeing. However, the directions of the causalities are, admittedly, not always entirely clear.

### **Institutional Framework and the Standard of Living**

THE FAMILY HAS CLEARLY BEEN CONSIDERED as the core unit of society in Norway until the present day when the shift is towards more individualization. Industrial companies often hired families as a work force in the first decades of the nineteenth century. They were paid according to their needs and working ability. The employers often provided board and lodging for the entire family. They assisted with schooling, which became compulsory from 1739, health care and social services. In addition the employees received cash wages, which were usually paid individually.

Women legally had the right to apply for jobs and make and terminate their own contracts with the employer. However, because of low female wages, they were seldom breadwinners, and in almost all cases were dependent on their husbands. On the other hand, the families could hardly survive without women's work and wages. Childcare was basically taken care of by the family itself or by relatives. Domestic servants were common in agriculture and in families belonging to the upper middle class in the urban districts. They were considered part of the domestic household as regards labour, childcare and consumption.

When it was common for most women to work, wealthy women did

8. Waite, Linda J. (1995), "Does Marriage Matter?" in *Demography*, 32, n. 4, pp. 483–507. Stutzer, Alois and Frey, Bruno S. (2006), "Does Marriage Make People Happy, or do Happy People Get Married?" in *The Journal of Socio-Economics*, 35, pp. 326–347. Zimmermann, Anke C. and Easterlin, Richard A. (2006), "Happily Ever After? Cohabitation, Marriage, Divorce and Happiness in Germany" in *Population and Development Review*, 32, no. 3, pp. 511–528. Mastekaasa, Arne (1995), "Age Variations in the Suicide Rates and Self-Reported Subjective Well-Being of Married and Never Married Persons" in *Journal of Community & Applied Social Psychology*, 5, No. 1, pp. 21–39. Frey, Bruno S. and Stutzer, Alois (2002), *Happiness and Economics*. Princeton University Press.

not. In fact, it was taken as a sign of wealth that women stayed at home. This was considered an ideal situation. However, most families just could not afford this until after World War II, when the female participation rates reached a bottom low. Despite the fact that the standard of living was relatively high in Norway compared to the European average, it was still not high enough to ensure interdependence between the members of the family. Then, in parallel to the arguments of Jan de Vries, Robert Allen and Jacob Weissdorf, the revolution in consumer goods made women seek entry into the labour market to earn extra money to increase consumption.<sup>9</sup> We find the first traces of this trend in Norway in the late 1800s. However, the two world wars partially halted this development. After World War II, the increased standard of living trend made one income sufficient for families. This led to another consumer revolution not impacting substantially on the participation rates of Norwegian women before the 1960s.

In 1589 church weddings became compulsory under the Lutheran state church ruling. Hence, marriages became authorized both by God and the King. Seven years previously, divorce had become legal by a court ruling in cases of adultery, mental illness, desertion or impotency. From the 1770s the King could grant separation for women who were physically abused by their husbands. In 1909 Norway adopted a new, and at the time liberal, legislation on divorce. In principle, men and women were given the same rights.<sup>10</sup> However, women were still dependent on their husbands and there were hardly any arrangements for childcare outside the family framework. And so divorce was hardly an alternative for the majority of the population, except for the wealthy or those who were victims of abuse. Childcare arrangements were primarily taken care of by orphanages. Adequate post-divorce financial arrangements were not regulated until the 1960s and the 1970s.<sup>11</sup>

9. de Vries, Jan (2008), Allen, Robert C & Jacob L Weissdorf (2011), pp. 715-729.

10. Blom, Ida & Anna Tranberg, *Nordisk lovoversikt, viktige lover for kvinner ca 1810-1980*, Nordic Council, Oslo.

11. Johansen, Hanne Marie 1997, *Separasjon og skilsmisser i Norge 1536-1909*, Bergen University, Bergen, pp. 18-37.

## Previous Research on Norway

SEVERAL SCHOLARS HAVE EXAMINED the relationship between demographic and economic factors in Norwegian history. In 1855 Eilert Sundt published two large studies on the working class in Norway. The first one was on mortality and the second on marriage.<sup>12</sup> Sundt was quite explicit about the relationship between good and bad times and the rise and fall in the number of marriages and births. Hence, he was one of the first to produce empirical evidence on the importance of economic development on the family structure:

“There are, in my opinion, two ways of explaining the course of population movements, or the changing rise and fall in the number of marriages and births. On the one hand, it can be explained by external circumstances, on the other, by internal ones. By external circumstances I mean the good and the bad times, good seasons, business prosperity and war etc. By internal circumstances I mean the different ways in which the population can be increased, so that, for instance, at a certain time there could be a comparatively large group of young people in the marriageable age group, at another time a small one. Whereas external circumstances have their causes in contemporary events, internal circumstances have their causes in events which occurred during certain earlier periods.”<sup>13</sup>

About one hundred years later, in 1965, Julie E. Backer published an empirically impressive presentation of the developments in marriages, births and migration. One of her hypotheses relevant for this paper was that output cycles and economic growth were decisive for development in demographic key aggregates. Her data set basically starts in 1771, but

12. Sundt, Eilert (1855), *Om dødeligheden i Norge. Bidrag til Kundskab om Folkets Kaar*. Christiania. Sundt, Eilert (1855), *Om Giftermaal i Norge. Bidrag til Kundskab om Folkets Kaar og Sæder*. Christiania.

13. Sundt, Eilert (1980), *On Marriage in Norway*, (translated and introduced by Michael Drake), Cambridge University Press, Chapter 5, section 38.

her analytical study highlights the period 1865-1960. By following business cycles, measured as differentials in gross domestic product per capita on the one hand, and marriage, divorce and fertility rates on the other hand, she suggests there is a relationship with a time lag from GDP fluctuations to these demographic variables. Thus, economic short- and long-term development seem to have been determinant for family structure and development.<sup>14</sup>

Four years later, the English demographer Michael Drake published *Population and Society in Norway 1735-1865*, which mostly consisted of his doctoral thesis from 1964.<sup>15</sup> Drake presents a very detailed analysis of births, deaths, marriages and the economic framework for Norway from 1735 to 1865, collecting and using different data sources including the previous work by Sundt. He concludes that social development was very much influenced by demographic shifts. However, he also stresses that the causality was two-sided. The path towards economic prosperity and a higher standard of living had a definite influence on mortality rates, births and marriages.

In 1994 Øystein Kravdal published his doctoral thesis on the socio-demographic relationship between fertility, divorce and economic factors. He focused primarily on the second part of the twentieth century.<sup>16</sup> This was supplemented with other important papers on the issue.<sup>17</sup> Using econometric tests, Kravdal concludes that socioeconomic factors, i.e. education, wages and expected income were crucial for fertility, marriages and divorces. Higher education seems to have postponed both marriages

14. Backer, Julie (1965), "Marriages, Births and Migrations in Norway 1856-1960" in *Samfunnsøkonomiske studier*, No 13, Statistics Norway, Oslo, pp. 28-35.

15. Drake, Michael (1969), *Population and Society in Norway 1735-1865*, Cambridge University Press.

16. Kravdal, Øystein (1994), "Sociodemographic studies of fertility and divorce in Norway with emphasis on the importance of economic factors" in *Sosiale-økonomiske studier*, 90, Statistics Norway, Oslo.

17. Kravdal, Øystein (1994), The importance of economic activity, economic potential and economic resources for the timing of first births in Norway. *Population Studies*, 48, pp. 249-267.

and first births, whereas education and economic independence seem to have caused divorce rates to increase. However, the trends are not necessarily as strong today as they were a few decades ago.

To sum up, earlier empirical studies on the relationship between economic wellbeing and key demographic factors conclude that there is a clear relationship between the two. However, few quantitative empirical studies have looked into the relationship between family dissolution and the increase in living standards. Hence, this is the main focus of this paper.

## Data

IN ORDER TO EXAMINE TRENDS in marriages, divorces, fertility, wage ratios and labour participation rates we need valid and reliable data. The data on family structure are basically drawn from Statistics Norway. In their historical statistics we find relevant data regarding births, marriages and divorces from 1769 onwards. As already mentioned, Julie E. Backer has done an excellent job in systemizing and interpreting these data for Statistics Norway in the publication *Marriages, Births and Migrations in Norway 1856-1960*.<sup>18</sup> It is also possible to find older data in less available publications and unpublished archival sources.

We basically compile these data from Statistics Norway's own historical statistics, which are partly published in printed series and partly electronically.<sup>19</sup> The data are compiled on the basis of registrations of births, marriages, deaths and divorces made by clergy and public records offices in all municipalities in the country. Such registrations were compulsory and their quality was controlled by government officials. Hence, the records must be considered reliable.

18. Backer, Julie (1965), *Marriages, Births and Migrations in Norway 1856-1960*. *Samfunnsøkonomiske studier*, no 13, Statistics Norway, Oslo.

19. NOS 1969, *Historical Statistics 1968*, Statistics Norway, Oslo, pp. 42-47, NOS 1978, *Historical Statistics 1978*, Statistics Norway, Oslo, pp. 44-49, NOS 1994, *Historical Statistics 1994*, Statistics Norway, Oslo, pp. 63-71 and URL: <http://ssb.no/emner/02/02/folkendrhist/tabeller/>

The trend of cohabitation since the 1970s make modern demographic statistic records inferior to those of previous times. According to Statistics Norway the number of cohabitants increased until about 2000. Thereafter it has been fairly stable. One fourth of all Norwegian couples were cohabitants in 2010 and one third of the cohabitations could be considered equal to marriages. The number of break-ups in such relationships is substantially higher than in public marriages. This means that “real” marriage rates and divorces have been underestimated during the last decades.<sup>20</sup>

The data on labour participation rates are also basically taken from Statistics Norway. For most of the post-World War II period these data are easily drawn from data published by the bureau.<sup>21</sup> For the pre-war period, however, it is not easy to present stringent time series. In the first place, the labour force data collected at the population censuses taken every tenth year need to be adjusted according to modern definitions of labour-force participation. The necessary adjustments have been made by using the same classification system as in modern publications on the very detailed census data from earlier periods. Secondly, annual data have to be reached by interpolation between the modified census data. The interpolation is done by using annual demographic, employment and unemployment data. These are available partly from Statistics Norway and partly from previous research.<sup>22</sup> The interpolation variables are found by deducting unemployment from the labour force. Employment figures are then available. The ratio between employment and the labour force stands as the annual interpolation variable for labour participation rates.

Finally, wage data are basically taken from an extensive project on historical monetary statistics monitored by the Norwegian central bank. Here we find wage series by occupation, by industry and on aggregated

20. Statistics Norway (2010), URL: <http://www.ssb.no/samboer/>

21. NOS 1994, *Historical Statistics 1994*, Statistics Norway, Oslo, pp. 229-230 and URL: <http://ssb.no/aku/tab-2009-01-28-01.html>

22. Grytten, Ola Honningdal (1994), *An Empirical Analysis of the Norwegian Labour Market, 1918-1939*, NHH, Bergen, pp. 130-131.

levels.<sup>23</sup> As part of the occupational wage series, we also find annual data sets for wages by gender from 1820 onwards. These series are basically constructed with data from Professor Dr. Ingvar B. Wedervang's Archive on Historical Wages and Prices (until 1940) and data from Statistics Norway (chiefly from 1920).<sup>24</sup>

The Wedervang Archive, kept at the Norwegian School of Economics and Business Administration in Bergen, is one of the richest manual archives on prices and wages for the nineteenth century. Furthermore, it contains significant numbers of observations from the seventeenth and eighteenth century. All in all, more than a million observations on prices and wages between 1641 and 1940 are kept in the files. The wage records reflect daily, weekly, monthly and annual wages for more than a hundred different occupations in between 18 and 40 industries all over the country, albeit, admittedly, with an urban South-Norway bias. Board and lodging has been added when necessary on the basis of rich data on the value of these non-cash wage components in the archive.

The archive was established in the 1930s by Professor Ingvar B. Wedervang in cooperation with Professor Ragnar Frisch, both from the Department of Economics at Oslo University. Some 40 part-time and full-time staff assisted in collecting data from public and private records nationwide during the first decade of its existence. The price data are considered very good and reliable from 1815, whereas the wage data are considered good from 1820 and very good from 1850.<sup>25</sup>

23. Grytten, Ola Honningdal (2007), Nominal wages in Norway by occupation 1726-1940, Eitrheim, Øyvind *et al* (eds), *Historical Monetary Statistics, Part II*, Norges Bank, Oslo, pp. 231-342 and Grytten, Ola Honningdal (2007), Norwegian wages 1726-2006 classified by industry, Eitrheim, Øyvind *et al* (eds), *Historical Monetary Statistics, Part II*, Norges Bank, Oslo, pp. 343-384.

24. Grytten, Ola Honningdal (2007), Nominal wages in Norway by occupation 1726-1940, Eitrheim, Øyvind *et al* (eds), *Historical Monetary Statistics, Part II*, Norges Bank, Oslo, pp. 271-342.

25. Grytten, Ola Honningdal (2007), Professor Dr Ingvar B Wedervang's Historical Archive on Wages and Prices, Eitrheim, Øyvind *et al* (eds), *Historical Monetary Statistics, Part II*, Norges Bank, Oslo, pp. 203-230.

Here we are able to differentiate between female and male wages in agriculture, domestic services and some manufacturing industries between 1820 and 1850. The gender-specific data are richer from 1850, as they include additional private services and most manufacturing industries. The coverage increases towards 1940, and after World War II they represent an almost total gender-specific wage database for most occupations and industries.

### Decomposition of Time Series

IN ORDER TO ESTIMATE TRENDS in our time series we have decomposed them into a trend and a cyclical component using the Hodrick-Prescott (HP) filter. This is one of several alternatives in our analysis. There are, of course, other relevant filters which could be used. However, as long as the HP-filter is used for decomposing cycles from trends in order to map trend developments (only), it is valid for analysis. The HP-filter is an algorithm for finding smoothed values, i.e., trends of a time series. The filter separates an observed time series,  $\{y_t\}_{t=1}^T$ , into a smoothed or a trend component,  $g_t$ , and a cyclical component,  $c_t$ . That is,

$$y_t = g_t + c_t$$

In the filtering (detrrending) of  $y_t$ , the trend component  $g_t$  is determined by

$$\min \sum_{t=1}^T (y_t - g_t)^2 + \lambda \sum_{t=2}^{T-1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2$$

Here  $T$  is the sample size and  $\lambda$  is the smoothing parameter, specifying the smoothness of the trend. A commonly used value  $\lambda$  is 100 for annual data, 1,600 for quarterly and 14,400 for monthly, depending on the use of the figures. One could argue for different smoothing parameters. 40,000 is sometimes used for monthly data in modern Norwegian busi-

ness cycle analysis, and 2,500 for annual. Morten O Ravn and Harald Uhlig have argued that 6.25 might be a good general parameter for annual data.<sup>26</sup> The choice of smoothing parameter should be made according to the kind of analysis the researcher wants to conduct or how smooth he wants the trend line to be. Here our aim is not to find cycle deviations from the trend. Hence, we should use a lower smoothing parameter than in business-cycle analysis. We have tried parameters with a value less than 10. These do not smooth the trend line adequately in order to adjust for annual “abnormalities”. Thus, we apply  $\lambda = 100$  in our analysis.

### **Trends in Family Structure**

IN ORDER TO INVESTIGATE the impact of changes in the economy and the labour market on marriage, divorce and fertility, it is important to examine structural changes in the family as a socio-economic institution.

### **From Families to Individuals**

BY LOOKING AT WAGE RECORDS from two of the pioneer industrial plants in Norway, the Baasland and Næs Iron Mill (from 1726) and the Alvøen Paper Mill (from 1797), we find that the labour force was basically connected to the companies by individual contracts. These were mostly made between the manager of the plant and the bread-winners of the household. Wages were paid not only in cash, but also *in natura*, i.e. housing and subsidized food and clothing. This was the case for manufacturing plants, agriculture and, to a large extent, crafts and the building industry. Payments were dependent on the household’s labour. Employers often demanded labour from both parents and from those of their children able to work. The families were paid both according to their total working capacity and their basic economic needs for survival.

26. Ravn, Morten O and Uhlig, Harald (2002), pp. 371-376.

In other words, the employers considered the family both as a labour unit and an economic and social unit.<sup>27</sup>

This pattern was significant until the mid-nineteenth century, and was still strong at the end of the nineteenth century, despite the fact that individual labour contracts had become widespread at that time. An example can be taken from one of the foremost textile companies in Norway, O.A. Devold, formally founded in 1853, but with roots dating back to 1818. The company was pioneered by Christian Puritans, which was very common for industrial companies in the Western world, including Norway. Devold was a pioneer internationally regarding production technology, hydro-electricity, telecommunications, wool products, health, and labour welfare and community-building. As late as the middle of the twentieth century, they still considered the families of their labour force as their responsibility, building kindergartens, awarding scholarships to sons and daughters of their employees, building the local hospital, church, mission halls and housing for their work force and their families. In return families remained loyal to the company, which in consequence recruited its work force internally.

During the inter-war economic crises, the old system of considering the family household as the basic unit of the labour force and of economics enjoyed a short revival generally, before it ceased after World War II.<sup>28</sup>

Figure 1 shows trends in the birth, marriage and divorce rates in Norway from 1886 to 2007. The numbers are quoted as a percentage of the annual mean population. The number of marriages was relatively stable with about six marriages per 1,000 inhabitants until the mid-1930s. From then on, there was a sharp increase of about 35% until

27. Fløystad, Ingeborg (1979), *ArbeidsmandensLod, det nødtafite Brød: Arbeiderlevkâr ved Baaseland and Næs Jernverk 1725-1807*, University of Bergen, Bergen, pp. 595-596. Goksoyr, Matti (1982), *Fra tjener til arbeider? En undersøkelse av Alvoen-arbeidernes rekruttering og lønnsforhold 1801-1865*, University of Bergen, Bergen, pp. 7-61.

28. Lerheim, Kr (1952), *Historikk - Devold*, Manuscript, Ålesund, pp. 1-86 and Wedervang Archive, file 417.

1950. However, looking at the raw data (the data before applying the HP filter) there was a sharp decline in marriages during World War II. Surprisingly, this decline was reversed for a short period after World War II. Then the trend is significantly negative with only a few exceptions. Today, we have about five marriages per 1,000 inhabitants annually. Hence, the fall in the number of marriages is not very big, if we look at the entire period from 1886 to 2007. Having said that, it should be noted, as has already been stated, that the trend since 1950 is clearly negative.

In general, men are still older than women when entering into their first marriage. This has been a stable pattern throughout the period under investigation. Until about 1920 the average age for a first marriage was about 28-29 years for men and 26-27 years for women. Then it started to increase until 1946. After 1936 it dropped considerably until 1970 when the average age had fallen to 26 and 23. Since then, the first marriage age has increased steadily and has reached approximately 32.5 years for men and 29.5 years for women. In other words, nowadays men are about four years older and women about three years older when they marry for the first time compared to 150 years ago. Nowadays the age difference between men and women when entering into their first marriage is about three years, which is about a one year increase since 1850.

## **Divorce**

THE DIVORCE RATE TENDS TO RISE when the traditional division of labour is weak, i.e. when the earnings from one spouse involved in domestic production and the other in work outside the household are small. Since World War II, women have experienced the possibility of higher education and work outside the home, and nowadays women's possibilities outside the home are greater than before, making it easier for them to break out of marriage. Hence, divorce costs less than previously. However, divorce also depends on other factors. Weiss and Willis show

that an unexpected increase in the husband's earning capacity reduces the probability of a divorce, whereas an unexpected increase in wives' earning capacity raises the probability.<sup>29</sup> Furthermore, similar levels of education at the time of marriage, together with similarity in religion and ethnicity, reduce the probability of divorce.<sup>30</sup>

Before 1900 divorce was practically non-existent. In fact, it was not until about 1970 that there was one divorce per 1,000 inhabitants annually. The number of divorces per 1,000 people is today approximately 2.5 per annum, that is, about half the number of marriages registered annually. This is confirmed in Figure 2a, which reports the divorce rate defined as the number of divorces divided by the number of marriages in a given year. The rate has increased steadily since 1970 with a peak about 1990. Thereafter it decreased until the late 1990s, due to less frequent marriages and an increasing number of cohabitations not covered by the statistics. In 1990 the relative number of divorces began to rise again.

Figure 2b shows that there are large cohort effects with respect to divorces.<sup>31</sup> There is a clear trend that the cumulative share of marriages ending in divorce increases with younger cohorts. This clearly shows that marriages are becoming less stable. Furthermore, not only do younger cohorts divorce more frequently, but they also divorce earlier, i.e., they are married fewer years before terminating their marriage compared to older cohorts.

Overall, marriages have been declining slowly whereas divorces have

29. Weiss, Yoram and Willis, Robert J. (1997), "Match Quality, New Information and Marital Dissolution" in *Journal of Labor Economics*, 15, no. 1, Part 2, pp. S293-S329.

30. Weiss, Yoram (1997), "The Formation and Dissolution of Families: Why Marry? Who Marries Whom? and What Happens upon Divorce?" in Rosenzweig, Mark R. and Stark, Oded (eds.), *Handbook of Population and Family Economics*, Volume 1A, Elsevier, North Holland. Chapter 3, pp. 81-123.

31. Cohort refers here to the year a couple enter into marriage. The source for the figure is Mamelund, Sverre-Erik, Brunborg, Helge and Noack, Turid (1997), *Divorce in Norway 1886-1995 by Calendar Year and Marriage Cohort*, Report no. 97/19 Statistics Norway.

been increasing rapidly, implying that other types of commitments between two people, e.g. cohabitation, are preferred before marriage. In addition, the threshold for ending a marriage is lower compared to earlier times.

## Fertility

IN HIS *Essay on the Principle of Population*, Thomas Malthus analyzed population dynamics within an economic framework from 1798. Becker's paper from the 1960s is the first analysis within a neoclassical economic framework.<sup>32</sup> Children are associated with their usefulness for their parents, income and costs. Furthermore, the parents must compromise between the quantity (how many children) and the quality of children (benefits). More children imply fewer resources per child for a given basket of resources.

Figure 3 shows the birth rate in Norway from 1886 to 2007 and chart 3a shows the total fertility rate from 1846 to 2005.<sup>33</sup> From the beginning of the period and until the present day, there has been a sharp decline in the birth rate, from about 3.1 percent to 1.25 percent annually. From the beginning of 1900 until the 1930s, there was a sharp decline in the fertility rate from about 4.5 to less than two children born alive to a woman in her childbearing period. The fertility rate increased rapidly from the end of World War II to the beginning of the 1970s (the baby boom), when it started to decrease again and it is now approximately 1.85 children per woman. This is smaller than the total reproduction rate of 2.1 children per woman, but significantly higher than the average rate for Europe, which is about 1.5.

32. Becker, Gary S. (1960), "An Economic Analysis of Fertility" in *Demographic and Economic Change in Developed Countries*, Princeton University Press for the National Bureau of Economic Research, pp. 209-231.

33. Total fertility rate is defined by Statistics Norway as: "The average number of children born alive to a woman in her child-bearing period exposed at each age to the existing fertility but not exposed to mortality. Total of one-year age-specific fertility rates 15-49 years."

The transition from high to low levels of fertility and mortality can be explained by the “theory of demographic transition”:

“Socioeconomic forces are seen to play a central role in this process: urbanization, the movement of work outside the home, increased population mobility, the increased importance of the nuclear family, the increased importance of education and human capital, declining infant and child mortality, the changing roles of women, and increased rationality in individual and family decision-making.”<sup>34</sup>

Until 1960 about seven percent of all children were born outside marriage. After 1960 this percentage has increased dramatically. Today, less than half of all the children born in Norway are born to parents who are married. Chart 3b shows the ratio of children born out of wedlock and the total number of children born in a given year.

### **Labour Market Gender Convergence**

AFTER HAVING QUANTIFIED the development of marriage, divorce and fertility, we are in a position to compare the development in these variables against labour-market statistics, i.e. participation rates and gender-specific wage ratios, in other words female to male wage ratios. Did female participation rates increase? Was the gender gap in terms of wages closed? If the answers to these questions are both yes, it may be concluded that women became more independent of male breadwinners.

### **The Labour Force Participation Rate**

ACCORDING TO CHART 4A, the female labour force participation rate showed a minor increasing trend until the turn of the nineteenth century,

34. Haines, Michael (2003), “Fertility” in Mokyr, Joel (ed.) *The Oxford Encyclopedia of Economic History Volume 2*, Oxford University Press, pp. 284-291.

when it fluctuated about 54% for women between the ages of 15 and 74, against 90% or higher for men. This came as a consequence of the relatively rapid industrialization process in Norway at the time, when more women were involved in manufacturing. The fastest growing female-intensive sub-industries were, among others, food processing and the textile industry.

From the turn of the century, the participation rate for women began to decrease significantly. This can basically be explained by the rapid productivity growth in agriculture, causing the agricultural labour force to fall rapidly. Thus, many women left the labour force, whereas most men remained in the labour force. The development was speeded up during the unemployment crisis of the interwar period, when women were forced out of the labour market due to political decrees by the Labour Party, backed by the trade unions, in order to give priority to male bread-winners before dependent married women in job application procedures. In local boroughs governed by the Social Democrats, married men were given priority over married women in the public sector.<sup>35</sup> This attitude was also mirrored in the private sector. At the end of the 1930s, the female labour participation rate fell to 42% against almost 87% for men between 15 and 74 years of age.

During the German occupation from 1940 to 1945, a lack of labour caused the participation rate to increase again, before steady economic growth and improvement in the standard of living after the war made more women opt to become housewives. This was considered a status symbol for a family until the 1960s. Thus, female participation rates reached an all-time low at 36%.<sup>36</sup> From the mid-1960s, modern feminism and a rapid increase in the demand for labour caused female participation rates to increase dramatically until the present day. In 2010, the female participation rate was over 70%, and the male rate was over 77%.

35. Grytten, Ola Honningdal and Camilla Brautaset (2000), "Family households and unemployment in Norway during years of crises" in *The History of the Family*, no 1, pp. 23-53.

36. Hodne, Fritz and Ola Honningdal Grytten (2002), *Norsk økonomi i det 20. århundre*, Fagbokforlaget, pp. 198-199.

In other words, we see a dramatic movement towards a convergence in labour-force participation in Norway from the mid-1960s onwards, due to less participation by men and substantially higher participation by women. In Chart 4b, we draw the estimated cyclical deviations from HP-filtered series. The chart informs us that the rate fluctuated significantly more among women than among men and was considerably more sensitive to business cycles. Hence, historically female labour participation fell more than male labour participation did during years of crisis. However, this difference in pattern seems to have been eliminated during the last fifteen to twenty years.

### **Female to Male Wage Ratio**

POLYNOMIAL TRENDS OF THE FEMALE to male wage ratios are plotted in Chart 4c. They are calculated in terms of female wages as shares of male wages for similar occupations within industries. As shown in the graph, the gender gap was in a process of almost consistently being closed. The only exception was during the years of devastating economic crises in the 1920s and 1930s, when the development was temporarily reversed. Obviously, the substantial interwar crisis in the labour market not only forced women to give way to male breadwinners in the labour market, but also led to a significant increase in wage differences. This development took place after a period of rapid decrease in the gender differences in wages during the post-World War I boom.<sup>37</sup> Thus, the divergence trend during most of the 1920s and 1930s can be seen not only as a result of years of crises, but also as a consequence of very high convergence rates during the economic upturn before the interwar crises.

From 1940 onwards, the female to male wage ratios have increased rapidly until the present day, when gender differences have fallen to

37. Grytten, Ola Honningdal (2007), "Nominal wages in Norway by occupation 1726-1940" in Eitrheim, Øyvind *et al* (eds), *Historical Monetary Statistics, Part II*, Norges Bank, Oslo, pp. 271-342.

about 10%, compared to about 55% in the 1880s. In order to close the last part of the gap, women have to enter senior positions more often than they have had the opportunity to and have been willing to do until now. In any case, the development over the last 120 years tells us that women have become less economically dependent on their husbands, and nowadays can afford to carry family responsibilities on their own shoulders, contrary to their abilities in the nineteenth and well into the second part of the twentieth century.

Is there a causal link between the gender-specific labour market convergence and increased family instability? From looking at the above graphs, there would seem to be shifts in trends relatively close to 1945. The Zivot and Andrews test, as described in the next section, identifies structural breaks within plus/minus 30 years from 1945. The time around World War II seems to mark a change of paradigms, both in family life and in the gender-specific wage gap.

### Unit Roots and Co-integration

IT IS NOT UNCOMMON for time series to be non-stationary. A non-stationary time series  $\{y_t\}$  does not have the properties of time invariant first and second moments, i.e., the mean  $E(y_t)$  and variance  $Var(y_t)$  is not constant. Another important property with a stationary time series is that the covariance  $Cov(y_t, y_{t+s})$  between two time periods  $t$  and  $s$  depends on the time period between them  $s$  and not on the actual time  $t$  that the covariance is computed. Investigating possible relationships between non-stationary time series may lead to results that are spurious.

Looking at the time series in Figure 5, it seems plausible that the variables in levels are non-stationary whereas the first differences seem to be stationary. To formally test for a unit root we employ the Augmented Dickey-Fuller (ADF) test. The number of lags is chosen as the highest significant lag out of a maximum of five lags. The test statistics are reported in Table 1. For the years 1886-2007, the test statistics for the

birth, divorce and participation rate is larger than the critical values, hence we are not able to reject the null hypothesis on non-stationarity. Wages are barely significant at a 10 percent level. Overall, the evidence supporting stationarity is weak and we conclude that the time series are not stationary in levels. But, from the same table it is clear that the time series are stationary in first differences. Hence, all four time series are integrated of order 1,  $I(1)$ . For the sub-sample period, i.e. 1945-2007, this conclusion still holds.

A problem with the ADF test is that it does not allow for structural breaks in the series. To allow for this we apply the Zivot and Andrews test procedure<sup>38</sup> as implemented in the `zandrews` command for Stata by Christopher F. Baum.<sup>39</sup> This test allows for one structural break in the time series. It can be in the intercept, the trend or both. We test for all three types of breaks. The results are reported in Table 2. They give the same overall conclusion as for the ADF. That is, the time series in levels are non-stationary.

### Co-integration

HAVING ESTABLISHED THAT all four time series are integrated of order 1,  $I(1)$ , it is natural to ask if any long-term equilibrium relationship between the series exists. Or is there only a spurious relationship? Thus, we examine whether the time series are co-integrated, i.e. if the series share a common stochastic trend. We apply the Johansen co-integration test. We use a two time period lag for the sample and one lag for the sub-sample. In both cases we use an unrestricted constant, allowing for a linear time trend in the levels of the data. Optimal lag structure is determined by looking at the Akaike Information Criterion (AIC), the

38. Zivot, Eric and Andrews, Donald W. K. (1992), "Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis" in *Journal of Business & Economic Statistics*, 10, Nr. 3, pp. 251-270.

39. Baum, Christopher F. (2001), "Stata: the language of choice for time series analysis?" in *The Stata Journal*, No. 1, pp. 1-16.

Schwartz Bayesian criterion (BIC) and the Hannan-Quinn criterion (HQC) estimated in a Vector Autoregressive (VAR) model framework. All three information criteria give their minimum value at the same length of lags. Table 3 gives the results for the trace and maximum eigenvalue test statistics.

We start by considering the full sample. The trace statistics reject the null hypothesis of no co-integrating vector with a test statistics of 52.303 which is larger than the 5% critical value of 47.21. However, we are not able to reject the null hypothesis that the number of these is at the most one.

Hence, based on the Johansen trace statistics, there is one of these. Turning to the maximum eigenvalue statistic, we see that the hypothesis stating no co-integrating vector is rejected. The test statistic for the null that there is at most one and the alternative that there are two cointegrating vectors is not rejected. Hence, both the trace and maximum eigenvalue test statistics give the same conclusion. Examining the results for the sub-sample, we conclude that there is one vector of this kind for the years 1945-2007.

Given the results we can estimate a Vector Error Correction (VEC) model with one co-integrating relationship in the specification. However, for both samples we are not as interested in the parameter estimates as in the ability to estimate the Impulse Response Functions (IRF).

### **Impulse Response Functions**

THE IMPULSE RESPONSE FUNCTIONS show how the variables within a system react to a one-standard deviation innovation (shock) in one equation at time  $t$ , while there are no innovations in the other variables at time  $t$ . The left column in chart 6 shows the IRFs for the full sample (1886-2007) while the right column shows for the sub-sample (1945-2007).

The two top figures show the response of the female labour participation rate to an innovation in the female to male wage ratio, the birth rate

and the divorce rate. The effect of a shock in the wage ratio has almost no effect for the years 1945 – 2007 which can be explained by the fact that the wage ratio has increased very much after World War II and in recent years has approached .9 (see Figure 4c). Hence, changes in the female to male wage ratio are associated with practically no changes in the female labour participation rate. The effect of a divorce is as expected, i.e. positive. A divorced woman, who in her marriage has been financially dependent on her husband, must after a divorce generate income on her own. In other words, she will join the labour force. Although it starts negative, it becomes positive after about three years. This can be interpreted as time for adjustment from a family situation into participating in the labour market. The effect of a shock in the birth rate is associated with a permanent negative impact on the female labour participation rate, both in the full sample and the sub-sample.

Looking at the sub-sample we see that a shock in the female labour participation rate has a permanent negative effect on the birth rate. Similarly, a shock in the divorce rate has, for the first seven periods, a negative impact on the birth rate. The shock in the female to male wage ratio has initially no effect, but after about two years the effect is positive. Higher wages make it economically safer to produce children when married, and, moreover, the financial risk associated with a divorce is somewhat reduced if the female to male wage ratio increases.

In both the full sample and the sub-sample, a shock in the female labour participation rate is associated with a higher divorce rate. And the increase is permanent. The same applies when analyzing the female to male wage ratio. This can be interpreted as meaning that, when women obtain increased economic independence, the divorce rate increases. This effect is expected. Participating in the labour market increases the market for potential spouses and converging female-male wages contribute towards levelling personal finances. For the sub-sample, a shock in the birth rate is associated with a decrease in the divorce rate. Hence, producing children tends to stabilize marriages.

## Conclusions

TAKING AS ITS POINT OF DEPARTURE Gary S. Becker's research on the family as the core production unit in the economy and its influence on family structures, the present paper asks whether the convergence of genders in the labour market and thus economic independence has led to the dissolution of the family. In order to do so, the paper draws on new data for a North-West European country, Norway. We follow time series of marriages, divorces and fertility since 1886 until the present day mirrored in gender-specific labour market convergence in wages and participation rates.

We map dramatic changes in family structure when it comes to marriage, divorce and fertility. We give evidence of the dimension of the labour participation rate and wage convergence between genders. For the entire period, we discover that birth rates fell as the living standards increased and the gender-gap in wages closed. We also find that divorce rates increased alongside this development in the labour market. The development speeded up after World War II. Increasing female labour participation rates from the mid 1960s also fuelled the development towards lower fertility rates and less stable family relations.

It is interesting to note that the effects of the demographic changes in family structure seem to be smaller for the recent period than they are in the full sample, especially with regard to the responses of the birth and divorce rates. We would explain this by the fact that family life and the economic lives of men and women are more separate today than earlier.

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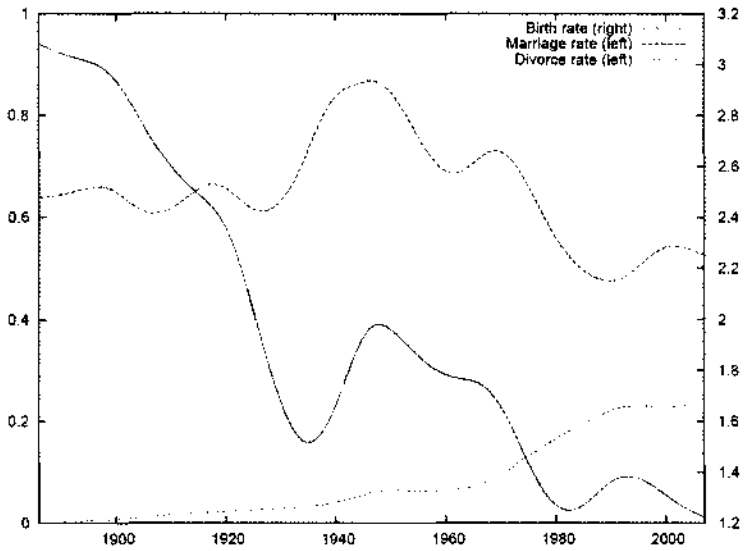
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## **APPENDIX**

Gender-Specific Labour-Market Convergence  
and Family Stability in Scandinavian Countries  
(1886-2007)

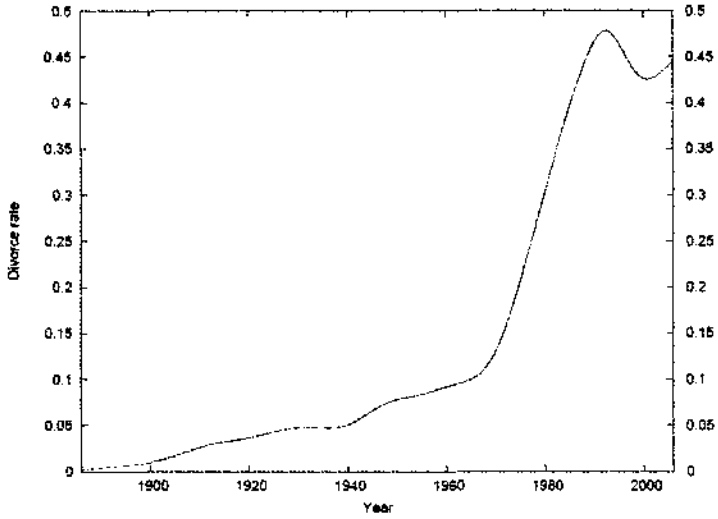


Figure 1. Birth, Marriage and Divorce Rates as Percentages of Population (HP-filtered,  $\lambda=100$ ).

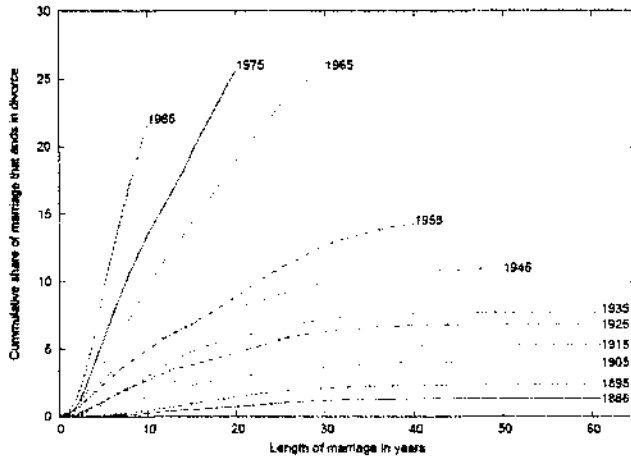


Source: Statistics Norway.

Figure 2. Probability of Divorce in Norway



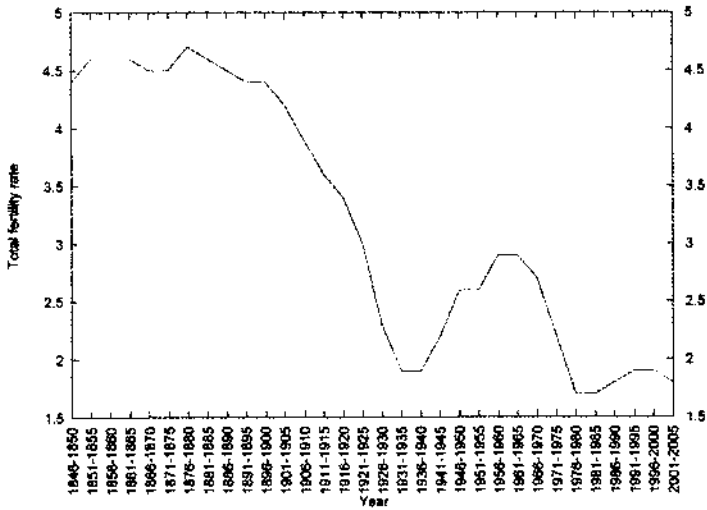
(a) Number of divorces divided by the number of marriages in a given year.



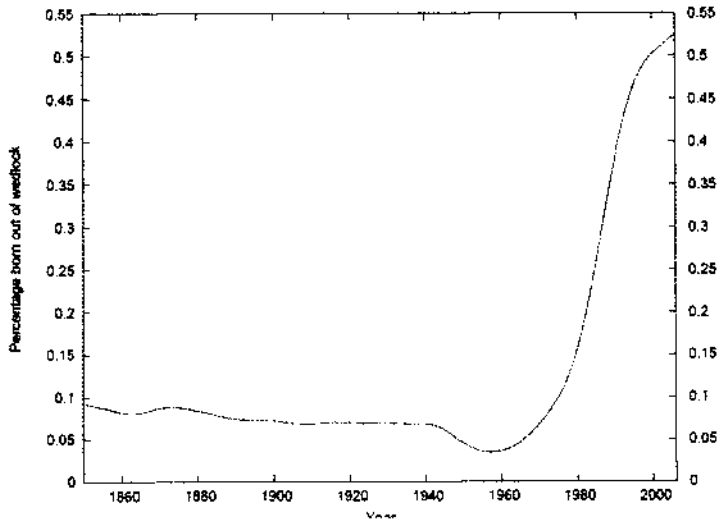
(b) Cumulative share of marriage that ends in divorce for a given cohort.

Source: Mamelund, Brunborg and Noack, 1997.

**Figure 3. Births and Fertility in Norway**



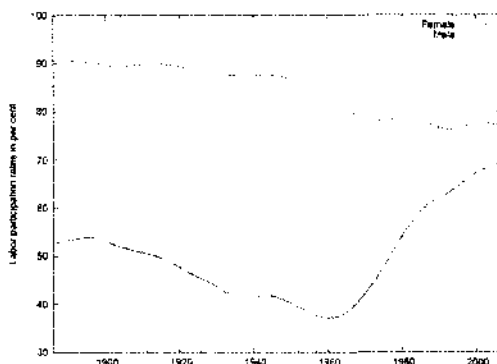
(a) Total fertility rate 1846-2005.



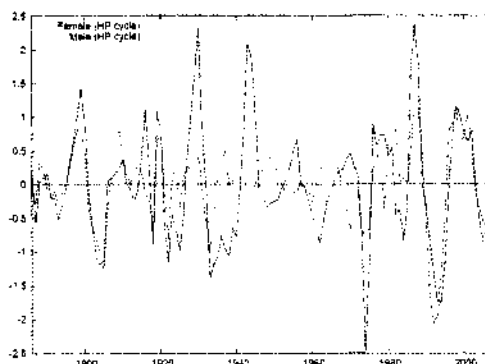
(b) Ratio of born out-of-wedlock to total (HP-filtered with  $\lambda=100$ ) 1886-2007.

Source: Statistics Norway.

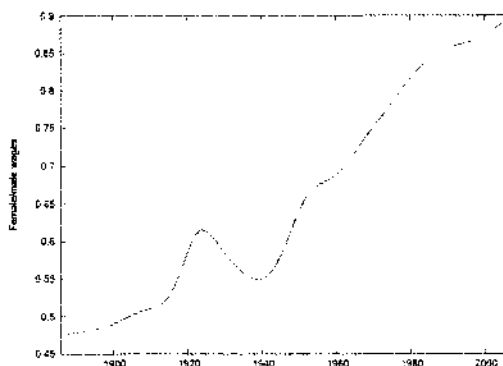
**Figure 4. Men and Women in the Norwegian Labour Market**



(a) Female and male labour participation rates (HP-filtered with  $\lambda=100$ ) 1886-2007.



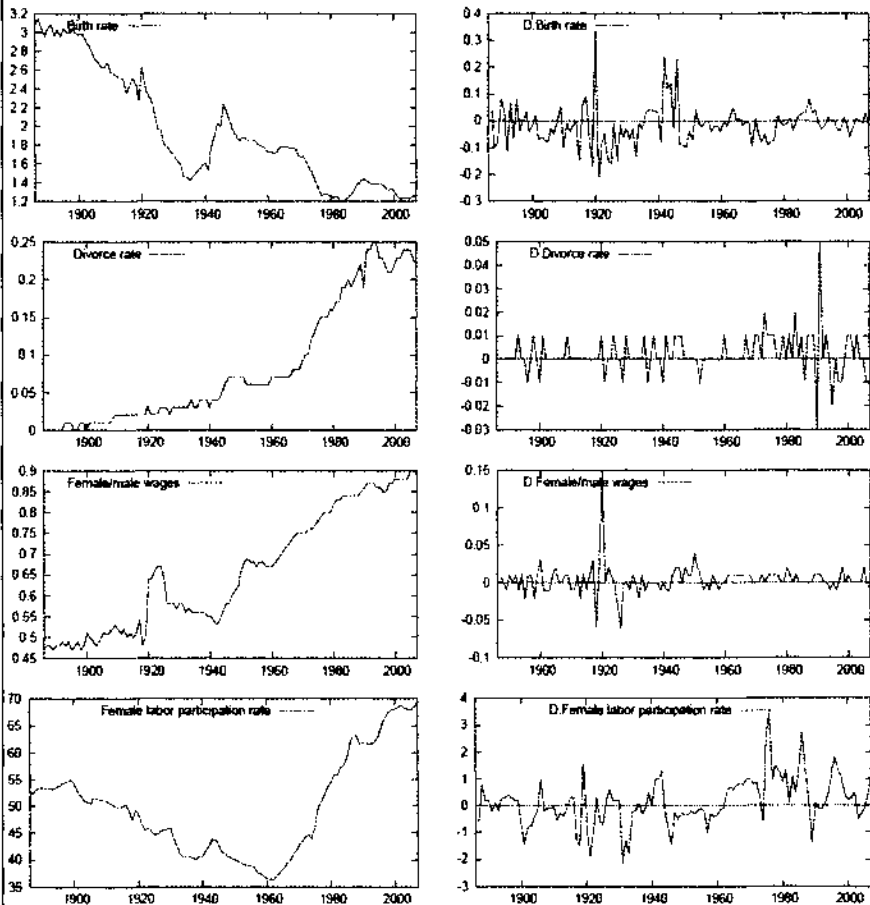
(b) Cycles of female and male labour participation rates (HP-filtered with  $\lambda=100$ ) 1886-2007.



(c) Ratio of female to male wages (HP-filtered with  $\lambda=100$ ) 1886-2007.

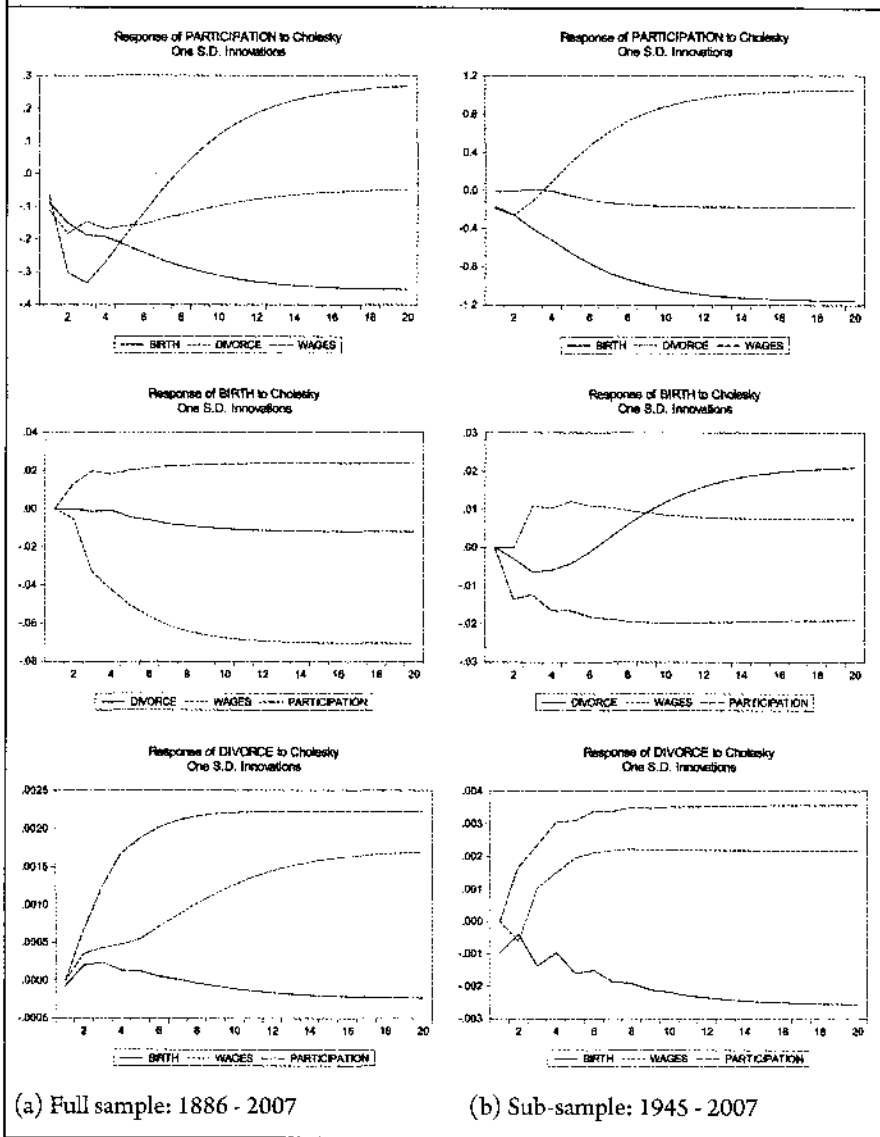
Sources: Statistics Norway, Grytten (1994), pp. 119-138 and Grytten (2007), pp. 271-342.

**Figure 5: Birth Rate, Divorce Rate, Female-Male Wage Ratio, Female Labour Participation Rate 1886-2007 in Levels (left column) and First Differences**



Sources: Statistics Norway, Grytten (1994), pp. 119-138 and Grytten (2007), pp. 271-342.

**Figure 6. Impulse response functions**



Variable	ADF	Critical Values			Asymptotic $p$ -value
		1%	5%	10%	
Years 1886-2007					
Birth	-2.29412 (5)	-4.035	-3.448	-3.148	0.43660
Divorce	-1.59041 (1)	-4.033	-3.447	-3.147	0.79710
Wages	-3.16451 (3)	-4.034	-3.448	-3.148	0.09174
Participation	-0.30368 (1)	-4.033	-3.447	-3.147	0.99060
D.Birth	-3.89845 (4)	-2.598	-1.950	-1.611	0.0000
D.Divorce	-6.80764 (1)	-2.597	-1.950	-1.611	0.0000
D.Wages	-5.15995 (5)	-2.598	-1.950	-1.611	0.0000
D.Participation	-5.72128 (0)	-2.597	-1.950	-1.611	0.0000
Years 1945-2007					
Birth	-1.67691 (5)	-4.168	-3.508	-3.185	0.7617
Divorce	-1.62408 (0)	-4.168	-3.508	-3.185	0.7723
Wages	-2.42625 (1)	-4.168	-3.508	-3.185	0.3657
Participation	-2.89491 (1)	-4.168	-3.508	-3.185	0.1641
D.Birth	-2.28547 (5)	-2.616	-1.950	-1.610	0.0215
D.Divorce	-4.52567 (1)	-2.616	-1.950	-1.610	0.0000
D.Wages	-5.09153 (0)	-2.616	-1.950	-1.610	0.0000
D.Participation	-3.34687 (0)	-2.616	-1.950	-1.610	0.0012

Notes: ADF = Augmented Dicky-Fuller test. Number of lags in parenthesis is chosen as the highest significant lag out of a maximum of 5 lags. The test includes a constant and a trend. In first differences no constant and no trend are included.

Variable	Break	t-statistic	Break year	Critical values	
				1%	5%
Birth	intercept	-4.099 (3)	1921	-5.43	-4.80
Divorce	intercept	-4.727 (1)	1973	-5.43	-4.80
Wages	intercept	-4.549 (3)	1925	-5.43	-4.80
Participation	intercept	-3.660 (1)	1975	-5.43	-4.80
Birth	trend	-3.845 (3)	1928	-4.93	-4.42
Divorce	trend	-2.249 (1)	1953	-4.93	-4.42
Wages	trend	-4.063 (3)	1941	-4.93	-4.42
Participation	trend	-4.666 (1)	1958	-4.93	-4.42
Birth	both	-5.384 (3)	1942	-5.57	-5.08
Divorce	both	-2.887 (1)	1973	-5.57	-5.08
Wages	both	-4.573 (3)	1931	-5.57	-5.08
Participation	both	-4.247 (1)	1956	-5.57	-5.08

*Notes:* Number of lags in parenthesis is chosen as the highest significant lag out of a maximum of 5 lags.

<b>Table 3. Johansen Co-integration Test</b>						
$H_0$	$H_1$	Test Statistic	1%	5%	p-value	Eigenvalue
Years 1886-2007						
<i>Trace Statistic</i>						
$r=0$	$r \geq 1$	52.303	54.46	47.21	0.0166	0.21042
$r \leq 1$	$r \geq 2$	23.952	35.65	29.68	0.2091	0.12712
$r \leq 2$	$r \geq 3$	7.6371	20.04	15.41	0.5120	0.055385
$r \leq 3$	$r \geq 4$	0.79979	6.65	3.76	0.3712	0.0066428
<i>Maximum Eigenvalue Statistic</i>						
$r=0$	$r=1$	28.351	32.24	27.07	0.0364	0.21042
$r \leq 1$	$r=2$	16.314	25.52	20.97	0.2153	0.12712
$r \leq 2$	$r=3$	6.8373	18.63	14.07	0.5169	0.055385
$r \leq 3$	$r=4$	0.79979	6.65	3.76	0.3712	0.0066428
Years 1945-2007						
<i>Trace Statistic</i>						
$r=0$	$r \geq 1$	59.326	54.46	47.21	0.0024	0.44106
$r \leq 1$	$r \geq 2$	22.678	35.65	29.68	0.2708	0.17064
$r \leq 2$	$r \geq 3$	10.890	20.04	15.41	0.2220	0.13101
$r \leq 3$	$r \geq 4$	2.0435	6.65	3.76	0.1529	0.03192
<i>Maximum Eigenvalue Statistic</i>						
$r=0$	$r=1$	36.648	32.24	27.07	0.0016	0.44106
$r \leq 1$	$r=2$	11.788	25.52	20.97	0.5806	0.17064
$r \leq 2$	$r=3$	8.8464	18.63	14.07	0.3062	0.13101
$r \leq 3$	$r=4$	2.0435	6.65	3.76	0.1529	0.03192

