Did industrialization have an impact on social mobility in Hungary? Industrialization and social stratification in dual societies

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1 Introduction

Industrialization in the last two hundred years was one of the most pervasive and fundamental changes infecting national societies. Industrialization entailed fundamental changes in the social structure, and affected the patterns of social mobility according to the theory of industrialization (Treiman, 1970). Treiman points out that industrialization would lead to the diminishing of the agrarian classes, to the emergence of manual and non-manual classes, and would result in greater amount of relative social mobility.

Whereas industrialization undoubtedly transformed economies across the globe, it is still debated whether industrialized societies are also more open , i.e. characterized by greater amount of relative social mobility than not industrialized societies. It is evident that, concerning social structural developments, there are societies which deviate from the patterns outlined by the theory. Hungary in the late 19th and early 20th Century, on which we will focus further on in this paper, is one of the deviating examples. Hungary, similar to other later industrializing European societies, have experienced rapid industrialization at the end of the 19th Century. Despite fundamental changes in the structure of the economy, the population remained predominantly agrarian and only a very thin layer of industrial and non-manual class emerged (Kover & Gyani, 1998; T. I. Berend, 2003; I. T. Berend, 2001; Eddie, 1989).

The questions we ask in this paper are the following: did the social structure of the Hungarian society change between 1850 and 1950, and did the Hungarian society become more open in this period, i.e. did the amount of relative social mobility increase? To answer these questions, we first investigate the link between industrialization and variation in social structure on the one hand, and industrialization and relative social mobility on the other hand, and contrast them with historical and social circumstances in the 19th and early 20th Century Hungary. We then empirically test whether there is variation in the social structure and in relative

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social mobility in this period in Hungary.

For this period of Hungarian history, no survey data is available. We employ a newly collected occupational mobility dataset, based on historical marriage records from Hungary, between 1850 and 1950. These registers contain, in a single source, the occupation of two generations: father and son. Marriage registers are available for a long period, making possible to study variation in social openness over time.

A major challenge of studying mobility from historical sources is to gather data which are representative for a given period of a given geographic unit, and thus can be relied on for generalizable conclusions and comparisons with other periods or countries (Grusky & Fukumoto, 1989). With respect to some exceptions, such as the Dutch Historical Sample of the Netherlands (HSN, 2008) and the French Tra-dataset (Braudel, 1995), historical datasets from vital registers do not usually represent the labor population of larger national units. The historical marriage record data we use in this paper represent the historical population of all large regions and municipal types of present-day Hungary. Our dataset therefore allows for generalizations beyond small regional boundaries.

Previous research, based on large-scale surveys have investigated whether social mobility patterns are similar across contemporary societies with different historical trajectories (Featherman, Jones, & Hauser, 1975; Lipset & Zetterberg, 1959; Grusky & Hauser, 1984; Hauser & Grusky, 1988; Erikson & Goldthorpe, 1992; Breen, 2004; Ganzeboom, Luijkx, & Treiman, 1989). The long-term longitudinal perspective of our study has the advantage that some processes, such as economic restructuring or social norms of communities might take longer time to change and influence labor market choices, whereas certain shocks, such as economic crises and wars are expected to have a sudden impact on the labor supply and demand, and thus, also on mobility. By studying a long time, we can distinguish short term fluctuations from long term trends, and have more control over factors that can confound with mobility trends.

Sociological literature on historical changes in social mobility has mostly focused on Western European patterns (Maas & Leeuwen, 2010). A shortlist of historical sociological work on mobility includes studies on Great Britain (Miles, 1994; Lambert, Prandy, & Bottero, 2007), on the US (Grusky & Fukumoto, 1989; Guest, Landale, & McCann, 1989; Guest, 2005), France (Fukumoto & Grusky, 1993), provinces in the Netherlands (Leeuwen & Maas, 1997), Sweden (Maas & Leeuwen, 2002)[Dribe and Svensson 2008; Dribe and Lundh 2009], as well as cross-country comparative work (Long & Ferrie, 2005, 2007; Bourdieu, Ferrie, & Kesztenbaum, 2009). Social mobility studies on Hungary have not yet researched the first period of industrialization, focusing primarily on the period of socialist restructuring of Hungary at the early 1950s (Andorka, 1982; Simkus, 1981, 1984; Luijkx, Róbert, Graaf, & Ganzeboom, 2002; Ganzeboom, Graaf, & Robert, 1990; S. Szelenyi, Aschaffenburg, Chang, & Poster, 1998). Some of these studies have found, however, that social mobility might already have increased before the socialist transformation (Simkus, 1984; Luijkx et al., 2002; Ganzeboom et al., 1990; I. Szelenyi & Szelenyi, 1995). In a study that included cohorts from the 1930s, the trend towards increasing relative mobility did not change its pace after the communist takeover (Ganzeboom et al., 1990). Based on their and other studies these results, Luijkx et al (2002) conclude that "*the communist take-over cannot be considered as an important break in the developments of declining ascriptive criteria for social mobility in Hungary*". However, research did not consider the whole period of first industrial development in Hungary.

We follow Treiman in defining the structure of the stratification systems as the composition of a population with respect to the possession of socially valued and scarce resources (Treiman, 1970). We focus primarily on occupational stratification. Occupational stratification is closely associated to stratification on several other forms of valued resources (e.g. general level and inequalities in education, value of inherited assets in the population in the form of land or other property and inequality thereof), and because it has direct consequences on the distribution of resources directly related to occupational roles (e.g. amount of endowments, quality of working conditions, distribution of income and other rewards).

Conceptually, we favor the usage of occupational classes as class positions reflect the multidimensionality of stratification in the labor market along sectoral, skill level, supervisory, ownership, and manual or non-manual divisions of occupational roles (Goldthorpe & McKnight, 2006). These divisions are, in turn, related to labor market resources, such as endowments, working conditions, income and prestige rewards (Grusky & Weeden, 2006). A reduced number of nominal class categories can, to a large extent at least, capture the important aspects of this multidimensional structure of stratification.

Our primary concern is the chance of individuals having different familial occupational class background and associated labor market resources to getting allocated to certain occupational classes with associated labor market resources, or, with other words, intergenerational occupational mobility. Occupational classes represent the multidimensionality of stratification on the labor market, and by analyzing the flow between classes we can infer on the process of labor market stratification. For example, large relative immobility of landowning farmers indicate the importance of direct inheritance via assets, such as land property, in the process of occupational stratification. An increase of mobility from land owner classes to non-owner classes than points towards decreasing importance of direct inheritance on occupational stratification over time.

By simply analyzing the amount of flow of workers between occupational classes across generations, however, we cannot assert to what extent the chances to access occupational classes are equal across people with different occupational class background. The reason why absolute flows between classes do not necessarily openness of a stratification system is that such flows depend partly on changes in the occupational structure as well. For example, an increase in intergenerational flow from agricultural to industrial laborers could in theory explained by a decrease in demand for agricultural labor and an increase in demand for industrial labor, so that a portion of children of agricultural laborers are forced to work as industrial workers. Such changes in flow due to changes in the structure of the labor market does not necessarily mean that the process of occupational stratification has become more egalitarian. We therefore use measures of relative mobility. Relative mobility describes the extent to which chances to reach a certain occupational classes are equal for people from different occupational class origins. This measure does not depend on changes in the marginal distributions of the occupational origins and destinations, i.e. in the structure, and therefore it is useful for studying the variation in the underlying inequality in the class structure.

2 Theory

In this paper we follow the definition of industrialization by Davis, as the "use of mechanical contrivances and inanimate energy (fossil fuels and water power) to replace or augment human power in the extraction, processing, and distribution of natural resources or products derived therefrom " (Davis, 1955). We also use the term mechanization, referring to the same phenomenon, only to avoid confusion if we talk about changes in the mode of agricultural production.

In the following section, we review the structural shifts in the occupational and educational distribution in industrializing societies, as well as the changes in relative mobility, as it has been outlined by the theory of industrialization.

2.1 Structural shifts in occupation according to the theory of industrialization

The first concomitant of industrialization is a decrease of the proportion engaged in the agricultural sector, and the increase of the non-agricultural manual sector. Mechanization of agricultural productions and more rational cultivation methods results in substitution of a large amount of manual labor in the 18th Century (Kuznets, 1957). Large proportion of landless agricultural workers and small farmers are therefore forced outside of this sector, and had to migrate to urban centers. This results in a shift in the structure of manual labor, from agricultural to industrial work (Treiman, 1970).

The large industrial labor force, concentrated in urban centers, has made the shift from craft system to assembly line system possible (Landes, 1969). In a craft system a same individual has carried out a series of complex tasks in the production of a given article. In contrast, in the assembly line manufacturing is divided into a set of discrete operations, each of which can be carried out by a different worker, or machine. The switch to the assembly line has led to an optimization of production, greatly increased productivity and economics of scale (Davis, 1955).

The second concomitant to industrialization, connected to greater productivity and mechanization, is the increase in non-manual classes. First, skilled and educated workforce is needed for the designing, and maintaining complex machinery of the assembly line system. Second, the development of complex production and marketing systems, and a growth of the size of enterprises require large amount of managerial, clerical and administrative personnel (Treiman, 1970).

Higher productivity of the workforce also results in higher population welfare and higher spendable income that can be spent on consumer products and services (Landes, 1969). This results in an increase in the number of people employed in professional and commercial occupations. At the same time, higher economic and commercial activity, larger population size and density requires more governmental institutions of coordination and control, which results in an increase in the number of governmental administrative and clerical positions.

As nations industrialize, the level of education of the population expected to increase (Anderson & Bowman, 1966). First, the shift towards mechanization leads to higher demand for trained personnel to maintain the complex machinery and supervise the production process. Second, mechanization leads to a decrease in the wage for non-skilled manual labor, and therefore the popular desire for education increases (Treiman, 1970). This popular demand can force government policies that aim for more general access to education for the masses. Third, with the new modes of production, parents are not able to train their children for occupational roles and teach them skills which are required in the labor market, and are more likely to send them to school. In addition, the demand for child labor in industrial societies is smaller than in agricultural societies, thus parents have less incentive to employ their children at a young age instead of sending them to school (Treiman, 1970).

On the supply side, educational opportunities are also increase with higher levels of industrialization. Industrialized nations have greater national economic and tax income which they can invest in general education of the population, thereby making elementary education more affordable, or free of charge to the students. Industrialization also results in the concentration of labor force in urban areas where educational opportunities are geographically closer than in agricultural areas and transportation is better to them (Treiman, 1970).

2.2 Changes in relative mobility according to the theory of industrialization

Following the theory of industrialization, industrialization leads to a decrease in the ascriptive component in the occupational and educational attainment (Treiman, 1970; Parsons, 1967). First, in industrial societies, direct inheritance of occupations becomes more difficult. Industrial establishments employ larger number of workers, and new employees could not longer be filled only via the kinship network, as it could and was mostly done in small craft industries, and it is therefore less likely that younger family members inherit the job of their elders. New administrative and clerical occupations are more formalized, bureaucratized which makes it difficult for fathers to pass on their positions or arrange for their children to work at the same jobs they do. Additionally, the size of agricultural sector in which the job, together with land and other assets are traditionally passed on from one generation to another, became smaller. Second, formal education becomes increasingly important for the learning of occupationally relevant skills. The higher demand of skill, adaptability, and mobility of the workforce in industrial societies likely results in a shift from ascriptive to universalistic achievement criteria as a basis for occupational role allocation. Parental status should play a less important role in educational attainment. Educational success is likely to depend mainly upon academic success at the previous level of schooling than upon financial capability. Also, urbanization increases the opportunities of schooling, as educational opportunities are more readily available for urban children.

2.3 Industrialization and structural shifts in occupation in Hungary, 1850-1950

We follow with an overview of the changes in the occupational and educational structure in Hungary concomitant to industrialization, and point out some implications on changes in relative social mobility in the same period.

The mechanization of agricultural production has begun with more than hundred years delay in Hungary compared to Western Europe (T. I. Berend, 2003). An important reason for that can be found is less internal demand for agricultural products. In Western Europe, the population size greatly increased in the 17th and 18th Centuries (Treiman, 1970), which gave opportunities to farms and estate holders to increase their output and invest in mechanization. In Hungary, population size increase in a much smaller pace in this period. Similarly, Hungary was much less densely populated than Western Europe, the overwhelming part of the population living in small villages, far away from urban centers (Beluszky & Gyori, 2005). Most of the peasant households therefore remained self-sustaining during the 17th and 18th Centuries. Lastly, there was also no Western-type proto-industrial development in Hungary. Peasant households in Western Europe engaged in home work, mostly textile production, organized via entrepreneurial put-out systems that increased urban commercial activities and led to higher demand for agricultural products (Gerschenkron, 1962). In Hungary, such demand from peasant households was absent (T. I. Berend, 2003).

The demand for agricultural products came eventually from the external world markets. By the second half of the 19th Century, Western European agricultural production could not supply the massively enlarged population. Hungary, as well as other late industrializing nations, had large agricultural reserves, and could export agrarian products and other raw materials (Gerschenkron, 1962). A favorable background for modernization of agricultural production has also been created in Hungary (T. I. Berend, 2003). The Liberation Act in 1848 liberated serfs from tithes. Most of them did not receive enough land to live from, and as agricultural work was much demanded, huge masses of liberated serfs continued to work as wage laborer on the great estates or for smaller landowning farmers (Kover & Gyani, 1998). The government also favored low wages to keep Hungarian products competitive on foreign markets and to prevent impoverished peasants to migrate to the city to find work (Eddie, 1989). The cheap and abundant agrarian labor force did not necessitate a replacement manual labor with machines, despite efforts to modernize cultivation techniques. A huge agrarian working class emerged in Hungary. The agrarian proletariat has lived in villages or nearby great estates, and only seasonally engaged in industrial work. A well-to -do landowning farmer class has also emerged, and became wealthier as national agricultural export increased and cheap agrarian labor was available (Kover & Gyani, 1998).

The increasing production of agrarian goods had spin-off effects on industrial development -most importantly- the food processing industry (Eddie, 1989). This development, however, took place in the economic context of the Austro-Hungarian Monarchy which policies did not promote the development of light industry in Hungary, such as the textile industry, in order to avoid competition with the Czech and Austrian lands (Swain, 1992). There was development in mining and still industry, partly to utilize the raw resources, and partly to fuel the rapid development of railroad system in the Monarchy, but the stock of technology, capital and industrial skilled labor was too small to outgrow the agricultural and food output and export (T. I. Berend, 2003). As a result, Hungary remained largely agrarian in its economic and labor structure. This picture did not change much in the first half of the 20th Century either. Hungary, due to the heavy agricultural dominance, could not break out of the role of being an exporter of agricultural products and buying market of industrial goods until the Second World War (I. T. Berend, 2001). Industrial activity lagged way behind that of the agriculture, and despite the growth in industrial output, the relative size of modern industrial classes remained small in Hungary (I. T. Berend, 2001; Erdei, 1980; Kover & Gyani, 1998).

The size of the non-manual occupational classes did grow in Hungary from the end of the 19th Century. This was partly due to the increase in the number of positions in local and national bureaucracies. Another reason is the considerable migration to large urban centers (?, ?), most notably to Budapest and to its surrounding region. This favored the growth of urban-type occupations. The size of these classes remain moderate throughout this period.

The general level of education of the Hungarian population was throughout the period low, mainly due to the backward conditions of the rural areas, and the moderate development of industrialization. The illiteracy rate of the adult population in Hungary was 35 percent at the turn of the century, among the agrarian population these figures were much higher (Maddison, 2001). The government made efforts to eradicate the urban-rural cultural and educational differences by establishing elementary schools, especially in rural areas. This allowed the agricultural population to send their children to school, and as as result, illiteracy rates dropped to 7 percent by the Second World War (Kover & Gyani, 1998). Well-to-do peasants could increasingly afford a middle or high education for their children, and the representation of children from peasant background in secondary education, increased throughout the period (Kover & Gyani, 1998).

2.4 Industrialization and relative mobility in Hungary, 1850-1950

To what extent did the effect of ascription - parental occupational class background - on son‘s occupational class diminish in Hungary in the period of first industrialization? On one hand, the predominantly agrarian character of the economy would lead us to expect no change in the influence of ascription on status attainment. Other developments - the expansion of elementary education and literacy to the agrarian population, as well as urbanization - lead us to expect a decreasing influence of ascription on occupational class in this period. We now turn to the next part of our paper to investigate which prediction is supported by the empirical analyses.

3 The Hungarian Historical Social Mobility project

The Hungarian Historical Social Mobility project was carried out between 2009 and 2011 as part of the ERC Advanced Research Grant project *Towards Open Societies*. The project aims at providing historical data to study long-term changes in social mobility in Hungary.

By creating the sample design, our goal was to ensure that variation in municipal development and demographics of the current territory of Hungary is represented in the dataset.

An important concern was that the legal status of settlements -whether it is a village or has town rights- does not necessarily reflect the level of their development. In his study on Hungarian settlement structure in 1910, Beluszky (2001) showed that around 300 settlements had some urban functions, more than twice the number of the officially acknowledged towns. On the other hand, some municipalities with towns rights lacked any urban character (Beluszky, 2001).

We stratified Hungarian municipalities by legal status of the settlement (villages, towns, and regional centers), and by the level of their development. To obtain the latter, we used demographic and development indicators from the 1930 census and performed cluster analyses[1]. The following settlement clusters were obtained: rural villages, developing rural villages, urban-type villages, agrarian towns, industrializing towns, developed urban towns, and regional centers with municipal rights.

The second concern was, that the settlement network of Hungary was overwhelmingly agrarian. Rural villages themselves form more than two thirds of all municipalities. The predominantly non-agrarian municipalities -in which less than half of the population works in agriculture- form only 5.4 percent of all settlements. The distribution of population is nevertheless more even across agrarian and non-agrarian settlements: 37 percent of the Hungarian population lived in non-agrarian settlements, while 63 percent lived in agrarian-type municipalities.

In order to represent all kinds of municipalities we developed a two-stage stratified cluster sample design to sample municipalities from the 1930 census which takes the uneven distribution of population across municipal types into account.[2] Sampling has been performed the following way: first, within each of the six larger regions in Hungary (called macro-regions) we selected randomly one or two towns from each developmental cluster. For three randomly selected regions we also sampled one regional center with municipal rights. Next, for each town and regional center, we selected randomly one or two villages in the smaller region of the town (also called micro-regions), again one from each developmental cluster. This way - although the sample needs weighting to be representative for the country- , each region and each developmental cluster is represented in the sample.

For each municipality we approached all local religious congregations and digitized marriage acts from their church books. [3]. Marriages had been registered by the registrar or priest, and in some cases, they had not documented the occupation of father, son or both. Due to varying customs, church books could be sparse with respect to occupational information. In order to avoid towns with very small number of marriages, a pre-selection of sampled towns and villages was necessary. The pre-selection was achieved in the following way: first, the number of church marriage records in towns were counted each five year, as well as the number of marriages that did not contain occupational information from either the father, or the groom, or both. Based on these counts, we decided to go further with the data collection in the town, or select another town.

[1] The 1930 Hungarian census contains information on demographics, labor, and housing situation of the Hungarian population. The figures were aggregated on the municipal level, and complemented with information on economic establishments by the Hungarian Central Statistical Office. Full information on all statistics was available for the 3417 municipalities. Published volumes of the census, containing municipal-level aggregate data were used (Hungarian Census 1930, 1935). Further details on the cluster analyses can be obtained in the codebook of the datafile (TO BE CREATED)

[2] The 1930 Hungarian census includes a complete list of municipalities for the year 1930, and we used it as the sampling frame to select municipalities. We excluded the territories of Hungary that belonged to the country before the end of the First World War (territories in present-day Slovakia, Romania, Serbia, Croatia, and Ukraine)

[3] For the town Kalocsa and two surrounding villages church books were already digitized and has been put at our disposal. Our estimates for the data collection, e.g. the expected number of marriages per periods, were based upon the inspection of these data. We would like to thank Andor Lakaros, chief archivist of the Diocesinal Archive of Kalocsa, and his colleagues for their work and for providing us with these data

The decision rule was that valid observations for the majority denomination were absent for a period of 30 years, or the number of valid observations was overall less than than 30 percent of all marriages within that denomination, we dropped the town from the sample, and sampled another one from this region and developmental type. If a town was sampled based on the counted marriages with information, we repeated the same procedure for each of the sampled villages in the micro-region, dropping those with too sparse books, and randomly selecting a new one from the micro-region with a similar developmental profile.

For larger cities, systematic random sampling of marriages was necessary as there were too many marriages. Random sampling was achieved by assigning a sampling interval for each year, denomination, and municipality. The starting point on the given page of the church book was selected randomly.

Table 1 shows the number of digitized marriages per municipalities, and denominations -Israelites, Lutherans, Reformed, and Catholics.

Table 1: Number of digitized marriages per municipalities and and denominations

Name	Region	Type	Isr	Luth	Ref	Cath
Cegléd	Central Hungary	agrarian centers	105	0	1706	1113
Nagykõrös	Central Hungary	agrarian centers	185	0	0	839
Ceglédbercel	Central Hungary	developing rural villages	0	0	0	1603
Törtel	Central Hungary	rural villages	0	0	0	915
Rákospalota	Central Hungary	urban centers	85	0	13	2567
Alsógalla	Central Transdanubia	developing rural villages	0	0	0	273
Csót	Central Transdanubia	developing rural villages	0	0	0	800
Vértesszõlõs	Central Transdanubia	developing rural villages	0	0	0	253
Pápa	Central Transdanubia	industrial centers	140	46	269	1592
Tarján	Central Transdanubia	rural villages	0	0	80	373
Vaszar	Central Transdanubia	rural villages	0	0	0	888
Felsõgalla	Central Transdanubia	urban centers	0	0	0	873
Bánhida	Central Transdanubia	urban-type villages	0	0	0	627
Tatabánya	Central Transdanubia	urban-type villages	0	91	25	1727
Hajdúnánás	Northern Great Plain	agrarian centers	0	0	2503	0
Újszász	Northern Great Plain	developing rural villages	0	0	28	934
Szolnok	Northern Great Plain	industrial centers	235	16	14	1414

Table 1 – Continued

Name	Region	Type	Isr	Luth	Ref	Cat
Rákóczifalva	Northern Great Plain	rural villages	0	0	37	612
Tiszakécske	Northern Great Plain	rural villages	0	0	0	947
Kazár	Northern Hungary	developing rural villages	0	0	0	1113
Hatvan	Northern Hungary	industrial centers	47	0	120	1522
Boldog	Northern Hungary	rural villages	0	0	0	1067
Cered	Northern Hungary	rural villages	0	0	0	449
Heréd	Northern Hungary	rural villages	0	0	0	613
Salgótarján	Northern Hungary	urban centers	106	293	121	2346
Somoskõújfalu	Northern Hungary	urban-type villages	0	0	0	661
Szentes	Southern Great Plain	agrarian centers	121	0	0	2262
Elek	Southern Great Plain	developing rural villages	0	0	31	1813
Mindszent	Southern Great Plain	developing rural villages	0	0	0	619
Gyula	Southern Great Plain	industrial centers	32	0	211	3959
Kalocsa	Southern Great Plain	industrial centers	333	0	0	2247
Hódmezõvásárhely	Southern Great Plain	municipal centers	0	0	1972	877
Kecskemét	Southern Great Plain	municipal centers	0	0	1757	1349
Foktõ	Southern Great Plain	rural villages	0	0	0	768
Homokmégy	Southern Great Plain	rural villages	0	0	0	377
Szakmár	Southern Great Plain	rural villages	0	0	0	578
Szegvár	Southern Great Plain	rural villages	0	0	0	1085
Tataháza	Southern Great Plain	rural villages	0	0	0	835
Dunaföldvár	Southern Transdanubia	agrarian centers	22	18	120	1961
Igal	Southern Transdanubia	developing rural villages	0	0	0	918
Mohács	Southern Transdanubia	industrial centers	0	0	4	1795
Köveskál	Southern Transdanubia	rural villages	0	0	104	0
Németkér	Southern Transdanubia	rural villages	0	0	0	394
Szulok	Southern Transdanubia	rural villages	0	0	0	1493
Taszár	Southern Transdanubia	rural villages	0	0	0	1002
Véménd	Southern Transdanubia	rural villages	0	0	0	1272

Table 1 – Continued

Name	Region	Type	Isr	Luth	Ref	Cat
Zalaszentbalázs	Southern Transdanubia	rural villages	0	0	0	1803
Kaposvár	Southern Transdanubia	urban centers	1001	178	154	1685
Bóly	Southern Transdanubia	urban-type villages	0	0	93	1148
Gönyû	Western Transdanubia	developing rural villages	0	0	0	800
Kópháza	Western Transdanubia	developing rural villages	0	0	0	829
Lánycsók	Western Transdanubia	developing rural villages	0	0	0	1059
Mosonszentmiklós	Western Transdanubia	developing rural villages	0	0	0	646
Murakeresztúr	Western Transdanubia	developing rural villages	0	0	0	732
Nagycenk	Western Transdanubia	developing rural villages	0	0	0	606
Öttevény	Western Transdanubia	developing rural villages	0	0	0	456
Mosonmagyaróvár	Western Transdanubia	industrial centers	0	0	0	2200
Nagykanizsa	Western Transdanubia	industrial centers	164	64	185	1509
Gyõr	Western Transdanubia	municipal centers	48	416	314	3458
Sopron	Western Transdanubia	municipal centers	170	1179	109	2046
Fertõrákos	Western Transdanubia	rural villages	0	0	0	826
Halászi	Western Transdanubia	rural villages	0	0	0	808
Nyúl	Western Transdanubia	rural villages	0	0	0	431
Szentbékálla	Western Transdanubia	rural villages	0	0	0	518
Total			2794	2301	9970	73285

4 Measures

The occupation of the groom had been recorded -as stated- by the registrar in the marriage registers. The occupation information was digitized and coded into HISCO. HISCO is an occupational classification system aimed to be applicable to historical and international occupational titles, and has been applied to data originating from more than 15 countries (Leeuwen, Maas, & Miles, 2002). The goal of HISCO is to create comparable occupational categories across historical periods and countries which could later be classified into classes or could be scaled by status scores. The occupational codes were in the following classified within the HISCLASS scheme, a historical measure of social class based on HISCO (Leeuwen & Maas, 2011). We used a condensed 6 category version of HISCO as the number of cases did not permit a more detailed classification. These categories are the following: *Managers and professionals; Lower managers and professionals, clerical, sales; Skilled workers; Farmers; Lower skilled and unskilled workers; Farm workers.*

The occupation of the father of the groom was extracted from the same marriage register, and the same procedures were applied as for the occupation of the groom.

Data were collapsed into 17 mobility tables according to 10 -year marriage cohorts until the 1890s and 5-year marriage cohorts afterwards, with the following exceptions: the first table contains data between 1850 and 1867, because data were too sparse in the 1850s, the 11th table which covers the period of the First World War (1914-1918), the 16th table which covers the Second World War (1942-1945), the 17th table which covers the period after the Second World War and the communist takeover in 1948 (1946-1948), and last table which covers the first two years of communism in Hungary (1948-1950).

Non-commissioned soldiers are excluded from the analyses as vast majority of them probably served military service in mandatory conscription and not as an occupation. The data have been weighted to reflect the population distributions across macro-regions and across development clusters. The weights have been estimated using the municipal-level aggregate population data from the Hungarian censuses between 1869 and 1949 (Dallos & Klinger, 1990).

Table 2: Marriage cohorts and number of cases

marriage cohort	N
1850-1867	3604
1868-1877	3359
1878-1887	4554
1888-1892	3877
1893-1897	4282
1898-1902	4440
1903-1907	5411
1908-1914	7293
1915-1918	2211
1919-1923	6253
1924-1928	5688
1929-1933	5807
1934-1938	5889
1939-1942	4827
1943-1945	2798
1946-1948	3720
1949-1950	2634
Total	76674

5 Results

Figure 1 shows changes in the occupational structure based on the Hungarian censuses between 1890 to 1950. Figure 2 shows the same changes, based on marriage cohorts from our Hungarian Historical Mobility data. The most important trends we see are the increase in the share of lower skilled and unskilled and skilled workers and a decrease, but persisting dominance, of the farming classes. The latter trend is more visible for the mobility data file. There is an increase in small-scale farmers to the expense of agricultural workers after the second world war which was due to the agricultural reform that distributed all large estates among landless workers.

Figure 3 shows the amount of social mobility and its change over the cohorts. The most important change is the increasing mobility of lower skilled and unskilled farm workers, lower professional occupations, and skilled workers. The landowning farmer class, the largest class in Hungary, remain largely immobile throughout the period. The highest class and lower skilled and unskilled workers shows considerable fluctuation. For all classes taken together, immobility has decreased from 80 percent in the 1850-1867 cohort to 40 percent in the 1948-1950 cohort. The decrease is fairly stable and linear, with a break in the trend at war years.

Is there a decrease in the ascriptive component of social stratification in Hungary across marriage cohorts? In order to answer the question, we estimate log-linear and log-multiplicative models. With these models, the level of association can be compared across tables, without the confounding effect of changes in marginal distributions. These models therefore have often been used to analyze the extent of relative mobility in mobility tables (Goodman, 1979a, 1979b).

6 Models and estimation

First, a null-association (NA) or perfect mobility model has been specified. This model only includes origin and destination effects for each cohort, the association parameter between occupational origin and destination is set to zero in each cohort, indicating completely equal chances across classes for becoming mobile.

We estimated mobility models in which each diagonal cell, i.e. the cells for which the class of the father and of the son are the same, holds a separate parameter. These models (Q) aim at reflecting the high propensity of certain classes -most importantly farmers and sale proprietors- to be immobile, inherit the occupation from father to son. The diagonal association parameters show the relative differences across classes in chances of being immobile. Next to these parameters, a single parameter indicates the off-diagonal association between father‘s and son‘s occupational class, estimated only for the non-diagonal cells.

We also estimated row and column association models (RC1). In these models the off-diagonal association is

Figure 1: Changes in the Hungarian labor structure, 1890-1950, data from the Hungarian censuses

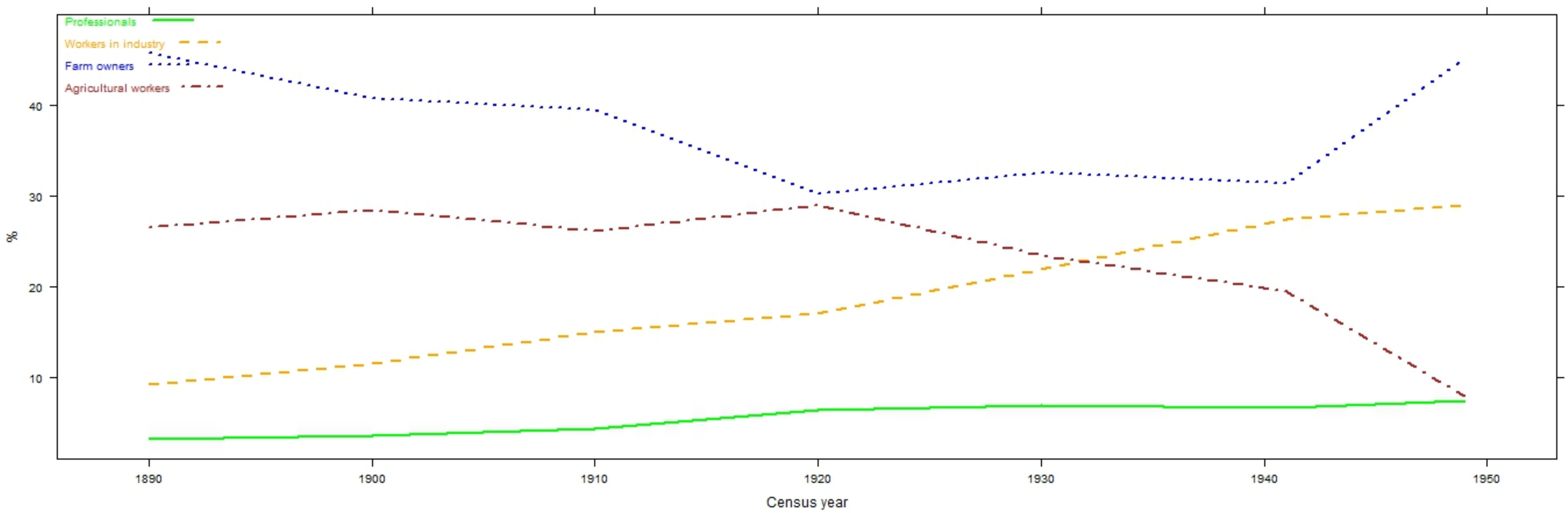


Figure 2: Percentage of destination classes per marriage cohorts, Hungarian Historical Mobility data

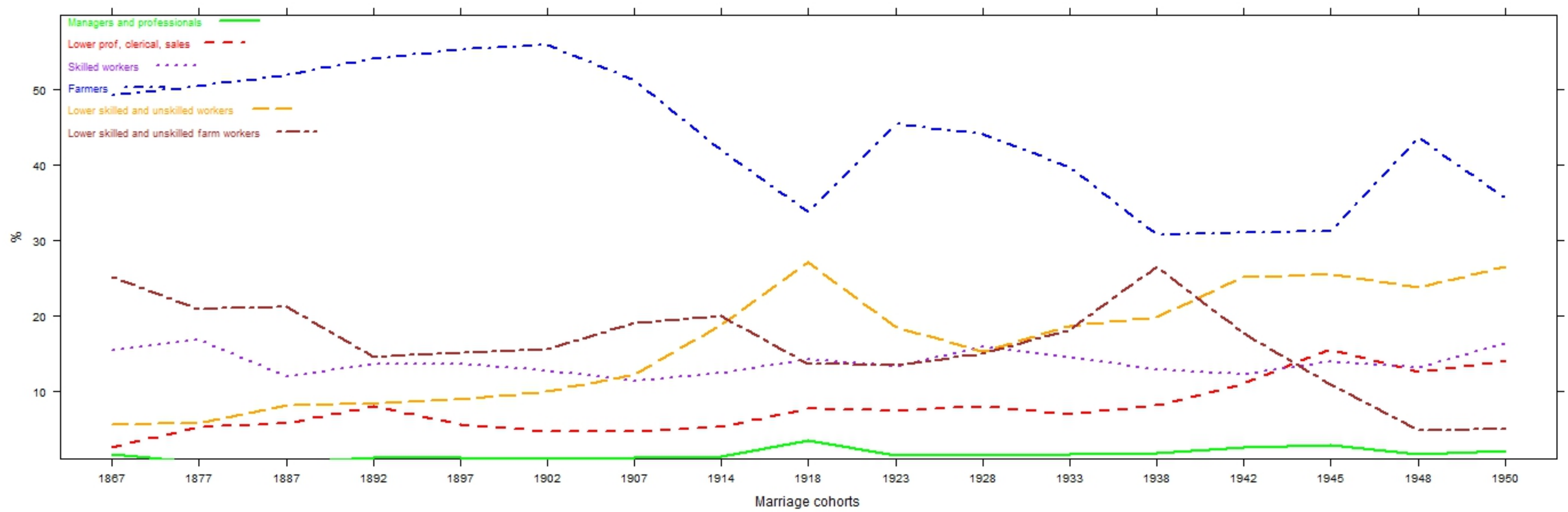
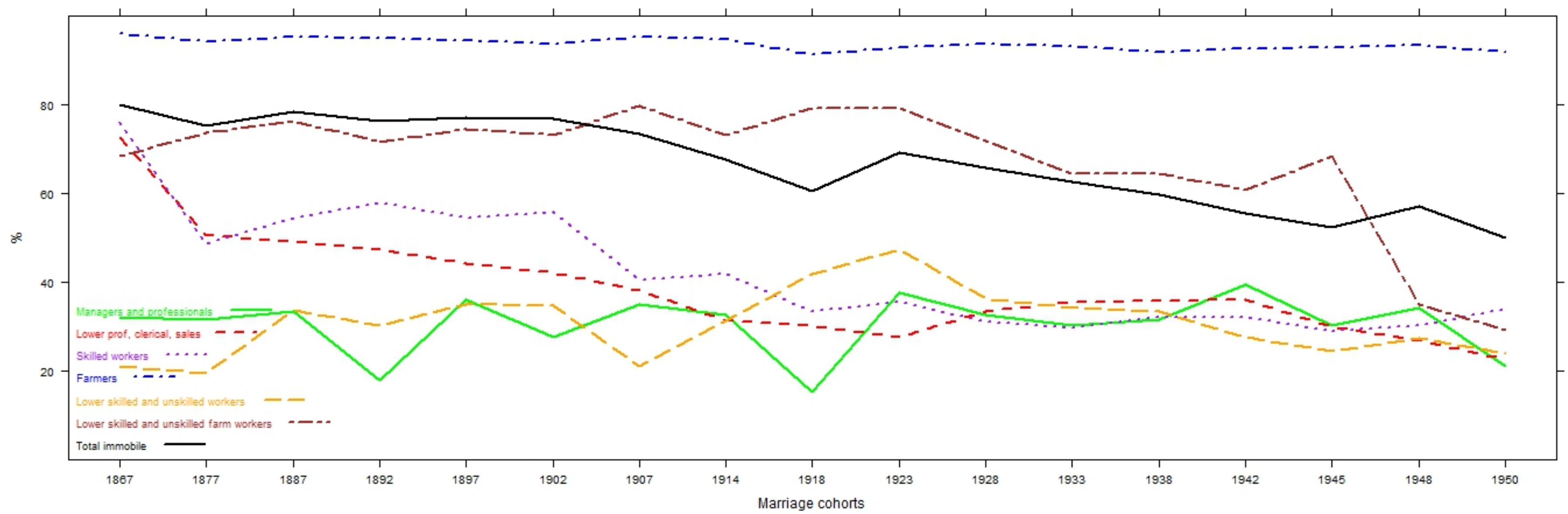


Figure 3: Percentage of immobile per destination class per marriage cohort, from the Hungarian Historical Mobility data



shown with scale values, estimated for each occupational class. The scale values indicate the distance between classes in terms of mobility: larger scaled distance between class A and B than class A and C indicates smaller chance of mobility between A and B than between A and C[4]. These models have the advantage that they are convenient to interpret: distances between classes on the scale can be interpreted as their relative distance in the occupational hierarchy (Goodman, 1979a). For these models, the diagonal association parameters were also estimated.

In some cases, a one dimensional scale does not adequately depict the occupational hierarchy. To test whether the Hungarian occupational structure can be modeled by a single scale, we also estimated row and column association models with two scale values for each occupational category (RC2)[5].

Finally, we estimated full interaction models with no restrictions on the origin and destination association parameters (FI).The diagonal cells were not singled out in these models, they are included in the interaction terms.

To compare cohorts, we specified the following model variations of the aforementioned Q, RC, and FI models. For the homogeneous association parameters model (denoted with the subscript o), the same association for each cohort was estimated. These models indicate that there is no change in the level of origin-destination association across cohorts. We estimated models with heterogeneous association parameters: in this model, each cohort has a unique set of association parameters (denoted with the subscript l). Heterogeneous models are difficult to interpret as there are many parameters to compare across tables. Log-multiplicative layer-effects or 'uniform difference 'models are useful for parsimonious comparisons across tables (Xie, 1992; Powers & Xie, 2008). These models include parameters that describe the common pattern of association, and table-specific comparison parameters. The table specific parameters show the extent to which the association parameters -uniformly- differ in the specific table from the common pattern of association. These models provide a method for parsimonious comparisons of the association structure across mobility tables.

The levels of diagonal and off-diagonal association do not necessarily change uniformly. It could occur that the chances of being immobile decreases from one cohort to the other, but the relative mobility chances across classes remain the same. With other words, immobility decreases, but the distribution of mobile people across off-diagonal cells follows the distributional patterns of the previous cohort(s). If, however, both diagonal and off-diagonal association decreases, it not only indicates that people are more mobile, but also that destination classes grant access more equally to people from different class origins.

We have therefore estimated two log-multiplicative specifications. The x models introduce log-multiplicative change on both the diagonal and off-diagonal association, the dx models include change only on the diagonal

[4]For this interpretation to be true, normalization required

[5]In all scaled association models, the scale values are estimated to be the same for the same classes in the father's and son's cohorts

association[6].

All models have been specified and estimated using the GNM-macro in R (Turner and Firth, 2011).

7 Results

Table 3 shows the models and their fit statistics. The q-models show a worse fit than the RC and full-interaction models. This means that the structure of origin-destination association is complex, a single origin-destination association parameter does not give back the patterns adequately. The homogeneous (o) models, for both Q and RC specifications, show a worse fit that the models that allow change in the association parameters (l and x models). This indicates that across historical cohorts, the extent of relative mobility changed in Hungary.

From comparisons between the RC1 and RC2 models, the RC2 models provide a better fit. A single occupational dimension therefore cannot capture the occupational class hierarchy in Hungary.

The best fitting model among the RC2 models is the log-multiplicative diagonal ($RC2_{dx}$) model which provides a better fit than the model in which both the diagonal and the off-diagonal are allowed to vary ($RC2_x$). This result indicate that even though immobility decreases, the inequalities in chances of entering certain destination classes did not change.

In the following, we interpret the origin-destination scale estimates from the best fitting model. The $RC2_{dx}$ model provides a better fit in terms of BIC value than the log-multiplicative full interaction model. We also look at the log-multiplicative parameters on the diagonal association, in order to asses the change in mobility.

Figure 4 shows the association structure from the $RC2_{dx}$ model [7]. The occupational class structure, as mentioned above, cannot be described with a single dimension. On the vertical dimension, we see and urban-rural divide between classes. Perhaps surprisingly, farmers are closer to the industrial and non-manual classes on this dimension than to farm workers. The reason might be that many landowning farmers, especially the wealthier ones, have lived in urban settlements, such as agrarian centers. Farm workers stand out as the most rural class.

The horizontal dimension can be interpreted as occupational status difference between the classes. The higher managerial class stands out having the highest status, followed by the lower professional and clerical classes. The landowning farming class and industrial classes form the middle classes with the agrarian working class

[6] The model in which only the off-diagonal association changed did not converged, and therefore we do not show the results here. Similarly, the heterogeneous specification (l models) did not converge for the RC1, RC2 and FI cases do to some cells being sparse

[7] The parametrization of the row and column scores in log-multiplicative models is not unique. We performed singular value decomposition to orthogonalize the eigenvectors, and standardize the scales. Eigenvalues were 2.48 and 1.51, indicating that the second dimension also carries information

Table 3: Log-linear and log-multiplicative models, Hungarian marriage cohort mobility tables, 1850-1950

Model	Description	L^2	df	p-value	BIC
NA	Null association between origin and destination	65710	425	0	70021
Q_o	Homogeneous quasi-perfect mobility	5371	419	0	9720
Q_x	Log-multiplicative cross-cohort quasi-perfect mobility	4853	403	0	9305
Q_l	Heterogeneous cross-cohorts quasi-perfect mobility	4097	323	0.00	9062
$RC1_0$	Homogeneous row and column association 1	2566	414	0.00	6947
$RC2_0$	Homogeneous row and column association 2	2204	410	0.00	6610
$RC1_x$	Log-multiplicative diagonal and row and column association 1	1930	382	0.00	6517
$RC1_{dx}$	Log-multiplicative diagonal, homogeneous row and column association 1	2006	398	0.00	6490
$RC2_x$	Log-multiplicative diagonal and row and column association 2	1484	361	0.00	6205
$RC2_{dx}$	Log-multiplicative diagonal, homogeneous row and column association 2	1643	394	0.00	6153
FI_o	Homogeneous cross-cohorts full origin and destination interaction	2163	400	0.00	6634
FI_x	Log-multiplicative cross-cohort full origin and destination interaction	1655	384	0.00	6228

Note: L^2 is the log-likelihood ratio chi-square statistic with the degrees of freedom (df) and the associated p-value. BIC is the Bayesian Information Criterion for model comparisons. Non-convergent model specifications not listed.

are clearly in the lowest position.

The two dimensions taken together, the managerial and professional classes and the farm workers have the largest distance from the other occupational classes, meaning that mobility from and into these classes were the least likely from other classes.

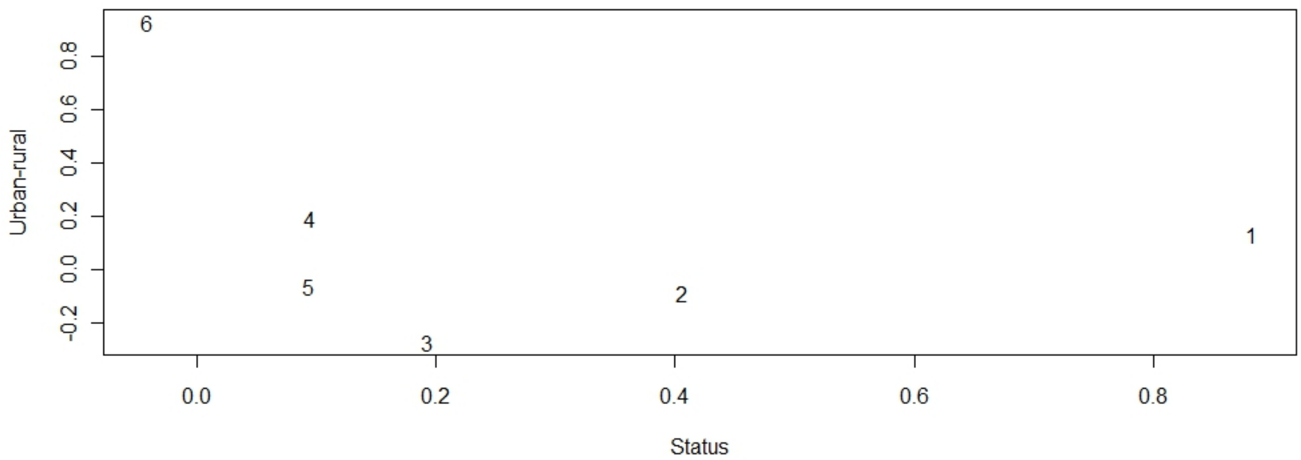
Looking at the change in diagonal association we see a decline in immobility. There is a great drop in diagonal association in the 1868-1877 cohort which corresponds to the first period of industrialization. Following this cohort, there is a small but non-significant trend in decline until the First World War. The cohort marrying during the war years produces a drop in association, probably attributable to the war economy that mobilize large masses. Following the war, the decline in diagonal association continues at the same rate as before the war. The diagonal association in the cohort marrying during the first two years of communism constitutes another break in the trend, likely due to the affirmative measures the socialist regime has taken.

8 Discussion and conclusion

[TO BE WRITTEN, SOME POINTS]

- decreasing immobility, but inequalities did not decrease across classes: does openness increase? - was there not "enough" industrialization in Hungary to wash away social rigidities, or rigidities were reproduced in a more industrialized setting, for instance by access to educational resources? - can the authoritarianism of the Hungarian political system in this period be attributable to the fact that there was no increase in

Figure 4: 2-dimensional distances between destination and occupation classes in Hungary, 1850-1950



1 Managers and professionals; 2 Lower prof, clerical, sales workers; 3 Skilled workers; 4 Farmers; 5 Lower skilled and unskilled workers; 6 Farm workers

openness?

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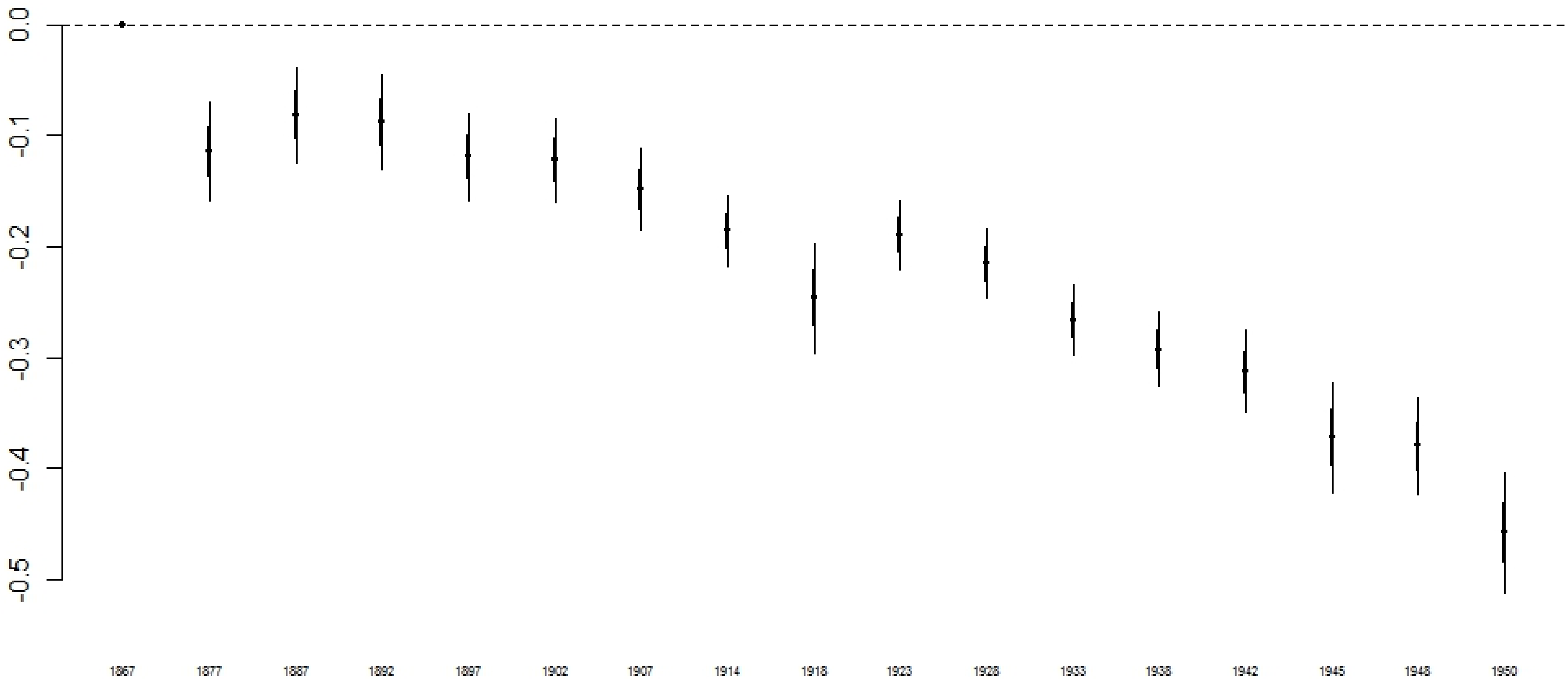
Figure 5: Cohort-comparison parameters on change in diagonal association from model $RC2_{dx}$



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