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The Quasi-Natural Experiment of Hungary
1914-2008

Dimitris Mavridis
Pálma Mosberger

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Dimitris Mavridis
University of Luxembourg

Pálma Mosberger
Central European University
European Commission, JRC

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[1]Dimitris Mavridis, University of Luxembourg dimitris.mavridis@college-de-france.fr, Mail address: 162A Av de la Faïencerie Université du Luxembourg Campus Limpertsberg 1511 Luxembourg (Corresponding author). Pálma Mosberger: Central European University and European Commission, JRC, mosbergerpalma@gmail.com, Mail address: Central European University, 9 Nádor St., Budapest 1051 Hungary. We are thankful for comments and suggestions from Tony Atkinson, Zsuzsa Ferge, László Katus, Gábor Kiss, Botond Kőszegi, Christos Koulovatianos, Róbert Lieli, Rajnish Mehra, Salvatore Morelli, Emmanuel Saez, László Sándor, Gabriel Zucman, and seminar participants in Southampton, Luxembourg, and the London School of Economics. Mavridis gratefully acknowledges financial support from the Central European University Foundation. Mosberger gratefully acknowledges financial support from INET-EMod during her visit at Oxford and from the Rosztóczy Foundation during her visit at UC Berkeley. Opinions expressed in this paper are those of the authors and do not necessarily reflect the views of their institutions.

Abstract

We construct the first top income share series of a formerly socialist economy before, during, and after socialism in order to exploit the quasi-natural experiment of the absence of markets on incentives and income inequality. We investigate top income shares dynamics and the sources of income at the upper tail of the income distribution. Within this setup, we study the effect of capital markets and liberalized wage settings on top income shares. Our estimates show that the introduction of wage-setting decentralization had a role in increasing the skill premium and income inequality in years prior the transition.

1 Introduction

What drives income inequality? Understanding what generates income disparities is important, as it has considerable normative implications. In recent years, economists are able to document the evolution of income inequality in long horizons that capture low-frequency events such as capital busts, the cycles of industrialization and financial development, and the size of government. Perhaps surprisingly, however, to date, little attention has been paid to the unique, large scale institutional experience that lays at the heart of the economic analysis of inequality, the period of socialism. We fill this void with a measurement study of top income shares covering the period before, during, and after socialism.

Research compiled in Atkinson et al. (2011) highlights among the explanations of rising top income shares the effects of tax policy shifts, labor and financial market regulations, more lenient social norms towards earning differences, and increased bargaining power of high earners (Piketty and Saez (2013), Piketty (2014)). Another strand of the literature attributes the recent surge in top income shares in some countries to skill-biased technological change and globalisation forces favouring skilled individuals that tend also to be top earners (Katz and Murphy (1992), Acemoglu (2002), Lemieux (2006), Acemoglu and Autor (2011), Kaplan and Rauh (2013)). In the wake of the recent global financial crisis, several studies have looked at the effects of growth, financial development and banking crises on top income shares (see Morelli (2012), Roine et al. (2009)). Recently, there has been much attention to the role of the return on capital behind the increase in top income shares, as was presented in Piketty (2014). The evolution of several top income series suggest that institutional and market forces may have played an important role behind these changes.

All mechanisms alluded to above operate on the distribution of income and its dynamics through latent, market-related processes. Changes in taxation alter many incentive structures, in particular, incentives for effort and human capital accumulation. The overall effect of a tax reform in the distribution of wages and the subsequent top income shares dynamics is a confluence of many factors. Moreover, the historical experience of high-income inequality may induce a rise in the progressivity of taxation, or changes in institutions that are consequential to the income distribution.

As a consequence, there is a severe issue of endogeneity. Specifically, it is difficult to identify whether latent mechanisms that are related to free markets and institutions have induced both the reform and the observed subsequent dynamics of top income shares. In order to assess these effects, economists need sophisticated models and strong identification mechanisms. Our paper is immune to this critique.

We assemble income data from a geographical and national boundary that evolves from an integral part of an Empire to a mature open market economy, through a period of socialism. We construct the first top income series of a Central-Eastern European country to exploit the exogenous institutional setup of a socialist economy and wage setting policy on the income distribution. Additionally, we look into how both the incidence of socialism, as well as the post-socialist transition have shaped the income distribution at the very top, all along the 20th century.

Our setup is tantamount to an economy with no capital markets, no population migration, and the absence of international trade in consumption and capital goods. Within this setup, we identify two periods. In the first period, the wage distribution is controlled by the political economy of the Communist Party. During this period, inequality at the top remained extremely low whereas the skill premium was decreasing, thus reflecting the distortion of incentives for effort.

The skill premium reverses its course within the period of socialism when the Central Planning Bureau delegates wage setting to state-owned enterprises. When the productivity signal of a worker becomes visible after wage-setting decentralisation, the skill premium increases, and inequality increases as a result. All other latent, market-related processes remained the same as they were at the beginning of the socialist period.

We investigate the speed and driving forces of top income shares in their convergence to Western-European levels after the transition into the market economy. The control periods are the decades before and after the communist period, when market forces determine both capital and labour income. The treatment period of the socialist economy provides a source of variation that is exogenous to the level of top income shares, or any special characteristics of the country. Comparing different time periods of one single country reduces the effect of variables other than the ones of interest on the outcome variable, which is precisely the level of top income shares. Obviously, these are not the only sources of variation between the control and treatment periods, as the institutional setup is highly consequential. In this study we do not look at other possible effects of socialism on top shares such as shortage of goods, price settings and selected access to education.

During the course of the twentieth century, Hungarian top income shares follow a U-shape as a consequence of equality by fiat rather than a secular trend in top incomes. In the period in-between the two World Wars, top shares were as high as in Western countries, is due from large capital structures and land. After the Second World War, when most Western countries experienced a compression in their top shares, the Hungarian shares decreased twice as much as a consequence of the distributional ideology of socialism. Top income shares remained constantly low

during the four decades of central planning. After the transition to a market economy we observe a rapid top income share adjustment, and in less than a decade, top income shares converge to Western levels. This increase is due to a surge both in capital and labour income components.

With the exogenous shock, we can study the effects of market forces on the top income shares, i.e. the effect of private ownership of capital and decentralised wage setting mechanisms. After the transition to the market economy, the transition from a single capital owner (the State) to multiple ones was completed, markets for capital started to operate and investment opportunities emerged. The contribution of capital income in the total gross income substantially increased, from which the top of the income distribution benefitted the most. We find that in just two decades the significance of capital income component at the very top of the distribution became supreme, reaching comparable levels even to the USA, a country with high capital income concentration.

Nevertheless, we find evidence that wage-setting decentralisation favouring the remuneration of skills also played a role in the increase of the top income shares *during* socialism. The comovement between the skill premium and top shares series is apparent during the periods of market institutions. During the decades of central planning, both series had a negative overall downward trend with a jump in 1970, exactly when for a short reform period the strict wage settings were relaxed and delegated to enterprises. The upward trend in the skill premium from the mid-80's happened parallel with the delegation of executive compensation and bonus setting to enterprise level. This policy shift, which marked the first step to complete liberalisation of the labour market, was followed by an increase in the top shares. After the transition to the market economy, both series continued to surge.

The structure of the paper is as follows. In Section (2), we briefly summarise the measurement instruments the and methodology we used for constructing the top income share estimates. In Section (3), we present the top income series, and in Section (4) we present a novel estimate of the capital share, in view of assessing the functional distribution of income. We conclude by describing the instutional mechanism leading to increased income disparities in Section (5).

2 Data and Measurement

As it is the case with previous research on the documentation of top income shares, the time-frame of our analysis extends back to almost a century. In a marked distinction with the rest of the literature, our paper concerns a national boundary that has experienced significant institutional changes and historical shocks, and whose

comparative analysis yields the support of our reasoning. Our time-frame is bracketed by highly significant events such as the dissolution of Austria-Hungary under the treaties of St. Germain and Trianon, the two World Wars, the establishment of the People's Republic of Hungary in 1949, and finally the transition to a market economy. These historical shocks mark significant institutional changes and policy orientation, by capturing the changes in economic systems that we observe over the 20th century.

We assemble primary data from official historical statistics and administrative sources. We use the tax code and its generated income tax statistics as a measurement instrument for the upper tail of the income distribution for the periods before the Second World War, and after the transition to a market economy. We use the available earnings censuses of the Socialized Sector from the period of the People's Republic of Hungary till the transition to the Republic of Hungary, a period that we will be referring to as the socialist period. Allowing for the varying definitions of income included in our data sources, we construct homogeneous population and income control totals to establish comparability between periods, and we define the top income shares accordingly.[1]

2.1 Definition of Income

The first comprehensive, progressive personal income tax in Hungary came into effect while the First World War was still unfolding. The year 1915 is the first fiscal year for which we obtain data, corresponding to income drawn in the calendar year 1914.[2]

We use the available income tax statistics for the period of 1914-1915 and 1927-1940 to estimate the top income shares. For 1914-1915 the figures document total declared income and tax levied on tax units across the sixty-four provinces of Hungary, and the areas of the independent Kingdom of Croatia-Slavonia along with the port of Fiume and its suburbs, which together constitute a region that fell under the jurisdiction of the Hungarian Kingdom at the time. For the inter-war years, the tax statistics cover the area of Hungary after the Treaty of Trianon after World War I. We adjust the population and income controls accordingly.

For the socialist period, we use earnings censuses reported in the Statistical Yearbooks for the period 1951-1968 and published subsequently up to 1988 by the Central Statistical Office (KSH). The frequency of the earnings statistics is irregular, with

[1] A detailed description of the tax system and the data sources is included in the Appendix.

[2] For fiscal year 1915, the tax-reporting threshold is 20,000 crows (*korona*). As a comparison, the remuneration of the Prime Minister is 24,000 crowns, whereas a skilled worker earns 800 crowns per year at that time.

the earliest available table referring to 1951. For the period 1955-1962, the censuses were collected yearly, while from 1962 onwards they were published biannually. The statistics depict the distribution of gross monthly earnings, including bonuses, allowances, in-kind benefits, and benefits from profit sharing. The income concept is gross earnings before deduction of the employee social security contributions for the entire period of 1951-1986, and for the year 1988 before the deduction of taxes levied under the newly introduced personal income tax.

The statistics depict the share of employees in the formal sector belonging to specific gross earning brackets based on the labour force censuses of state-owned enterprises conducted by the State. For the period 1951-1968 earnings statistics refer to workers employed at state-owned firms and state-owned farm establishments of the State Sector, and at state-owned enterprises, state-owned farms, and cooperatives in the broader Socialist sector for the rest of our time-frame. To the interest of constructing homogeneous top income shares for the entire time frame of the socialist economy, we explicitly assume that the distribution of earnings in the Socialist Sector at the top coincides with the distribution of earnings at the State Sector.[3]

Legislation gradually introduced the present income tax code during the period 1987 to 1991. The income declared to the fiscal authority falls into two categories: the "comprehensive" and "separately taxed" income. The comprehensive category contains three main income subcategories: *i*) income from dependent activity, mainly wages and salaries; *ii*) income from independent activity such as self-employment, the exercise of liberal professions, or small-scale agricultural activities; and *iii*) other income such as income earned abroad and tax-exempt income (pensions, scholarships, and subsidies). The comprehensive income was taxed progressively during the period 1992-2008.[4] The separately taxed income is a "schedular" tax on capital income items, with different flat tax rates applied to separate categories of capital income, such as dividends, capital gains, and profits from business activity.

We use both administrative micro data and published aggregate income tax statistics for this period to estimate the top income shares. For both sources, the income concept that we retain is gross income before deductions, and employee's payroll and personal income taxes, and after employers' payroll taxes. Based on the detailed micro data we estimate the top shares both excluding and including realised capital

[3]Supporting evidence for this choice is provided by statistics tables published by the Central Statistical Office (and reproduced in the Appendix) on average earnings of employees with specific university degrees employed either at the state or the cooperative sectors in the year of 1963 and 1967 showing similar earning amounts.

[4]A flat-tax was introduced in 2011. The overall statutory tax rate has been gradually decreased from 20.32% (16% on the so-called "super-gross" tax base, i.e., the tax base inflated by 27%) to 15% since the introduction of a flat-tax.

gains for the period of 1992-2008. The total income denominator of the later series includes all realised capital gains.

2.2 Income Units

Tax statistics during the period before World War II report total income of an extended family dwelling under the same living quarters. The tax base in terms of units consists of either a single individual or a couple with dependent persons, with the head of the family being the primary income earner.[5] We approximate the number of households as the total number of the population above the age of 15 minus the number of married women at province level reported in decennial censuses. We adjust the data for territory change as a consequence of the treaties after World War I. For the inter-war period, we obtain an estimate by linearly interpolating the appropriate figures from the censuses of 1920, 1930, 1940, and 1949 covering the Trianon borders of the country. For the socialist period and transition periods, we estimate a population total that consists of the entire population above the age of 15 as a proxy for the potential tax base.

2.3 Income Total

To construct an income aggregate, we first assemble GDP series during the period of study denominated in current prices, and across three different currencies (Austria-Hungary crown, pengő, and forint). We compute personal income totals for the years when these statistics are available. For the few years when these statistics are not available, we proxy the total personal income by assuming it is the same fraction of the GDP as in the neighbouring years.

For the beginning of our time frame, we use the income total series reported in Schulze (2005), consisting of GDP estimates in the 64 provinces of the Hungarian part of Austria-Hungary, Fiume, and the provinces of Croatia-Slavonia, in alignment with the income reported for tax purposes. For the inter-war period we use the output figures in Eckstein (1955) corresponding to the post World War I and Trianon treaty territory of the country, adjusting these figures to account for market prices with estimates of the indirect taxes found in Matolcsy and Varga (1938), and accounting for depreciation.[6] Eckstein (1955) computes net national product at factor cost. To

[5]Dependent individuals are considered those related to the head of the household by blood or marriage (grandparents, children, grandchildren, in-laws), provided that they are economically dependent on the head of the family.

[6]We employ a capital depreciation of 5% to obtain the gross national product figures. An

get an output measure in market prices, we inflate the figures by 5% based on the estimate of indirect tax amount in the year of 1935 in Matolcsy and Varga (1938).

For the first decade of the socialist economy, the Central Statistical Office publishes income aggregates conforming to the socialist Material Product System. The main aggregate is the Net Material Product, an accounting concept that does not include the contribution of "unproductive" services to national income. We adjust this series by using the average fraction of the official GDP and NMP series between 1961-1988 and apply it to the period 1950-1960. For the period of 1961-1990, we use the official GDP data published by the Central Statistical Office under the modern SNA definition. From 1991 up to today, we use the official Eurostat figures reported by national authorities.

To proxy the individual income control total for the first decades of our time frame we use a 73% contribution of our constructed GDP series as a proxy for aggregate personal income.[7] For the socialist period we compute a personal income total defined as the sum of labour income, social security contributions (including pensions, unemployment benefits, family allowances, maternity benefits, scholarship grants, other social benefits) and the part of capital income (such as lottery, interest, insurance) in the national income accounts data calculated by the Central Statistical Office. For the 1991-2010 period, we use the national income data published by the Central Statistical Office. Our constructed personal income total contains wages and salaries, mixed income, property income including net interest, dividend, property income attributed to insurance policy holders, rental income, state social contribution (pension, sickness pay, unemployment benefits, family allowances, maternity benefits), scholarships and grants. We also include the total realised capital gains amount reported at the Tax Authorities summary tables containing items corresponding to the actual tax code.

Concerning prices, we gather data from several published series to construct a cost-of-living index that honours a currency unit's worth from 1913 to today.

2.4 Parametric Form

To estimate the top income shares from raw data tables we approximate the top tail of the income distribution by a Pareto law. We follow the methodology described in

implicit assumption in producing the estimate is that the installed capital base, albeit expanding, was relatively modest compared to the European West. Moreover, as is documented in Tomka (2001), the contribution of international capital flows is minimal at that time.

[7]We obtain this average ratio based on the total individual household income series available only for the period of 1925-1935 and reported in Matolcsy and Varga (1936, 1938), coupled with our compiled statistics.

general lines in Atkinson (2007). Accordingly, the percentage of the population with income above a given threshold y_i distributed across $i = 1, \ldots, n$ brackets is given by the hazard function

$$H(y_i) = 1 - F(y_i) = \left(\frac{c}{y_i}\right)^{\alpha}, \quad i = 1, \ldots, n$$

where α is the Pareto shape parameter, and c is the scale parameter. Assuming constancy of the shape parameter in between two neighbouring brackets $i, i+1$ from a total of n brackets, and linearising the hazard function yields

$$\alpha = \log(p_i/p_{i+1}) / \log\left(s_{i+1}/s_i\right), \quad i = 1, \ldots, n$$

where s_i is the income threshold of the bracket i and p_i is the cumulative share of people with income above this threshold. Then

$$c = s_i p_i^{1/\alpha}, i = 1, \ldots, n$$

Finally, given the values of the parameters (α, c), we produce the exact income threshold and income shares for any top income quantile.

3 Top Income Shares

This section analyses the evolution of the Hungarian top income shares for the period between 1914 and 2008, projected in a historical and institutional context. We depict homogeneous series of economic performance and prices for the entire 20th century in Figure (1).[8] An overview of real GDP per capita index reveals that the country has witnessed high growth rates after 1945 compared to the inter-war period, and a profound crisis during the transition from socialism, along with a surge in the average level of prices.

During the entire 20th century, inequality has followed a U-shape, as is witnessed in Figure (2). The measurement methodology of Gini coefficients renders the estimates incomparable across periods. The revealed pattern exhibits an increase in inequality during the Great Depression years, a much lower difference during socialism, and a surge in Gini series after the transition out of socialism. Jumps in inequality occur in historical events such as the Great Depression and the financial

[8]Tomka (2010) compares per capita GDP indices in 13 Western European countries and finds that Hungary lays in a distance of around 60% of the Western European frontier in the period 1914-1940.

crises of 1929/31, the establishment of the socialist economic model, a few years following the reforms of the New Economic Mechanism of 1968, as well as the transition to a free market economy. Income inequality is markedly higher in periods with private property and open markets in comparison with the socialist period. Our top income shares estimates are in line with this pattern.

3.1 From Austria-Hungary to World War II, 1914-1940

An established fact in the late 19th century economic historiography of the Hapsburg Empire is that the patterns of economic growth were chequered, ranging across the eastern and western constituencies of the Empire. The Hungarian Kingdom on the wake of the 20th century is still, by and large, an agrarian economy with significant historical impediments in industrialisation as nearly half of its production is drawn from the primary sector. Schulze (2000), in discussing new estimates of output in the various regions of the empire provides evidence to support the Komlos (1983) argument of a capital inflow in the Hungarian Kingdom after the Vienna stock-market panic of 1873, fostering the first wave of industrialization in a largely agrarian economy.[9]

The aftermath of the Armistice was highly consequential for both parts of the Empire. Growth slowed down after the war and its ensuing capital bust, as the Hungarian state was confined to one-third of its Imperial-era frontiers, leaving outside a sizeable part of its endowment in both labour and natural resources and disrupting trade routes. The treaties of Trianon and St. German-en-Laye deprived Hungary of more than approximately 70% of the former territories of the Hungarian Crown. There was a prolonged contraction of aggregate activity, reflecting the misallocation of resources due to the war effort.

The financial crisis of 1929-1931 and the hyperinflation that erupted after World War I slowed down economic development as it wiped out what was left of the banking industry. A stabilisation program conducted by the League of Nations was successful in setting the economy back on track. In the years leading to World War II, the fallback was reversed by strong recovery years resulting in similar growth patterns than in the developed European countries. This process was again halted by a destruction of the capital base during World War II.

[9]New and reliable estimates of the share of the primary sector outlay over total value added in late 19th century Hungary bring it to around 50% over the period 1870-1913. See Schulze (2000), Table. A2 for estimates using a value-added approach, and Schulze (2007) on regional disparities between Austria and Hungary. See Berend and Ránki (1974), Ránki (1964), for a discussion of main impediments to the industrialisation process, from the perspective of socialist-era historiography.

We estimate top income shares over the period 1914-1941. Late industrialisation and heavy reliance on the primary sector results in a skewed income distribution with three distinct societal groups, as highlighted by Éltető and Láng (1971) and Berend and Ránki (1974). The bottom 80 percent is comprised of servants, agricultural, and factory workers with below-average income, while the less than 20 percent middle class includes mainly privately employed administrative employees, civil servants, engineers, doctors, teachers with much higher than average income. The top of the income distribution consists of landowners, high-income earners such as wholesale merchants and bankers, and capital owners with sometimes 20-40 times higher than average income.

The skewed distribution of landownership of the historically numerous Hungarian nobility and large landholders had been a political predicament ever since the Revolution of 1848. Eddie et al. (1993) document a declining share of land in the hands of large holders between 1893 and 1935, with land becoming a productive asset whose property rights were increasingly traded held by financial intermediaries.[10] An early inequality study by Matolcsy (1938) depicts a Lorenz curve similar to that of Germany and the United States during the 1930s.

The overall evolution of the top income shares is depicted in Figure (3). At the beginning of the first part of the 20th century, the top 1% is estimated to hold than 15% of income, while the top 0.1% in some years even reached 7.5%, which are in line with top share estimates at the Western countries that time. The top shares display an overall decreasing trend during this period, at a time where Hungary underwent the First World War, a hyperinflation, the Great Depression and a banking crisis. In 1927, our estimates exhibit similar levels to the pre-war shares. During the interwar period, the Hungarian economy was distressed by the Great Depression. The situation worsened when it was also hit by the banking and credit crises starting in the summer of 1931 with the insolvency of the Viennese Credit-Anstalt that propagated into Hungary.[11]

Historical accounts of banking crises show that they are followed by capital busts, liquidity shortage, recessions and high unemployment rates. Capital busts have been reported to affect the top shares more severely, especially in times when agents at the

[10]Growth in the late 19th century was led by increases in productivity in agriculture in which the eastern part of the Empire exhibited a comparative advantage. Capital flows increased after the Vienna panic of 1873 were directed to the primary sector, with a few notable exceptions in material processing industries and textiles. Land ownership retained its historically skewed pattern, with 0.16% of the greatest proprietors of Hungarian land owning 33% of total farming area in 1910; see Ránki (1964).

[11]See Schubert (1991) for an account of this incident, and Berend and Ránki (1974), pp. 111-113, Fior (2008), pp. 109,138 for its consequences in Hungary.

very top are capital owners and have access to the stock market, whereas the latter affect the bottom of the distribution; see Morelli (2012). In Figure (6) we document the co-movement of the top income shares with the Budapest stock market index. The change in the top shares depends on the relative decline in the different parts of the distribution. Bordo and Meissner (2011) find that in most countries during the interwar period the top of the income distribution was hit more severely leading to contracting top shares. Our estimates show the same trend with a 17 and 33 percent decrease in the 1% and 0.1% shares between 1927 and 1934, respectively.

The income decomposition of the top shares is shown in Figure 4 for the years when income source figures are reported in the official statistics. The series shows that during the first decades of the last century more than half of the originated from capital holdings for income earners at the top 0.1%. The Figure displays that both capital and business income were hit severely in the crises period as they contracted by the beginning of 1930's compared to 1915.[12] Employment income became a significant part of the top shares, with a three- to four-fold increase in less than two decades, suggesting structural changes at the top of the income distribution. Similarly to the western parts of Europe, the Hungarian top shares started to recover only after the mid-1930's. The source of recovery in the top shares was due to an increase in the business income as depicted in Figure (4). This surge coincides with the recovery of the economy driven by some specific industrial sectors such as electrical production, and tradeables such as chemicals and pharmaceuticals.[13] Overall, income from large capital structures, either businesses or land, dominates the composition of the top income shares in the interwar period.

3.2 Socialist Economy, 1951-1988

Central Planning and Partial Reforms Concurrently with the Western European reconstruction, albeit in an entirely different institutional setting, the Hungarian economy rapidly converts into a command economy between 1949 and 1953. Instruments of this transformation were the nationalisation of the industrial base, the forced collectivisation of agriculture, and the shut-down of capital markets. The exogenously imposed Soviet model relied on the promotion of heavy industry, and

[12]Berend and Ránki (1974), pp. 147-148 documents some aspects of this capital flight: 4500 million pengő bank deposits before World War I in savings banks reduced to 752 million pengő in the aftermath of the financial crisis.

[13]Mass production was not yet prevalent, and against the background of a deferred industrial development, Hungary was lagging behind most European countries. Slowly, though, the dominance of the agricultural and food industry started to fade away; Berend and Ránki (1974), pp. 116, 122, 134-144, 167.

the concentration of productive assets to the direct control of the central government. Private production of capital goods was abolished, investment was the responsibility of the central government, and secondary financial markets closed.

The State delegated corporate governance to the top management of State-owned companies. The central government controlled all property rights to all productive assets and was the ultimate beneficiary of any operating surplus.[14] Firms had no autonomy, quantities were centrally planned in every detail, and prices were set centrally without reflecting market demand and supply. With fixed final prices and artificially low raw input prices, managers were not given the incentive to realise higher profits through lower production cost or more efficient production, as they received their bonuses if the planned production targets were fulfilled at any cost. Realised production fell short of targets in every consecutive five-year plan. This incentive mechanism led to low investment in R&D, lower quality of final goods, overproduction of some specific stocks, and shortage of other goods.[15]

Due to the visible defaults and the manifested discontent with the system during the Revolution of 1956, the planners initiate a series of partial reforms during the 1950s and 1960s.[16] These reforms aimed at introducing efficiency considerations, without breaking from the central planning paradigm. The planners tried to achieve higher efficiency by allowing more autonomy to enterprises, and by reducing the number of centrally given commands. Nevertheless, these partial reforms did not go all the way in introducing real markets.

Some important changes concerned wage setting. In particular, instead of determining wages via the compulsory payroll figures that were decided at the central planning bureau level, wage setting was based on "average wage" instructions for various occupational categories. During the partial reforms, enterprises received more freedom to set the allocation of bonuses, although they were given serious disincentives not to do so.[17]

The effect of the first wave of partial reforms on the top income shares amounts to a 12% increase in 1957 compared to 1955 as portrayed in Figure (7).[18] Survey

[14]See Portes (1969) for a description of the production sector at the time.

[15]Weitzman (1976, 1980) highlights the prevalent "ratchet effect" of this contractual arrangement between the central planning authorities and state-owned enterprises. The result was persistent under-performance, for fear of setting elevated future performance targets.

[16]See Berend (1990) for a detailed account of a series of partial, and lesser known reform attempts.

[17]See Berend (1990), and Kornai (1980), Ch. 16. for a detailed exposition of the socialist wage setting system.

[18]The increase in the 1956 top shares is due to the drastic jump in the income denominator in the year of the Revolution of 1956. The increase, however, of the 1957 shares cannot be attributed to a change in the denominator as nominal per capita GDP reversed back to its trend level.

evidence suggests that the top of the income distribution is occupied by the management of state-owned enterprises and white-collar workers. The earnings differentials between the top of the employment ladder and blue-collar workers were primarily created by allowances and similar benefits. These income items are included in our income statistics. The result of these partial reforms was, however, reversed as witnessed in the Income Survey of 1962. Skilled workers and enterprise managers observed an increase of 7% and 5% in household income between 1959 and 1962, whereas households on the bottom of the skill ladder increased by more than 10%.[19]

The New Economic Mechanism (NEM) of 1968 was a response to persistent sluggishness. The system evolved from a centrally planned model of development to one in which every element of the balance sheets of households and firms was either taxed or subsidised. Property rights to productive capital and corporate governance were retained by the central government. Little, if anything, was left to be determined by an unfettered market on which prices are set freely.

After 1968, and instead of explicit commands on the resources to be used and production targets, the central government tried to provide further profit incentives in view of meeting the objectives of the periodic five-year plans. Although more freedom was allowed in wage setting, the average salary was still centrally determined with upper and lower payment limits for specific occupations. Additionally, if the enterprise wage bill surges were above a certain level, then heavy taxation was imposed. As part of the NEM reforms, the surplus of state-owned enterprises was not taxed away entirely by the central government, but it was channelled back into "profit sharing" funds to be redistributed among the managers and employees. The maximum profit-share dividend was set at 15%, 50%, 80% percent of the remunerations for workers, middle-level management, and top management, respectively.[20] Figures 3 and 7 respectively depict an 11-26 percentage increase in the very top shares, and a 5-7 percentage increase at the lower shares between 1966 and 1970 exactly after the introduction of the New Economic Mechanism.

A mixed-price setting mechanism replaced the overall direct price determination by authorities. This process included the so-called "free" prices set by enterprises, though controlled by the state via a set of regulations. These price control instruments included profit-margin restrictions, temporary "price stops", laws concerning "unfair prices", instructions and direct price rules virtually everywhere in the pro-

[19]We cannot compute percentiles from our income threshold estimates, as these thresholds refer to individual income. We do observe however that a single earner household who is a CEO of a state-owned enterprise in 1962 takes home 3,371 forints, an amount that puts the head of the household at the top 0.5% of the income distribution, according to our estimates.

[20]See Berend (1990), pp. 170-179 for an outline of this mechanism.

duction process.

As a result of heavy regulation, relative prices of final goods were distorted, and the shortage of goods was a widespread phenomenon (Kornai (1979, 1980)). Shortage of commodities affected the diverse segments of the society unevenly. The situation was further distorted by capital controls, manifested in foreign exchange quotas for only parts of the population.

Our data depict an image of the effect of these distortions on the income distribution, by comparing the top shares during socialism to those during the market economy decades before and after. In addition to the significant difference in the level of top shares immediately after the beginning of the new economic regime, there is an overall decreasing trend afterwards. The sharp jump in 1970 is due to a new set of partial reforms aiming at increasing wage differentials of enterprise managers particularly via sharp differences in bonus payments, to provide incentives resulting in higher productivity. The increasing trend from the mid-1980's also occurred after managerial wage and bonus setting were delegated to enterprise councils.[21]

The regulation of the price of labour was a central component of socialism, set by the State monopsony of labour. Different wage tables existed for blue and white-collar employees that prescribed earnings differentials between blue collar and white collar workers, administrative workers, and managerial staff. However for short reform periods the strict wage settings were relaxed and delegated to enterprises to increase production efficiency.[22] We exploit this variation in our argument below.

Capital Income During socialism, households had limited capacity to own real or financial assets, property rights were not secure, and investment opportunities in sectors other than the government were heavily regulated. The degree of this institutional setting was absolute, even though a shadow economy was operational.[23]

The monetary authority was entirely subject to the periodic plans, in effect relegating the money creation privilege to the central planners. High-powered money was financing the investments and operational capital of state-owned enterprises, and the needs of the wage bill. Loans and mortgages were issued by the National Savings Bank and the Saving Cooperatives (*Takarékszövetkezet*), two financial institutions subject to the monetary authority. All interest rates were centrally regulated. A practically unchanged nominal interest rate with suppressed inflation resulted in

[21]See Cukor (1990), p. 9 and Héthy (1990).

[22]Among others, see Boote and Somogyi (1991), p. 18, and Éltető and Láng (1971), pp. 303-314.

[23]In all socialist countries, an informal sector was operational in varying degrees; see Grossman (1977) for an outline. Productive assets, however, were not traded in the informal sector, and capital gains were outlawed.

negative real interest rates for several years.

Owner-occupied housing was the most important real asset. However, neither rental income nor capital gains on these real assets was part of household income. In particular, during the entire socialist period, households retained limited and non-transferable occupancy rights to residences. The rental and secondary property markets were non-existent. Quotas to ownership and limited transferability of the property rights to houses made it impossible for such a secondary market to develop. As a result, household portfolios were elementary, containing mainly cash deposits and savings.[24] Property rights to bank deposits were not secure.

Any capital income will have to be imputed based on assumptions whose validity is impossible to verify. Nevertheless, we provide an upper bound estimate of possible capital income in Figure (9). We do so by imputing an upper limit on capital income based on the distribution of capital income to the top percentiles in 1992, on the wake of the opening up of secondary financial markets after the transition. Capital income was negligible among the top 1% compared to the era before and after socialism.

3.3 Transition to Free Markets, 1992-2008

Post-transition, Hungary enters a rapid process of liberalising the labour market, distributing property rights to capital through privatisation, and opening up markets in productive assets and final goods. A vast assemblage of a vintage capital stock was privatised. This process started in Hungary earlier and was completed more rapidly than the rest of the countries of Eastern Europe. In 1992, one-third of the firms were privately owned.[25]

The shock during the years of the transition into the market economy resulted in a drastic decrease in per capita output. In recent years including the financial crises years the average growth rate was of 1.8% (1992-2010).

A property restitution program was also implemented, giving back property rights on real assets that were expropriated since 1939 including the inter-war, pre-communist and communist regimes to the original owners or their descendants. The process was completed by giving partial compensation paid in freely tradeable coupons that could be used to bid in auctions for state property; Bornstein (1997), pp. 325-326.

Markets for capital started to operate, and investment opportunities emerged. Income shares of both capital and labour increased in tandem. Immediately after

[24]See Portes and Winter (1978), and Ábel and Székely (1992).

[25]The mode of privatisation evolved from management buyouts to an orderly, regulated process via competitive tenders; see Brown et al. (2006), p. 71.

the transition the top 0.1% share tripled and the top 1% doubled, while the next percentiles increased less markedly (P95-99 by 65%, P90-95 by 50%). The top 1% share increased much faster than the following percentiles: in 2008 the top 1% shares were still below the level seen in 1940, while the income share of the next four percentile surpassed it.

There is an apparent increasing trend in the recent top income shares as displayed in Figure (3) and Figure (7). A peak in top shares in 1999 is followed by some stagnation years and increase again from 2005 onwards. To be able to detect the driving forces behind the movement of the top income shares, we estimated the decomposition of the top shares displayed in Figure (8). Capital income shares followed clearly the market movements with significant drops in realised financial gains during 1997-1998 and 2002, when Hungary was severely hit by the financial crises originating from the Asian stock market, and by global equity market downturn. There is an increased share of realised real asset gains since the mid-90's with a drop in 2007, following the real estate boom and bust of the housing bubble, associated with decreased foreign investment in the property market. It is also apparent from our estimates that there was a significant drop in business income shares after 2002 as a result of drop in business activities among the top income recipients.[26]

3.4 External Validity

How far did Socialism manage to compress the income distribution compared to other countries? And how quickly the shares adjusted after the transition into the market economy? We address these questions by comparing the Hungarian top 1% shares to those of other countries in Figure (10) below. Inter-war Hungarian top income shares were as high as the shares of the Western European core. Hungary converted to a Soviet satellite at a time when Europe is undergoing a massive reconstruction stage, with high public investment and the conception of the modern European welfare state. Top income shares estimates of Nordic countries cluster well above what Hungary exhibits after World War II when most of the countries experience a compression of top income shares: socialism brought a compression of top income inequality twice as much, and continued to keep low during the next four decades. It is also apparent that immediately after the transition to the market economy, the Hungarian top income shares rapidly adjusted, and continued to increase.

Comparisons with China and India offer external validity in our estimates. In

[26]The drop in business income is unlikely to be due to simple reorganization of tax labels as only one main item was excluded from business income after 1995, but the decrease started many years later in 2001.

particular, China exhibits almost identical top income inequality at the beginning of the Deng Xiaoping reforms in the early 80s, albeit with dissimilar trends.[27]

4 The Capital Share

Which segment of the income distribution benefited the most during the socialist period? After the transition the significance of capital component including realised capital gains at the very top of the income distribution quickly recovered in Hungary, rapidly approaching levels of the inter-war period. Those at the top 1% and top 0.1% received respectively more than 25% and 50% of their income from capital income during the years preceding the recent financial crises. Meanwhile, the lower fractiles received much smaller shares of their income from capital. In just two decades the significance of capital income component at the very top of the distribution became important, reaching comparable levels even to the USA, a country with high capital income concentration.[28]

The factor decomposition of earners at the top 1% is displayed in Figure (5). It is clear from the income decomposition that the capital income component was a strong drive behind the surge in the top income shares after the transition to the market economy. During the inter-war period, top income shares are high, and they come from large capital structures and land, in agreement with the rest of the Western European experience at that time. During socialism, the top income shares are solely composed of labour income since profits accrue to the State. After the transition, income shares of both capital and labour increase in tandem, as secondary capital markets open up and labour services are traded in a decentralised economy.

Bengtsson and Waldenström (2015) are concerned with the relationship between capital shares and personal income inequality. Our finding is in line with the statement that both capital and labour income factors play a significant role in increasing income inequality when market forces determine endowment valuations. In particular, we depict a situation where market forces are of the first-order, and where the adjustment witnessed after the transition is due to the opening up of markets for factor services. Figure (12) displays that the capital share of GDP rapidly reached

[27] Alvaredo et al. (2013) highlight two trends in the long run top income shares; the English speaking countries following a U-shape, and the continental European countries and Japan displaying an L-shape. The recent Hungarian top income shares show an increasing trend similar to the U-shaped countries, but the level of the shares is akin to the L-shaped countries.

[28] The capital income component including realised gains for the top 1% and 0.1% shares in Hungary was 32.99% and 52.83% in 2006, respectively, while it amounted to 30.1% and 37.2% in the USA in that year (calculations based on Piketty and Saez (2006)).

a remarkably constant level, also illustrating that the remuneration proportion of capital in the total gross income increased substantially.

What, if anything, can the evidence compiled here say about the classical political economy problem of factor share distribution? After the transition to a market economy, self-employment and entrepreneurship started to play a role.[29] The share level adjusts during the six years of transition, increasing from the level on which it is clustered during the years we have data on socialism, and staying on a remarkably stable level after that.

Piketty (2014) argues that regulations on the remuneration of capital have dampened the increase in the capital share after World War II in market economies. We indeed find that this is true, in an extreme case where these regulations are far more consequential, namely the shut-down of secondary capital markets and the delegation of the investment decision to the state. Eichengreen (1994) highlights the effects of labour market institutions on the functional distribution, and in particular the degree of unionisation and the bargaining power of unions. Karabarbounis and Neiman (2014) attribute labour share movements to shocks that influence the rental rate of capital. The decline in the relative price of investment goods, often attributed to advances in technology, will substitute labour for capital and therefore increase its relative part on total income. In our case, the opening up of the economy to domestic and international markets was an indisputable factor in driving factor shares.

After the transition to a market economy, changes in fixed capital formation have been remarkable. An assemblage of vintage capital structures was privatised. On the wake of the recent financial crisis, the country was a net debtor in foreign direct investment of about 62% of GDP in 2009.[30] The transition from state-owned to privately owned capital also marked the transition from a single owner to multiple ones, the domestic and international secondary capital markets, as well as to global finance.

[29]Gollin (2002) highlights the measurement issues that arise in countries where self-employment is significant. Our estimates of the capital share assume a ratio of labour and capital income in the mixed-income as that in the whole national income excluding mixed income. Details on the measurement methodology are in the Appendix.

[30]Updated and extended version of dataset constructed by Lane and Milesi-Ferreti (2007).

5 Institutions and Incentives

5.1 Incentives

Decisions on human capital accumulation and incentives for effort are determined by the dynamics of the wage distribution. In turn, the dynamics of the wage distribution is affected by labor market imperfections, notably the technology and the market structure in the production side, conditions that induce the observed wage distribution as an outcome. These aggregate imperfections are compounded with the imperfections in capital markets, and in particular those that affect credit and borrowing constraints. When factor and product markets are perfect, and abstracting from issues of agency and imperfect information, the wage distribution will reflect differences in marginal productivity, and hence the exercise of effort in human capital investment and training.

Earned income is a major part of our top income share estimates during the periods of free markets, and the essential part of the estimates during the socialist period. Hamermesh and Portes (1972) refer to the market structure on the side of supply as being "close to the textbook level case", notably the "trade unions' insignificant effect on wages." (p. 241). With an unfettered labor supply side, and given the centralized structure of production in a socialist economy, the wage and hence the income distribution were, by and large, set by the state monopsony of labor. In order to investigate the extent to which the institutional arrangement of socialism has affected incentives for effort, we estimate the relative price of skills over the entire period of our top income shares estimates, from the 1920s to 2008.

To the interest of compiling homogeneous estimates across periods, we define the skill premium according to the availability of aggregate labor market statistics. We construct the ratio of the average wage of white collar workers over the average wage of blue collar workers. The dynamics of the skill premium closely track those of the earned income part of our top income shares estimates, as is shown in Figure (14). Both series have a negative overall downward trend during the most of the socialist period. The skill premium series displays an upward trend from the early 1980's that is followed by an increase in the top shares. Both series continue to increase around this trend after the transition to the market economy.

In our setup, the swings in top income shares during socialism reflect wage differentials between skilled and unskilled workers, as a result of a series of gradual, productivity-linked remuneration reforms. Changes in these differentials were obtained as a result of a non-transparent, political bargaining process within the Communist Party apparatus.

The introduction of partial reforms during socialism coincides with jumps in the skill premium and top labor income shares. According to Berend (1990), the New Economic Mechanism of 1968 introduced meritocratic elements that favoured those with skills and expertise, while it attacked the vested interests of the rank-and-file Communist Party members at the state or managerial apparatus, whose power was in jeopardy. Those against such productivity-linked wage reforms and profit-sharing schemes put forward arguments such as the defence of the "values of socialism" and considerations of the "workers' interest." Blue-collar workers were also against the reform as they claimed it shifted the income distribution unfavourably for them, essentially resisting to an increase in wage dispersion. Since blue-collar workers were the majority of the labour force, and with a political system dependent on the subsistence of the labour base, the earnings difference of skilled and unskilled workers were heavily bargained in the internal political process of the Party. The results of partial reforms in the skill premium and the income shares dynamics were short-lived at every introduction, as raises of wages at the bottom outperformed those at the top. This political process persisted up until the end of the 1970s. The persistent decrease in the skill premium over this period seems is directly linked to the decrease in the top share after the jump in 1970.[31]

As part of the New Economic Mechanism the Central Planning Bureau gave the right to state-owned enterprises to exploit some margins of compensation to workers according to productivity, essentially redistributing a fraction of any potential surplus to the middle and top management. Though this wage reform was short-lived, we see a parallel increase both at the skill premium and at the top shares exactly after the introduction of the reform in 1968. The reform was reversed almost immediately, followed by decreasing skill premium and top income shares.

The process of a gradual decrease in the skill premium is reversed in the end of the 1970s. During that time a significant reform took place, with wage and bonus settings of executives were delegated to enterprise level. This policy shift, that marks a first step to complete liberalisation of the labour market, led to a reversal of the decrease of the relative price of skills. The increase in the top shares from the mid-80's coincides with this delegation of wages and bonuses to the enterprise level.[32] This remuneration scheme favoured skilled workers over unskilled ones, as the productivity signal was more accurately observed on the enterprise level.

After the transition, evidence of skill-biased technical change is prevalent, although interrupted by labour market regulations and foreign exchange crises during the mid-2000s. Our findings are in line with Kézdi (2002) who documents a steady in-

[31]Berend (1990), p. 202, Mieczkowski (1975), pp. 222-223, Flakierski (1986), pp. 54-55 Table 4.
[32]Köllő (2001) gives a rough outline of this reform.

crease in the skill premium for the years 1986-1995 as a consequence of inter-sectoral skill reallocation. Kézdi (2002) documents job loss for unskilled labor, proxied by years of schooling, and an even higher skill premium growth for the second half of the '90s with skill biased technological change at most sectors. Moreover, Brown et al. (2006) provide evidence of increased productivity differentials of labour operating in foreign-managed companies over those that are domestically held after privatizations.

5.2 Institutions

Political institutions that affect redistributive policies are endogenous to inequality. Acemoglu and Robinson (2015) summarise this approach, according to which the technology evolves endogenously as a result of economic and political institutions. Institutions, in turn, shape the technology and the labour market, on which the relative price of skills and the supply of skilled labour is formed. These labour market conditions are of relevance to the subsequent evolution of top income shares.

To illustrate this mechanism, Acemoglu and Robinson (2015) use as a case study the ratio of white to black wages compiled by Leibbrandt et al. (2010) during the 20th century in South Africa, which is a de facto proxy for the skill premium. They argue that the disconnect between an increasing skill premium and the rapid fall of inequality at the top in South Africa is explained by the non-market institution of apartheid, itself a result of a political process relating to the level of resource endowments and its distribution in the beginning of the 20th century. In the context of our study, this would have meant that the documented high inequality in the interwar years, stemming from a skewed distribution of capital income that favors the top percentiles, would have brought about the non-market institutional setup of socialism and its extreme capital taxation and redistributional policies.

Our paper is immune to this critique. The planned economy period we investigate is a quasi-experiment of a non-market institution that is exogenously imposed and sustained. Socialism did not arise as a result of a political bargaining process that is endogenous, that is, as a result of a heightened income inequality during the inter-war period.

Indeed, in post World War II Hungary, large parts of the population and especially small landholders, were represented by the centre-left Smallholders Party (*Független Kisgazdapárt*) that won 57% of the vote in the elections of 1945, against the 17% of the Communist Party that had a stalinist disposition. The democratic forces were gradually removed from office after a series of coups that came to be known as "salami tactics." From then on, *de facto* political power was held by the Communist

Party. The Party was more of a Soviet-backed puppet organisation rather than a "grassroots" movement originating in the revolutionary movements of the inter-war period.

After World War I, the short-lived bolshevic revolution of Béla Kun was held responsible for exacerbating hyperinflation forces that ensued as a result of seignorage of the war expenses (Sargent (1982)). Berend and Tibor (2005) argue that the left-leaning forces were nascent during the interwar period, which may have fostered a certain kind of retaliatory disposition after the end of World War II. However, the electoral outcome of 1945 for the Communist Party precludes the possibility of such political and ideological path-dependence. While the October Revolution may have been the result, among others, of an extreme form of deprivation of the majority of the population in Tsarist Russia, socialism in Hungary was exogenously and forcefully constructed rather than inspired. Therefore, socialist redistributive policies that affected the income distribution dynamics were exogenous to prior conditions on inequality.

In free markets, fiscal instruments operate on the distribution of final outcomes and subsequent top income share dynamics through multiple, market-related latent channels. The effect of a tax on capital (structures or equipment) will affect the labour market and the wage distribution in ways that operate through production elasticities, aggregate investment, as well as the effective supply of labour. In an incomplete markets setup, and apart from preference heterogeneity, the effects will depend on the distribution of assets, skills, and the opportunities offered by the market. It is difficult to obtain clear results that will yield transparent economic mechanisms, or even identification of the channels on which a certain tax reform operates to the final income distribution.

An interpretation of the socialist experience in Hungary from 1949 to 1991 is one that is tantamount to the confiscation of private capital, an effective tax on capital of close to 100%. The fusion of the party and the government resulted in expropriating the entire productive capital stock. Corporate governance of state-owned enterprises was entirely under the direct control of the Party establishment, who operated the state apparatus. Decisions on prices and quantities reflected the political economy of socialism, rather than the workings of a free or regulated market. Moreover, the state operated as a monopsony of labour, and entrepreneurship was abolished. Secondary capital and goods markets were non-existent. All of the latent mechanisms alluded to above were shut-down, by an institutional setting that was exogenously imposed.

6 Conclusion

In this study, we used individual tax statistics to construct top income share series for the periods prior the Second World War, and after the transition to a market economy. We complemented the series with available earning censuses in the socialised sector for the planned economy period.

We have exploited the quasi-natural experiment of partial liberalization of wage setting during the socialist era to study questions such as the effects of market forces on the top income shares; how both the incidence of socialism, as well as the post-socialist transition have shaped the income distribution at the very top; and how quickly the shares returned to Western-European levels after the transition into the market economy.

During the studied period between 1914 and 2008 the Hungarian top income share series followed a U-shape. The top shares were as high as in Western countries (USA, UK, France) and came from large capital structures and land during the first decades of our time frame. After the Second World War, when most Western countries experienced a compression in their top shares, the Hungarian shares decreased twice as much and remained constantly low during the four decades of socialism. After the transition to a market economy we observed a rapid top income share adjustment: in less than a decade top income shares increased to levels prevalent in western countries, and the increase was due to a surge both in capital and labour income factors.

The constructed top share estimate series suggest that both capital income via the allocation of capital holdings from the state to private owners and securing property rights; and labour income via wage-setting decentralization favoring the remuneration of skills played a significant role at increasing income inequality during market economies. Investigating whether institutions that promote market efficiency have a more profound effect than secular movements of top income shares can be more fruitful in understanding income disparities.

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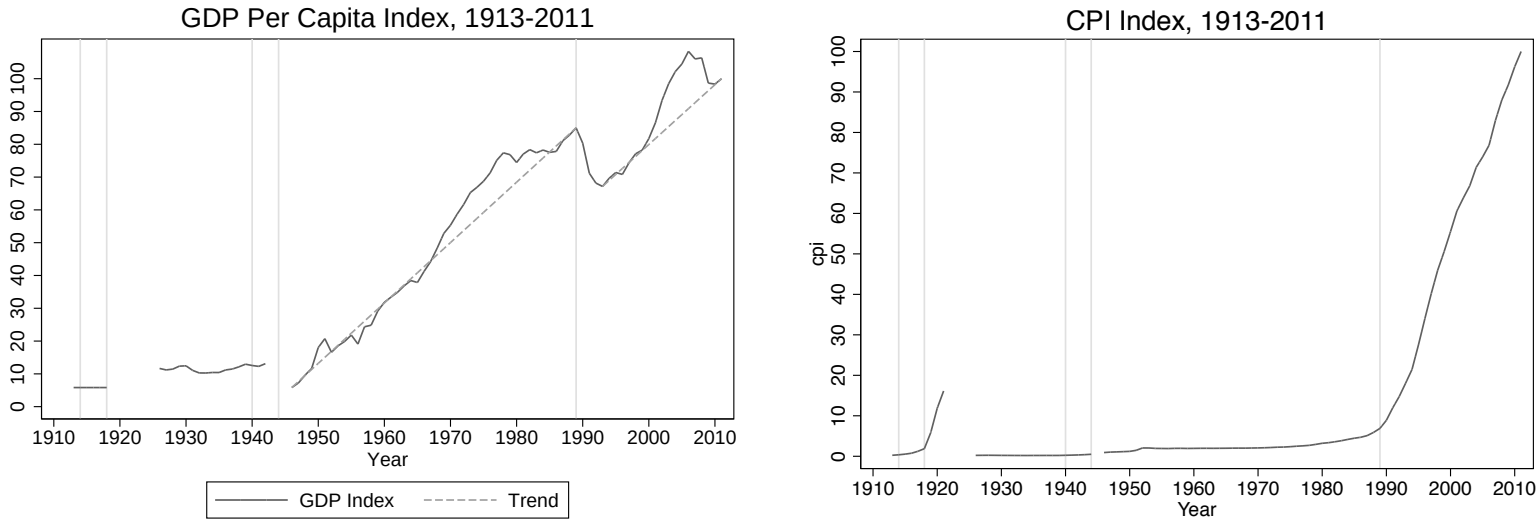

(a) (b)

Figure 1: (a) Real GDP per Capita Index (2011=100); Trendlines refer to periods 1946-1989 and 1993-2011. (b) CPI index (2011=100). Methodology and historical data sources are provided in the Appendix.

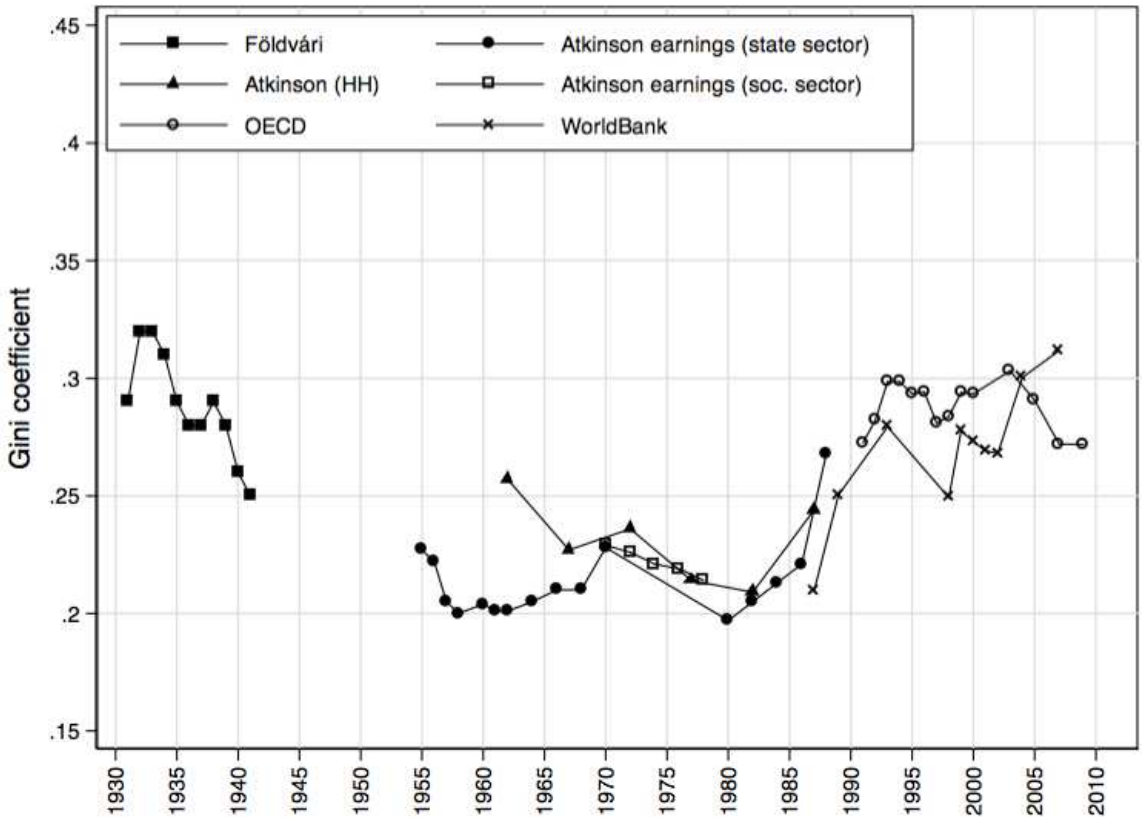

Figure 2: Gini coefficients, 1930-2010

Source:1928-1941: Földvári (2009) computes Gini estimates based on official income tax statistics, and by assuming Pareto distribution. 1951-1988: Atkinson and Micklewright (1992) calculates Gini coefficents based on per capita household income (HH), and employee earnings both at the state and socialist sectors. 1987-2009: OECD publishes per capita Gini series based on the Tárki Household Monitor survey. 1987-2007: World Bank publishes Gini series based on the household surveys of the Hungarian Statistical Office. The unit of analyses is all workers at the state or socialist sectors for the series based on the employee earning censuses, and per capita household income for all other series.

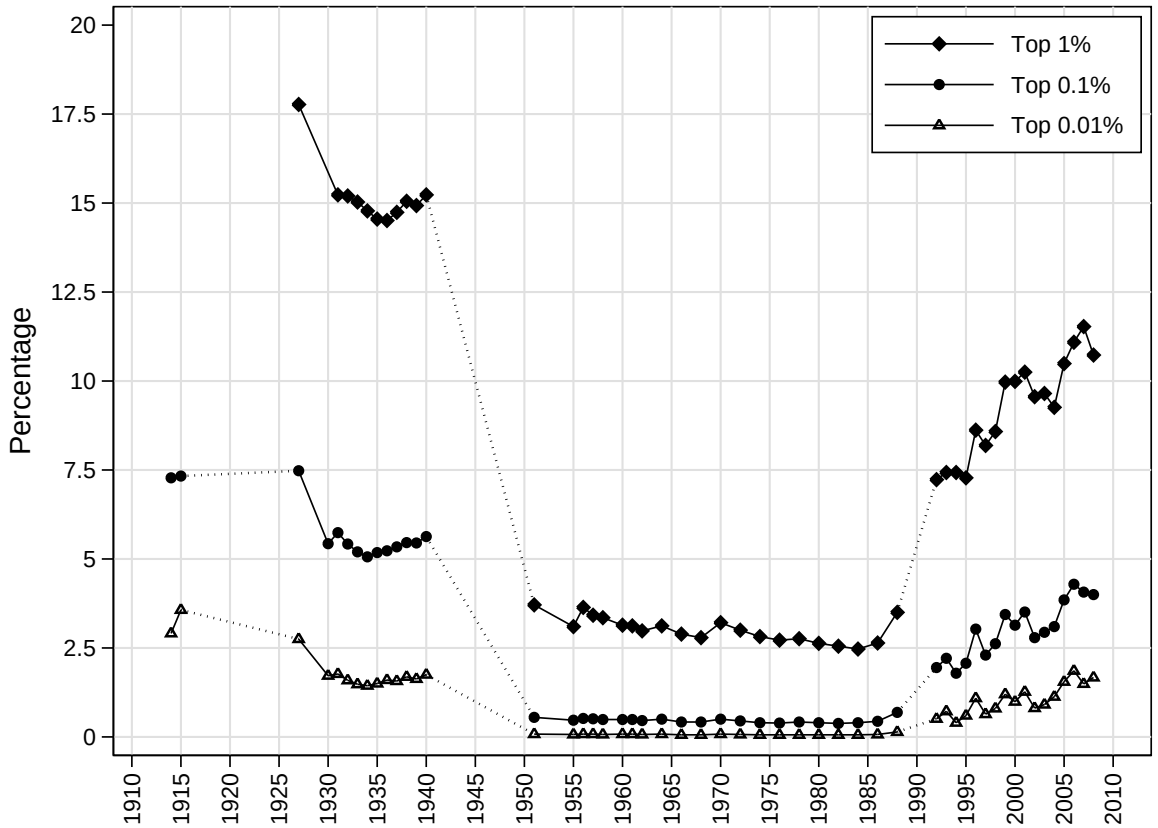

Figure 3: Percentage of total income received by each of the top groups on the income distribution, 1914-2008.

Notes: Income is defined before taxes; capital gains are excluded in years 1914-1940 and included in years 1992-2008. For the period 1951-1988, income is defined as wages and salaries of state-owned enterprises.

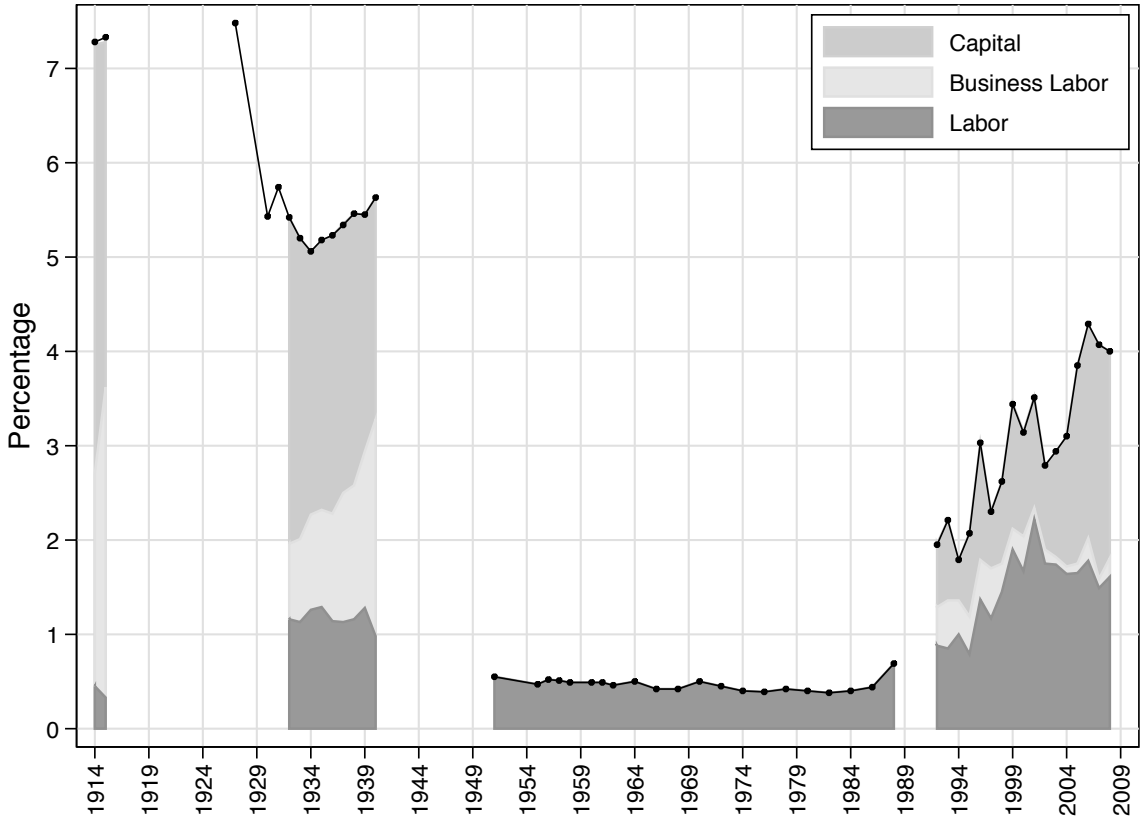

Figure 4: Decomposition of the top 0.1% income share, 1914-2008

Notes: Capital is defined as income from capital assets, land and buildings. For the period 1992-2008 realized capital gains are included. Labor income is defined as wages and salaries and other employment income. Business income is mixed income. In 1914 the decomposition of top 0.1 income share is assumed to be the same as the decomposition of top 0.14, and in 1915 as the top 0.2 (see Appendix 2.2). See the Appendix for a comprehensive definition of income.

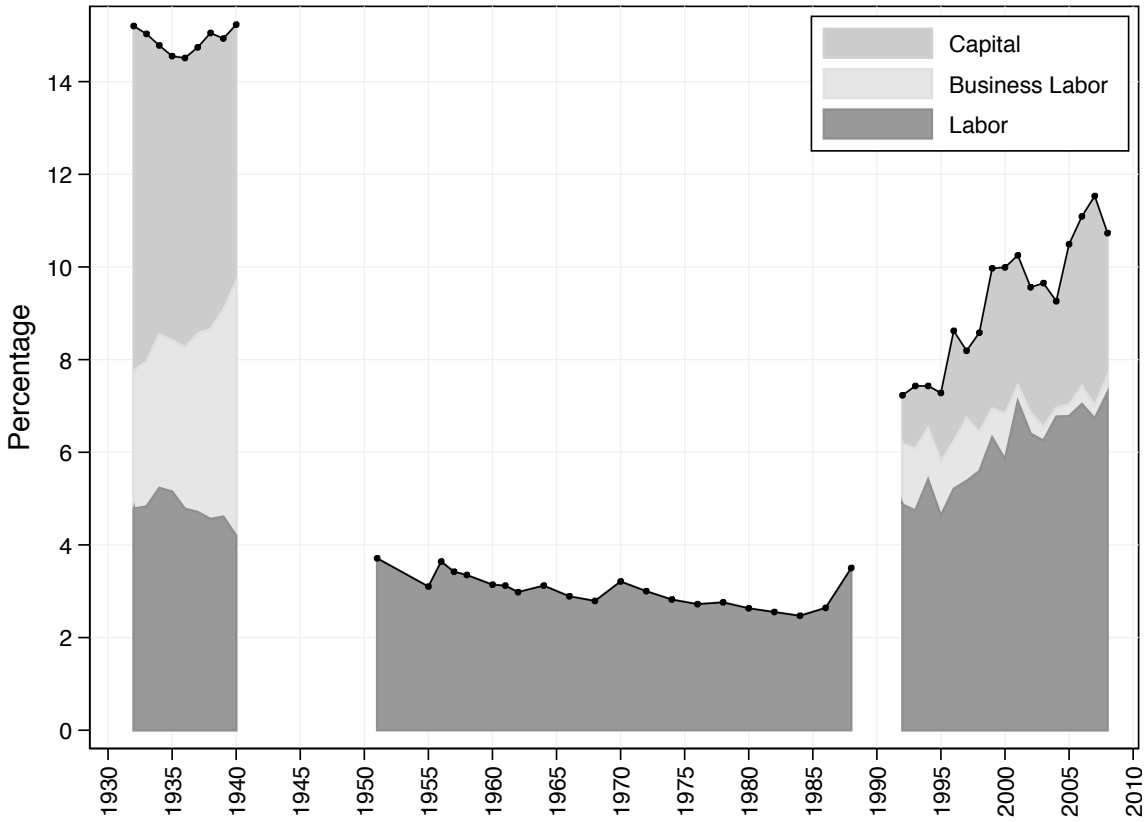

Figure 5: Income source decomposition of the top 1% income share, 1932-2008

Notes: Capital income is defined as income from financial assets (interest, dividends), land and buildings and for 1992-2008 including capital gains. Labor income includes wages and salaries and other employment income. Business income is mixed income. See the Appendix for the precise definition of income.

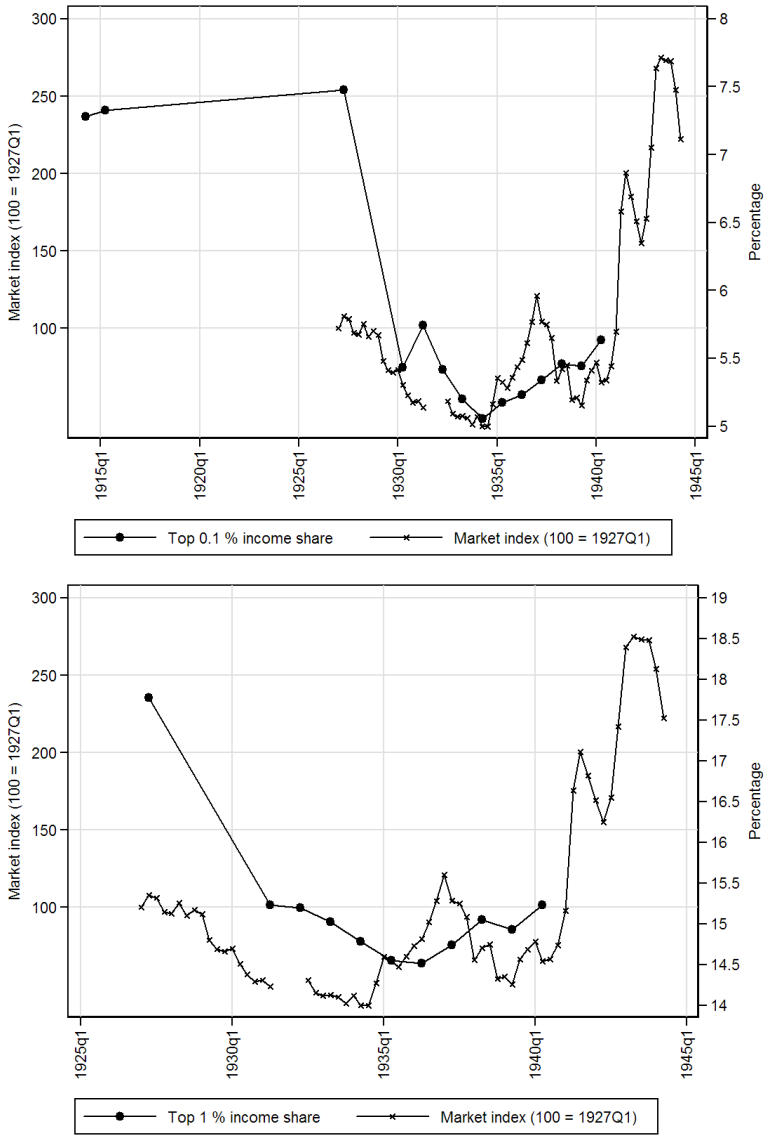

Figure 6: Quarterly market index of the Budapest stock exchange, 1927-1945, and top 1 and 0.1 percent income shares, 1914-1940. (Source: own computations, League of Nations Statistical Yearbook (various issues)).

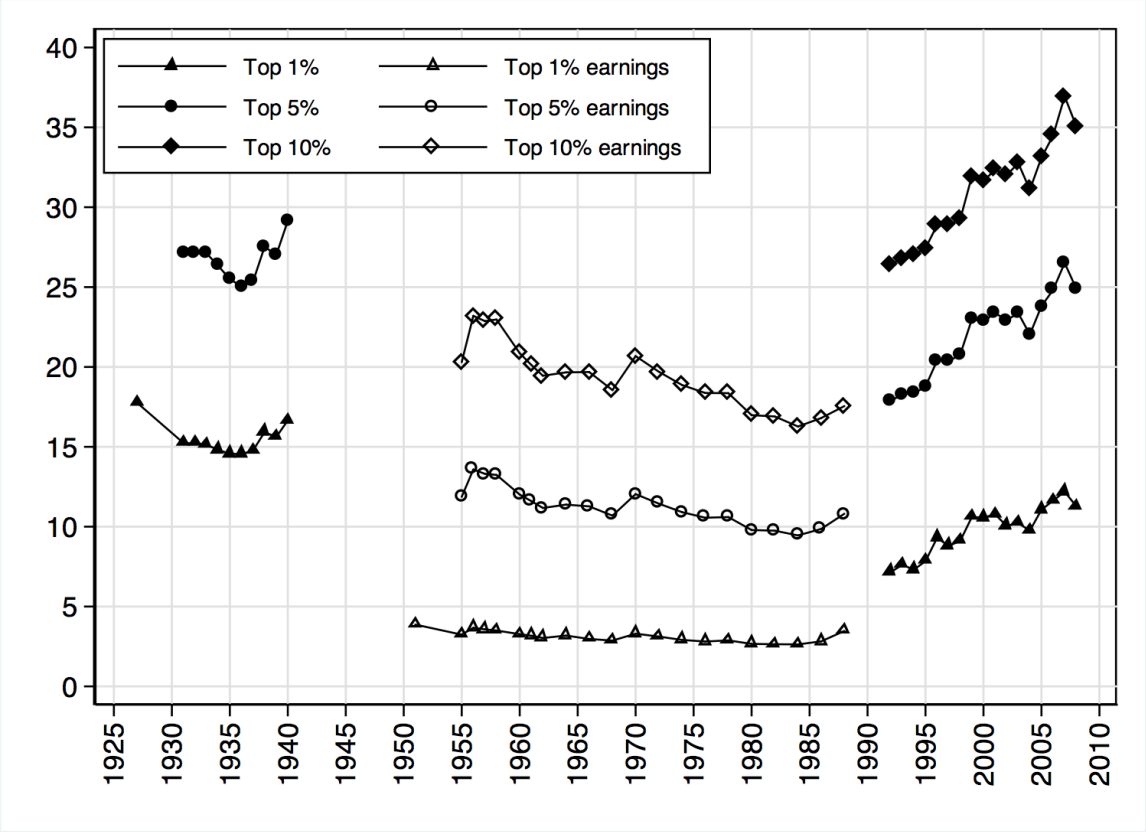

Figure 7: Top 1, 5 and 10 percent income shares in Hungary, 1914-2008

Note: Percentage of total income received by each of the top groups. Income is defined before taxes and excludes capital gains for 1914-1940, and includes capital gains for 1992-2008. For 1951-1988 income is based on earning tables. For 1914-1988 the fractiles are defined by total income excluding realized capital gains, and for 1992-2008 including realized capital gains also. (For details see Appendix section 2, 3 and 6.)

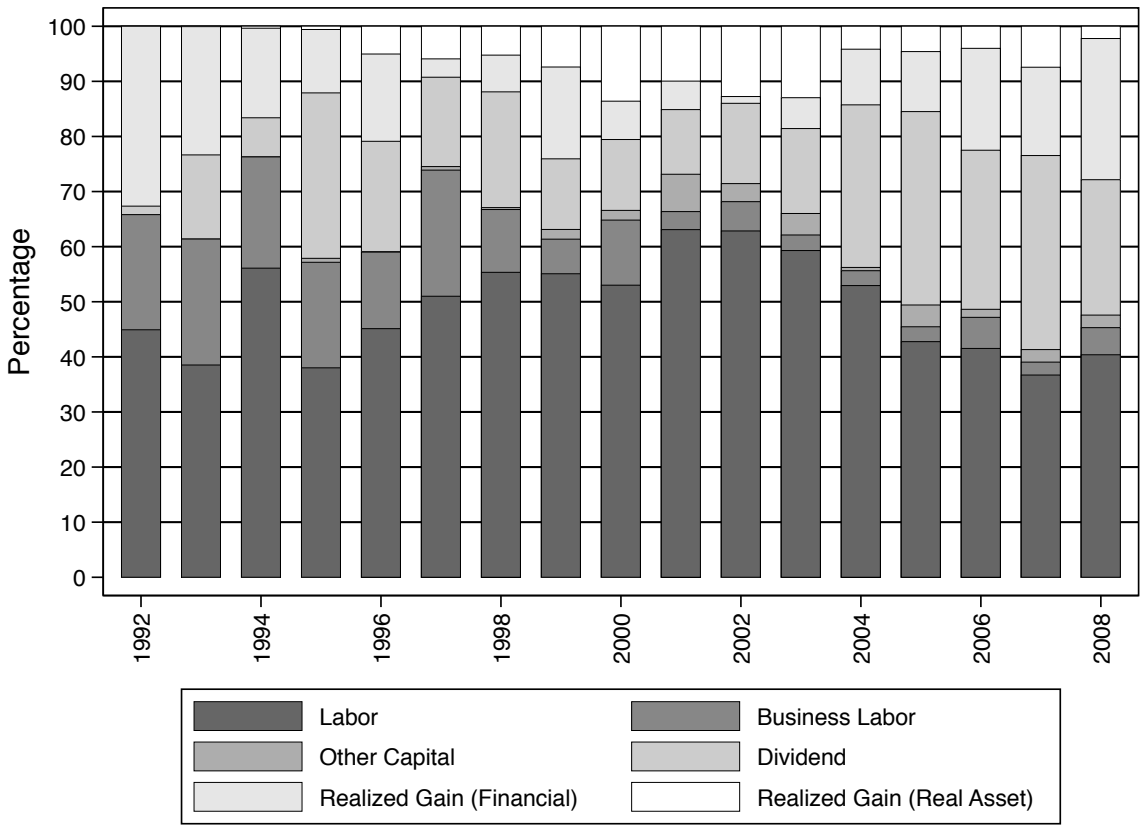

Figure 8: Decomposition of the top 0.1 percent income share, 1992-2008

Note: Income decomposition of total income received by the top 0.1 percent. Labor: wages and salaries, bonus, in kind benefit, stock option, and employee stock, taxable cost compensations, pension, unemployment and maternity benefit, scholarship. Business labor: self-employed and partnership income, liberal profession, agricultural income. Dividend: general dividends, and dividends received through partnership. Real asset capital gain: realized gain from selling property, movable goods, rights. Financial capital gain: realized gain from selling financial assets. Other capital: any other taxable capital income such as rent, annuities and interest not taxed at the source. See Table 12 for detailed income categories.

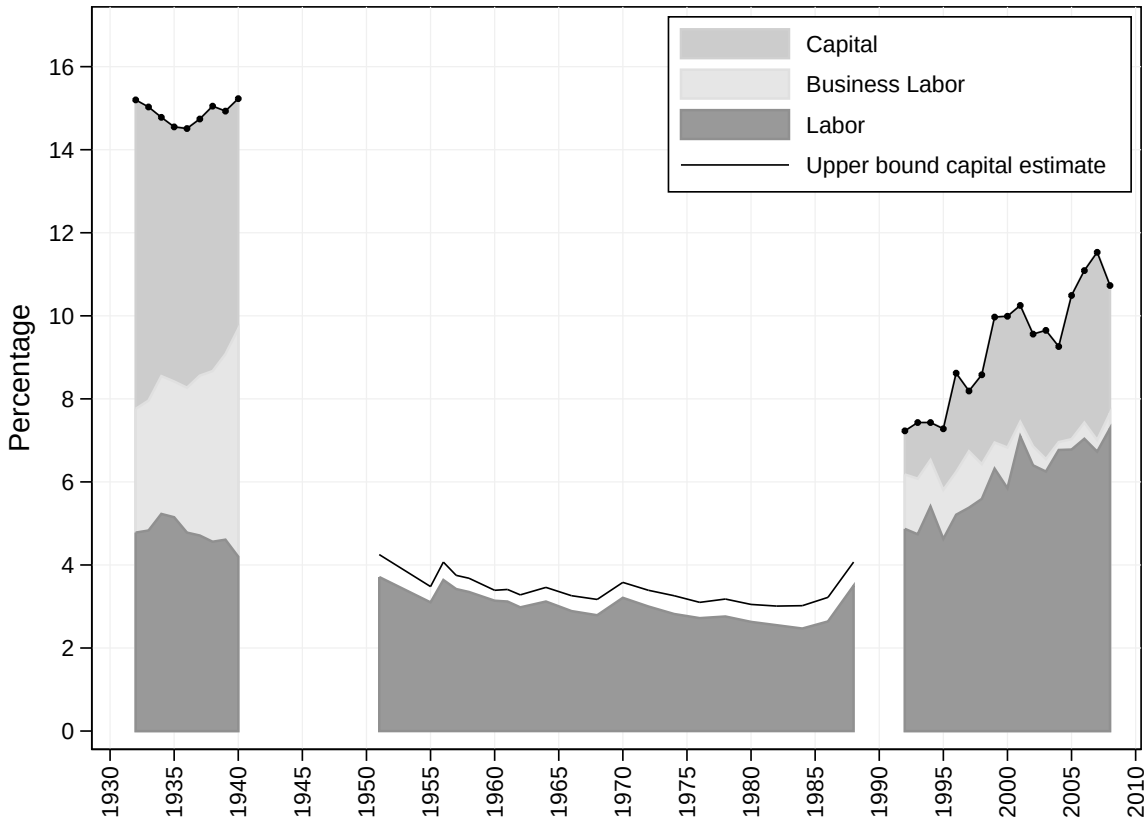

Figure 9: Imputed upper bound on capital income, 1951-1992.

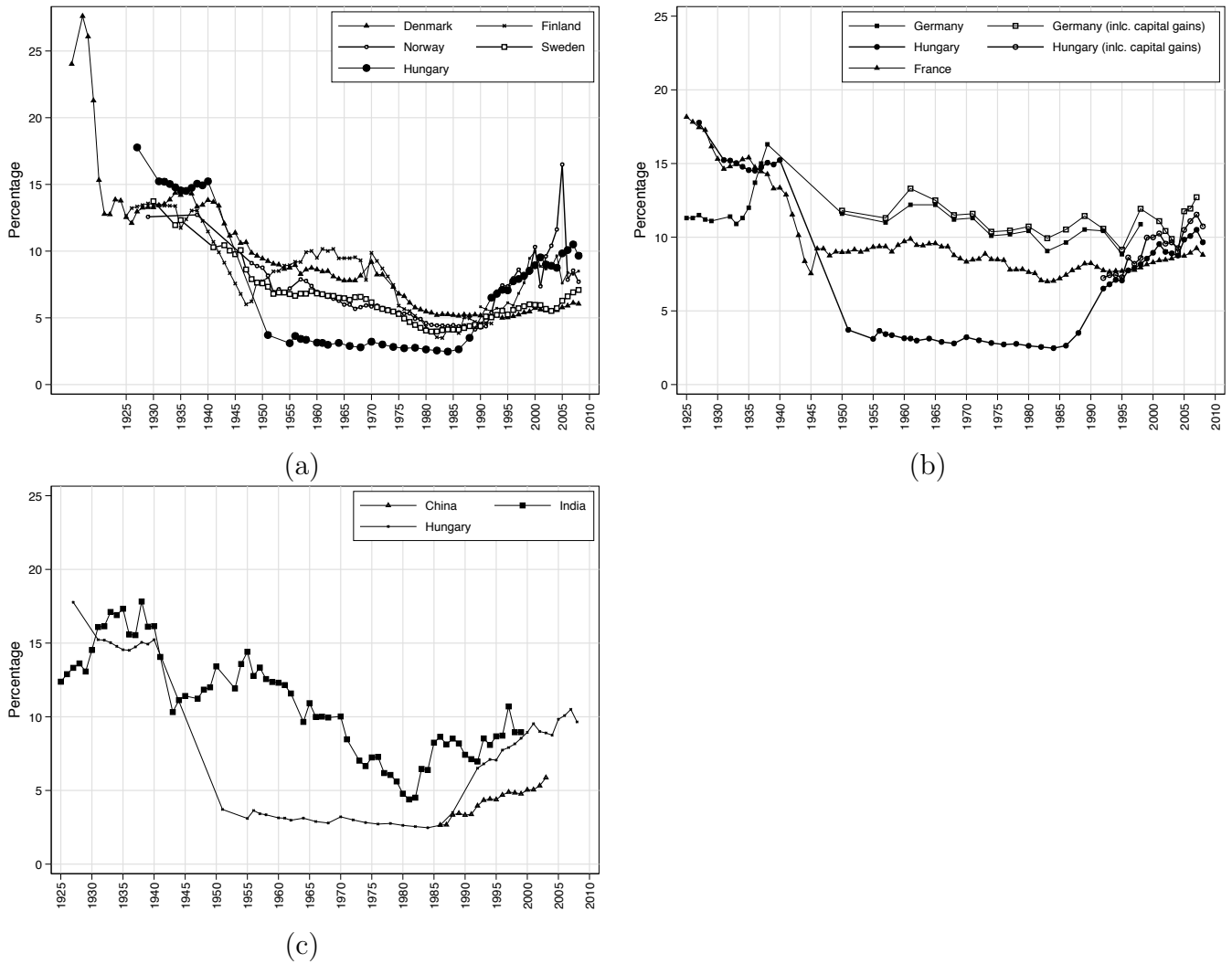

Figure 10: Top 1% income shares, 1925-2008.

Note: For Hungary the shares are reported with and without realized capital gains for 1992-2008. Source: World Top Incomes Database and our computations.

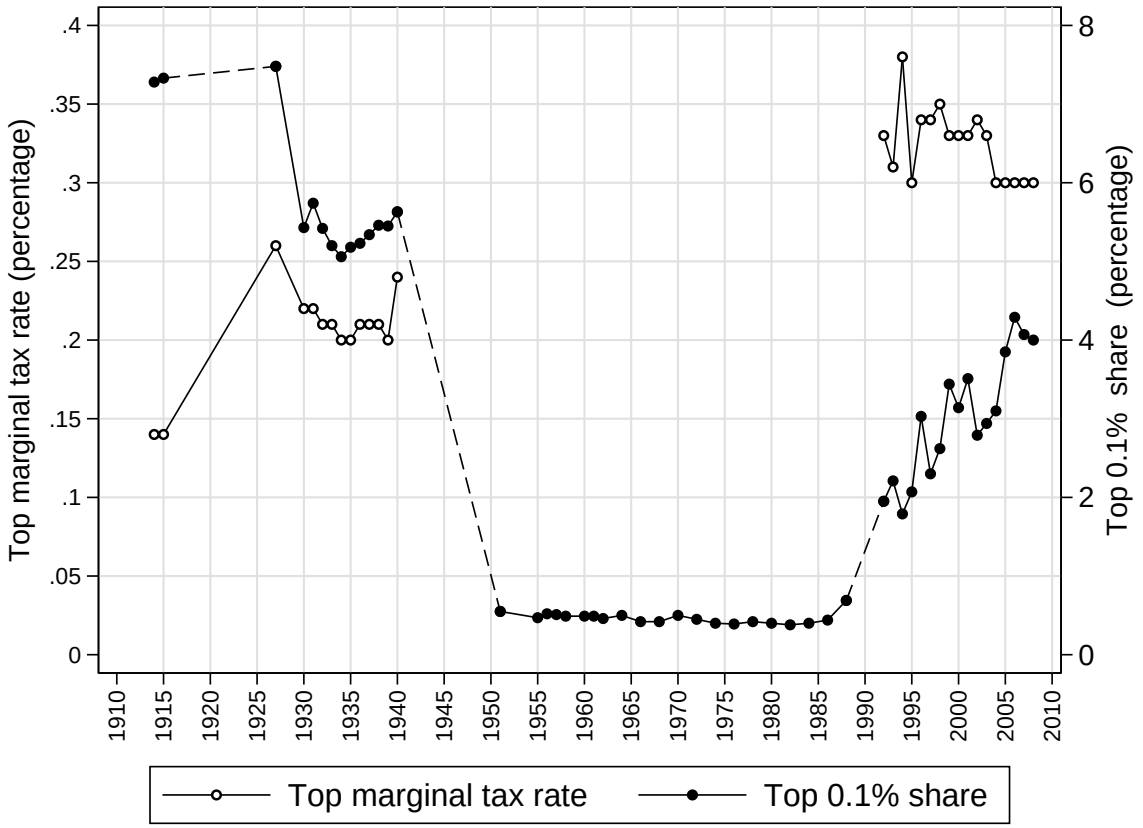

Figure 11: Top 0.1% income share and top marginal income tax rate, 1914-2008.

Notes: See the Appendix for construction of the top marginal tax rates. The top 1% income share series for 1927-1940 excludes capital gains, for 1992-2008 it includes capital gains, and for 1951-1988 it is based on earning tables. Source: Authors' computation using tax returns data and tax return law.

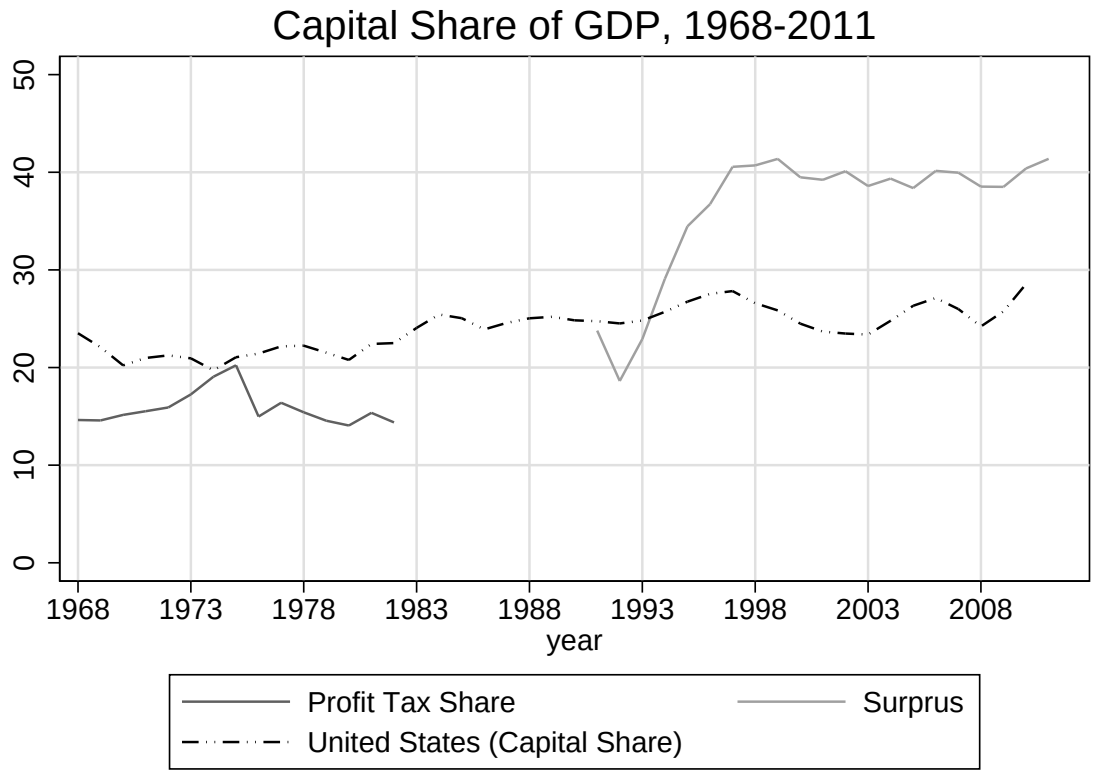

Figure 12: Capital Share, 1968-2011

Notes: Proxies of capital income share of GDP. For the period 1991-2011 the series report the capital factor share (gross operating surplus of households and firms). For 1968-1982 the series report the net income the state extracted as the owner from enterprises, i.e. profit and income tax. An alternative series includes the net of production subsides and production tax, and is detailed in the Appendix. Sources and definition of capital share for the United States are in Bengtsson and Waldenström (2015).

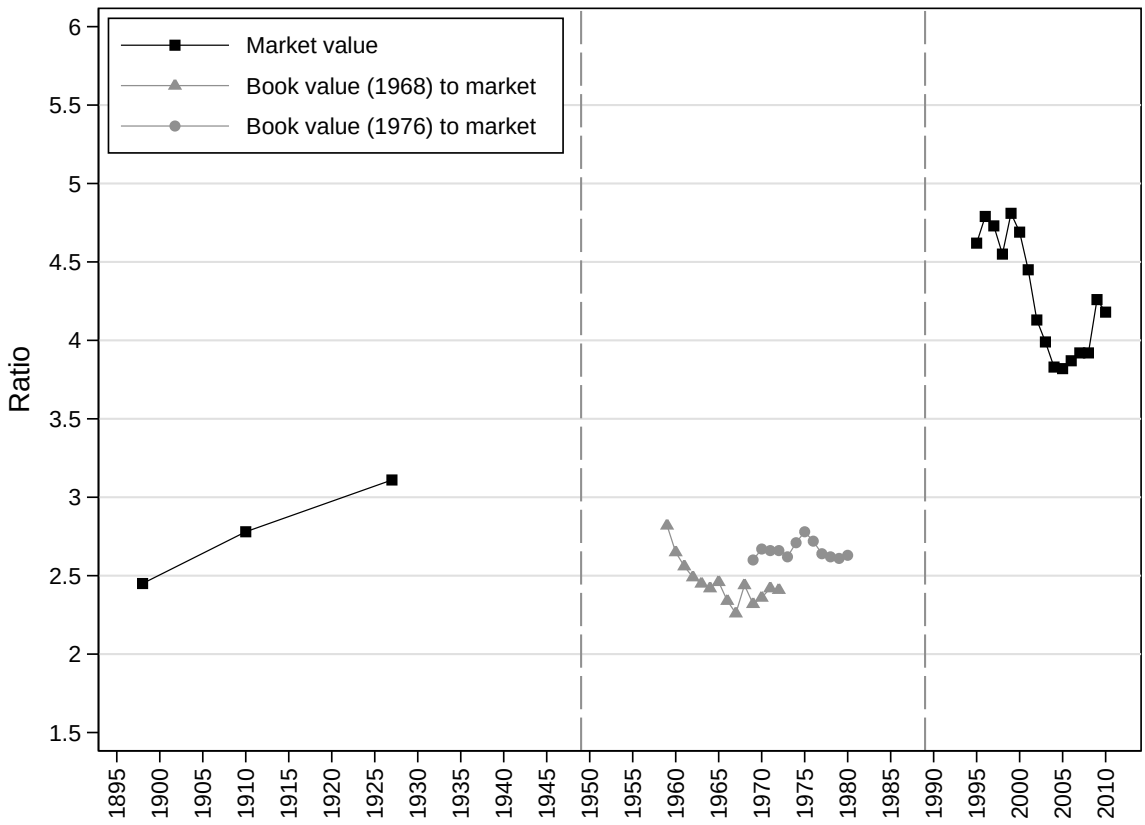

Figure 13: Capital to GDP ratios

Notes: Estimates of fixed capital to GDP, net of depreciation, based on two different methodologies and on two different sources of data. For 1995-2010 assets are calculated at market value. For 1959-1980 half of the assets such as dwellings, roads, bridges, dams, private sector assets is valued at replacement value, while the other half is valued at book value (1968 prices, and 1976 prices). Sources and measurement methodologies are detailed in the Appendix.

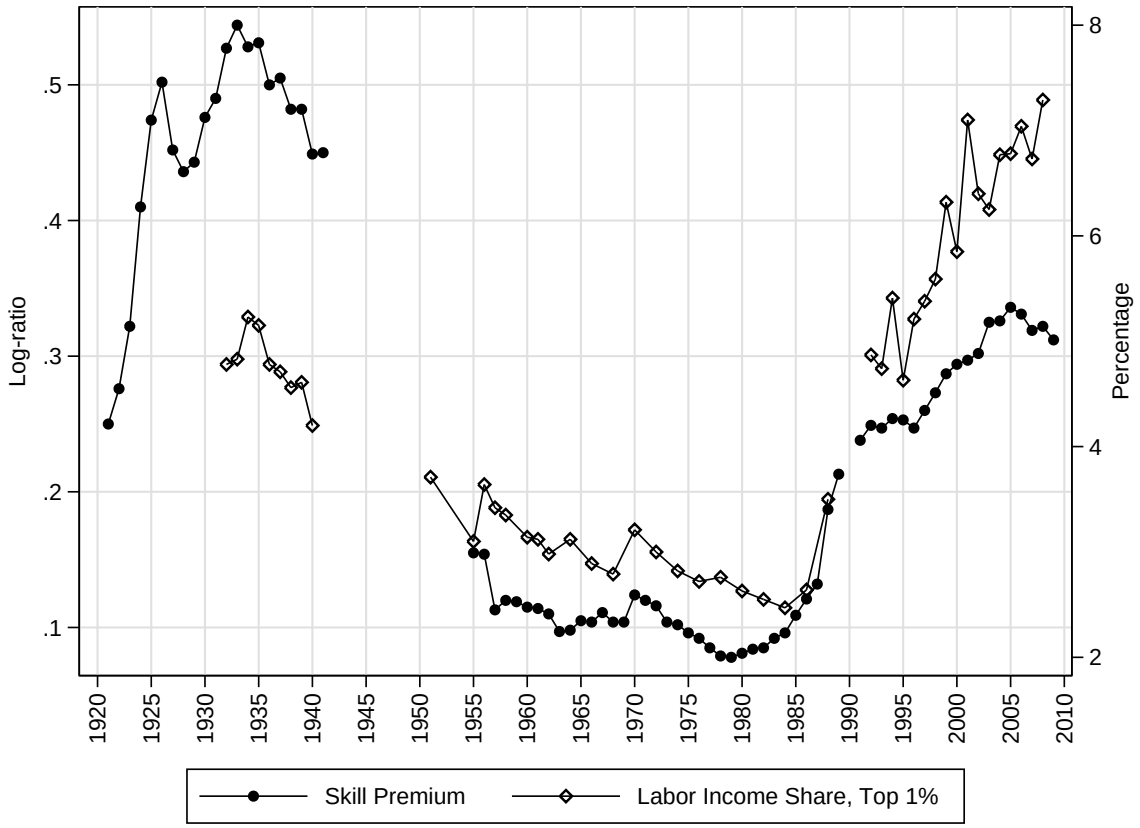

Figure 14: Top 1% labor share and the skill premium, 1920-2008.

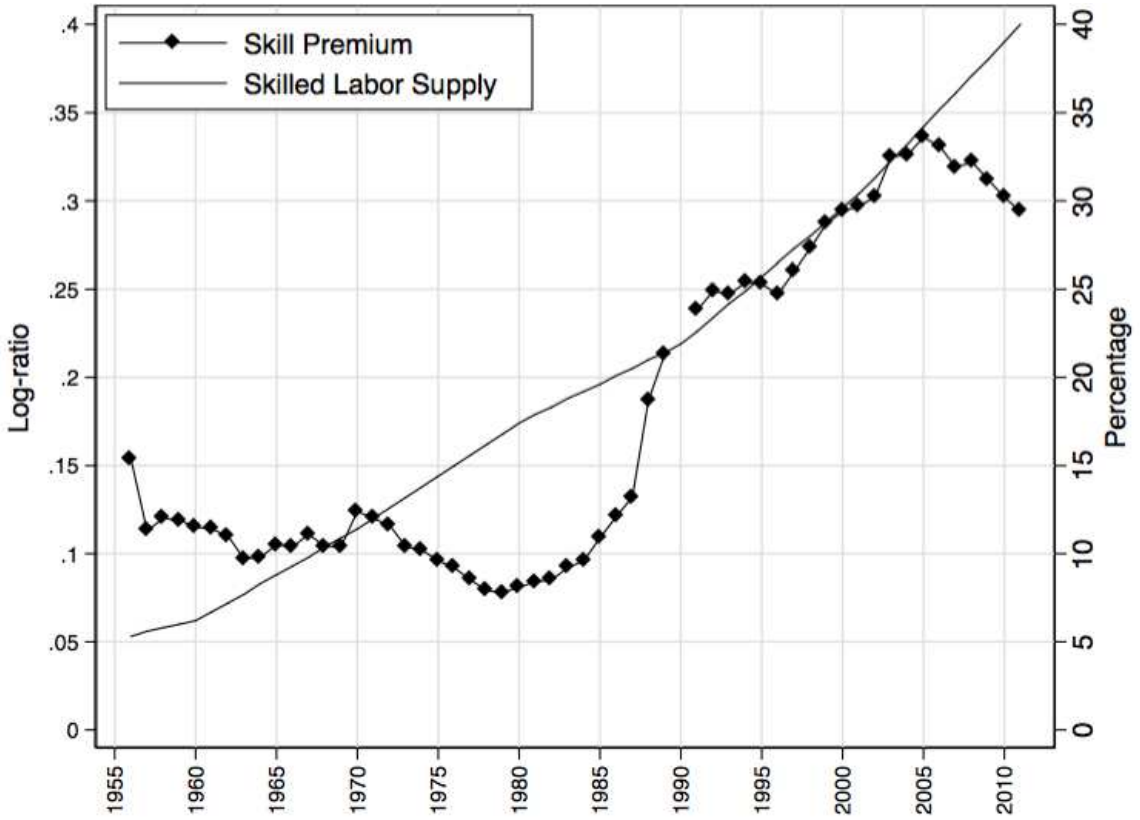

Figure 15: Skilled Labor Supply and Skill Premium, 1955-2011

Notes: Skilled labor supply is the percentage of the labor force with high school and university degrees, and skill premium is the ratio of log average white-collar worker wage over log average blue-collar worker wage. (See Appendix 7 for details.)

Appendix
Income Inequality and Incentives
The Quasi-Natural Experiment of Hungary, 1914-2008*

Dimitris Mavridis
University of Luxembourg

Palma Mosberger
Central European University and
European Commission, JRC

June 13, 2017

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1 Introduction

This appendix describes the data sources and income definitions used in the construction of the income share estimates, as well as the adopted measurement methodology. In Section (2), we present a historical account of the evolution of the income tax system for the periods 1914-1940 and 1989-2008, the available tax statistics, and we explain the use we made of them. We document the relevant income concept entailed by the tax code, the income tax statistics, and the adjustments we introduced in order to homogenize the top income share estimates across periods. In Section (3), we describe the available earnings censuses we use to estimate the top shares for the socialist period. Sections (4), (5), and (6) contain the detailed description of the tax units, income control and the assembled price index, respectively. Supplementary statistics on labor supply and the skill premium are provided in Section (7), and capital ratios in Sections (8) and (9). Annex (A) contains the results. Finally, a detailed account of the various data sources is contained in Annex (B).

2 Income Tax Statistics, 1914-2008

2.1 19th Century Historical Account

The short-lived revolutionary government of Lajos Kossuth introduced an income tax in almost immediately in 1848 as part of the reforms known as "March laws." A conspicuous characteristic of the system of direct taxation prior to this period concerning the top of the income distribution was that the numerous and wealthy nobility retained a tax exemption status established during the Middle Ages. The enactment of Act VIII by the revolutionary government of 1848 under the headline "On the common sharing of burdens" ("*a közös teherviselésről*") manifests a change in this situation, leaving future assemblies to legislate on the precise nature of the newly born tax system.[1] However, due to the overthrow of the revolutionary government an income tax that adheres to this law never came into effect.

The Habsburg Tax Reform of 1850 brought into effect a personal wage earnings (*kereseti adó*) and personal income tax (*jövedelemadó*), along with an array of direct taxes on land (*földadó*), built property (*házadó*), on capital gains (*tőkekamatadó*) and a corporate income tax (*vállalati adó*). This system evolved after the Constitutional Reforms of 1867 as necessitated by the new administrative arrangement of the Dualist

[1] See Krivoss (1943), pp. 9-10, and Murray Haig and László Ecker (1935) for a description of the 19th century origins of the modern income tax in Hungary introduced after the World War I. We discuss this tax code below.

system, which establishes Austria-Hungary as a customs and monetary union with two separate parliaments and independent national fiscal mechanisms.

Direct taxation evolved in tandem with the new forms of property and wealth as a result of late industrialization and the imperative of the construction of the national state. The first tax system free of Austrian influences was established during the 1875 direct tax reform, with an earnings tax (*kereseti adó*) similar to the *Classensteuer* in Prussia.[2]

This earnings tax categorized people in "classes" and levied taxes accordingly. Day laborers, servants and agricultural workers belonged to Class I and paid fixed per capita tax amounts. Taxes levied in Class II were structured as surtaxes on owners of property and land, as well as those receiving either capital income or annuities. Taxpayers receiving personal income from industrial, commercial, mining and liberal professional activities belonged to Class III and were obliged to report to the tax authorities the total amount of income retrospectively for the past three years. Class IV included employees with a pay-as-you-earn scheme, similar to the Prussian *Lohnsteuer* system. Statistics produced by the administration of these direct taxes do exist, but are not published in a template that is amenable to our measurement strategy.

2.2 Austria-Hungary 1914-1915

A comprehensive, progressive personal income tax is introduced in the Hungarian Kingdom in 1909 with a tax reform during the second premiership of Sándor Wekerle. Along with some minor revisions in 1912, it constitutes the relevant income tax code for the beginning of our timeframe, namely the income years 1914-1915 during Austria-Hungary.[3]

The first effective income year of this modern personal income tax was the year 1914 for net income above 20,000 crowns, subsequently reduced to 10,000 crowns in fiscal year 1917. The progressivity of the general income tax rate was rather obtuse, ranging from 0.5% to 5% over 74 brackets; see Figure (A.1).[4]

We use the two installments of the *Jövedelemadóstatisztika* income tax statistics

[2]Dell (2007) provides a description of this tax system, in using it as a measurement instrument for the top income shares in Germany.

[3]The description that follows is based on Fellner (1916) (pp. 50-61), Fellner (1926) (p.3 onwards), and Murray Haig and László Ecker (1935) (p.71), inter-alia, in addition to our own compilation of the relevant official legislation.

[4]The low progressivity of the tax code at a time of war is compatible with the historical fact that the bulk of the war expenditure was met by seignorage, as reported in Sargent (1982), apart from a one-off tax levy for the military effort in income year 1915.

published as Magyar Királyi Pénzügyministerium (1916, 1917) for income years 1914 and 1915, respectively. We use the figures that document total net tax base and tax levied on income earners across the sixty-four provinces of Hungary, and the eight provinces of the autonomous Kingdom of Croatia-Slavonia along with the port of Fiume and its suburbs, which together constitute a region that fell under the jurisdiction of the Hungarian Kingdom at the time. The constructed populations and income control totals for this period refer to the same geographical area; see Sections (4) and (5), respectively.

In the relevant tax code, declared income is defined as gross income net of expenses, depreciation, and maintenance costs. The total net tax base is formed by further subtracting other direct taxes from the reported income, as well as interest expenses, pension policies and war aid contributions, etc. The published tax tables include net income subject to tax (*vallomást adók*) as well as "income declared at a first instance" (*első fokon adóval megterheltek*), i.e., the total income assessed by regional ad hoc tax auditing committees appointed to assess in retrospect for the past year the income declared of incomplete, missing, or tax filings of contestable credibility. [5]

The total income above the threshold of 20,000 crowns had to be reported in five different categories separately, roughly corresponding to the various sources of income, in order to assess different deductible items and to form the net tax base. Category I includes income from land used in agriculture and forestry (*földbirtokból*), whereas Category II concerns income from built property and real estate (*házbirtokból*). Both of these categories consist of declared net rental income or net imputed rents based on the average rent in the area. Category III is applied to income from industrial, commercial, and similar activities (*ipari, kereskedelmi, és egyéb kereseti foglalkozásokból*), as well as income from business activity (self-employment) in the corresponding sectors, and income assessed according to the earnings schedule of the income tax (*kereseti adó*) including remunerations of business executives. Category IV includes capital income and annuities (*tőkevagyonból és vagyonjogokból*), interest income from royalties, savings, securities, dividends, as well as income from capital

[5]The committee members were selected in order to represent all taxpayer groups including the Chamber of Commerce, industrialists and lawyers, liberal professionals, land, real estate and capital owners and were required to possess information on the income and wealth conditions of the citizens living that area. They were entitled to invite tax experts and witnesses to their meetings, question the taxpayers on their income and expenses and check their business balances. The lists containing the calculated income and wealth taxes for each taxpayer were displayed at the town hall. Meanwhile the taxpayers had the possibility to appeal against the tax amount declarations for 15 days, a procedure that gave rise to a second instance; see Klug and Soltész (1917) for a detailed description, and the tax manual of Lánczi (1916) for an actual tax return of fiscal year 1915.

placements held domestically and abroad. Income declared for tax purposes includes various capital income items, such as the ones above as well as the imputed value of in-kind income that was paid by lessees of land plots. Category V includes income from wages and salaries (*szolgálati illetményekből ellátásokból*), remunerations of employees in the public and the private sector, pensions, including bonuses and excluding executive compensation. Although the wage bill of the members of the administration (civil servants, and members of the military and civil guard (*csendőr*) was tax exempt, the income tax statistics do contain data on the declared income of the members of administrative corps whose total income exceeded the income reporting threshold; see Klug and Soltész (1917), pp. 162-163.

We proceed to the following adjustments of the income tax data, in order to form the appropriate figures for our final estimates. First, in terms of fiscal units (taxpayers), we remark that the individuals who were not permanent residents of the Hungarian Kingdom, or did not live at least four months in Hungary during year $t-1$ for a given fiscal year t, had to pay taxes on the tripled amount of their actual land and property income realized in a given fiscal year, pertinent to income Categories I and II. Accordingly, we subtract the number of non-residents from the total number of taxpayers assigned to each bracket of the tax statistics by using Sections IV and VII of the published statistics, respectively, for income years 1914 and 1915. Second, the income tax statistics depict, per brackets, the total net tax base i.e. total declared income minus tax exempt income and deductions including other direct taxes, paid interest, and life insurance policies. We hence adjust the tax base figures using the total country-level ratio of the total reported income over the net tax base. Finally, the income of non-residents multiplied by a factor of three is subtracted from the total to produce the tax base.

2.3 Interwar Period 1927-1940

Changes in the tax code during the interwar period reflect the stabilization program of the League of Nations in view of taming the hyperinflation episode that ensued from wartime imbalances. These fiscal imbalances led to an increase in the different direct tax rates and introduced a steep progressivity of the general income rates from income year 1927 onwards, ranging from 1% to 40% with a tax-free threshold of 1,000 pengő; see Figure (A.1).

Currency conversion took place after the stabilization of 1925-1926, when the Hungarian crown (korona) was replaced by the pengő. Apart from the higher tax rates, the income concept of the income tax introduced in 1909 remained virtually unchanged. This tax code produced several installments of income tax statistics

published by the Hungarian Finance Ministry and corresponding to income years 1927 and 1930-1940; see Table (B.3) for a detailed account of the income tax statistics sources.[6]

Income Assessment Methods The first adjustment relates to figures reported separately in different but comparable distribution tables, and under different income assessment methods. The tax income statistics for the income period 1927-1940 contain income figures assessed for tax purposes in two broad categories, namely (i) income "adopted" with no modification or, alternatively, income subject to "previously fixed" taxes *(rögzített adók)*, and (ii) newly assessed income (*nem rögzített adók*). Taxpayers with declared gross income less than 10,000 pengő and declared wealth less than 200,000 pengő at year t were treated in a fast-track manner by the tax authorities, who"adopted" legally the taxpayer's income and wealth for the subsequent year $t+1$ as an income subject to "fixed" taxation. In this case, the taxpayer did not have to file a tax return in the subsequent year, unless the declared income was significantly revised either upwards or downwards, at which point, the income was considered as "newly assessed". [7] Newly assessed, non-fixed income included two categories: income above the 10,000 pengő threshold that could not be fixed (*nem rögzíthető*) and income below 10,000 pengő that was not yet fixed (*rögzíthető*) due to incomplete tax year or because it was the first year to be assessed.

For income years 1932-1935 the very few taxpayers and their income in the first broad income bracket (0-10.000 pengő) in the newly assessed "non-fixable" *(nem rögzíthető)* income table are divided up into detailed brackets based on the assumption that their income distribution is the same as the "previously fixed" (*rögzített*) and "not yet fixed" (*rögzíthető*) income parts of the table with detailed income brackets below 10.000 pengő. Taxpayers and their income in the lowest newly assessed non-fixable bracket were distributed to specific brackets by keeping the adjusted mean income in the empirical mean level. We distribute the income and taxpayer figures into a consolidated table in order to increase the precision of the interpolation

[6]Földvári (2009) estimates Gini coefficients based on the same tax table statistics by assuming different overall income distributions. He also calculates the share of income accruing to all taxpayers present at the tax tables, but these ad-hoc top shares are not comparable between the years, as the calculated top shares refer to different percentages of the population varying between 5% and 9.1% in different years. Moreover, Földvári compares household tax units reported on the tax tables to a total population denominator, and not to a tax unit denominator.

[7]A taxpayer was called to revise the amount of "adopted" income for tax purposes in the case where the taxpayer changed occupation, location, or at will. If a taxpayer declared income over an incomplete fiscal year t, then this could not be taken as an "adopted" income by the tax authority in the subsequent year $t+1$; see Takács (1943), pp. 483-486 for the details.

scheme, thereby increasing the number of brackets of the overall distribution. No such adjustment was undertaken for the income years 1936-1940, as the tables are amenable to consolidation.

Income Sources Concerning the different income categories that add up to the tax base, the statistics are reported in two different formats. For income years 1932-1934 all income of an individual is assigned to solely one income category corresponding to his main income source, while for income years 1935-1940 the various income sources of an individual taxpayer are assigned to specific income categories. For instance, for income years 1932-1934, capital income of an employee is reported at employment income category, while from income year 1935 the capital and employment income is reported separately in different categories. This change in reporting format does not influence the total estimated shares. In order to obtain comparable income composition estimates between the two reporting formats, we adjusted the 1932-1934 income components by assuming same composition in 1934 and 1935, and keeping the relative changes for the years prior.

The general tax statistics tables depict income from the following categories of income under both reporting formats. Category I includes income from land (*földbirtok*), while Category II includes income from built property and real estate (*háztulajdonból*). Income depicted in the 1914-1915 statistics as Category III is now reported separately; such as income from crafts in Category III (*iparosok*), industrial income in Category IV (*gyárosok*), trade income in Category V (*kereskedők*), income from mine ownership in Category VI (*bánya tulajdonosok*), income from liberal professions such as doctors in Category IX (*orvosok*), lawyers in Category X (*ügyvédek*) and other liberal professionals in Category XI (*egyéb értelmi szabad foglalkozásúak*). Finally, the share of profits accruing to management (tantième income) is reported in Category XII (*tantiemet élvezők*).

Category VII and VIII include income from activity using any rented property. Category XIII includes income from salaried employment (*szolgálati viszonyban lévők*). Capital income is reported in Category XIV including interest from royalties, savings, securities, dividends, and including income from wealth or rights that were not subject to separate land, property, earnings, mining or corporate taxes. Category XV is applied to income from annuities and the imputed value of in-kind (produce) income paid by lessees of cultivating lands, that was reported as capital income in the previous tax code.

Table (A.1) reports the comparison of income categories in the tax code in the periods before and after World War I. To have consistent income categories between the periods 1914-1915 and 1927-1940, we make the following adjustments. Income

Category VII contains reported income from activity using rented lands (*földhaszonbérlők*), which was included in Category I in the tax code of the previous years, whereas Category VIII includes income from activity using any other rented property (*egyéb haszonbérlők*), which belonged to Category III previously. Both of these categories of income can be designated as lessee income. For 1932-33 these two categories are reported jointly for the income proceeds of activity using rented land and other rented property, while for later years they are reported separately. We divided up the jointly reported lessee income for 1932-1933 based on the ratio of these two income sources in the 1934 tax statistics, at an approximate ratio of 10:1.

The regulations in effect for 1914-1915 report income from annuities and in kind income and work in exchange of renting small lands (*szolgálmány*) as capital income, while for the years 1934-1940 it was reported separately under Category XV.[8] Thus, for the years 1934-1940 and in order to have comparable income notions, we added the income figures from Category XV to the capital income category. For 1932-1933 this is reported as residual income in the various categories. We extract this part of income from the residual income category based on the 1934 ratios and incorporate it to the capital income category for the years 1932-1933.

Tax Base In several series of income tax statistics, both the total declared income net of expenses and the total net tax base i.e. total declared income minus deductible items including tax-exempt income, other direct taxes, paid interest, life insurance and pension policies are reported on the tax statistics by total tax base brackets. We adjust the tax base brackets with the average tax deductions using the figures of the total declared income and tax base in the respective brackets. That is, using the set of tax base bracket intervals $\{[\underline{b}_i, \overline{b}_i]\}_{i=1}^n$, and given the data on total reported income I_i, tax base B_i, and number of taxpayers N_i for every bracket $i = 1, \ldots, n$, we undertake the following adjustment

$$\beta_i = b_i + \frac{I_i - B_i}{N_i}, \quad i = 1, \ldots, n, \qquad \beta \in \{\underline{\beta}, \overline{\beta}\}, \quad b \in \{\underline{b}, \overline{b}\}$$

and produce a new set of brackets $\{[\underline{\beta}_i, \overline{\beta}_i]\}_{i=1}^n$. We undertake this adjustment for income years 1927 and 1930-1940. For income year 1927, we use the nearest such breakdown from income year 1931.

[8] See Klug and Soltész (1917), p. 87, as well as the relevant Act VII of 1909, §1 "On capital income and annuities taxation" (*tőkekamat és járadékadó*), and Act 50,000, §20 of the Royal Ministry of Finance, 1927.

Geographical Area As a consequence of the territorial expansion of Hungary during the years 1938-1941, the income tax statistics include reported income and the number of taxpayers of an enlarged geographical area. As the available income control total refers to the geographical area of Hungary after the Trianon Treaty and during the period 1927-1938, we adjust the number of taxpayers from the income tables to form the appropriate numerators for the top income share estimates.

There are two geographical areas that are newly included in the tax statistics, namely (*i*) Partially annexed counties; these are territories that exist already in Hungary during the years 1927-1938, and enlarged to their historical boundary during the Vienna accords (*ii*) Fully annexed counties such as Nyitra-Pozsony and Ung, as well as the region historically known as Kárpátalja during 1938-1940, as well as the territories of Transylvania for the year 1941. Altough we have information about the number of taxpayers included in the tax statistics and originating from these regions, by two broad income brackets (below and above 10,000 pengő), we do not have information on their reported income.

Under the implicit assumption that the income distribution at the top is the same in the new territories as it is in the old territories, we proceed to the following adjustments. Based on the figures of the number of taxpayers for the two broad income brackets, we calculate the ratio of taxpayers residing at the annexed regions to the total number of taxpayers reported in the tax statistics. We then use the ratio to deflate the income reported in the tax statistics, as well as the number of taxpayers to which it corresponds to. During the first phase of annexation in 1938, the income tax statistics report the distribution of taxpayers between newly annexed territories and for those counties that were partially annexed. We use this distribution for the two later income years where this information is missing.

2.4 Post-Transition 1992-2008

The present day income tax code was introduced by Act VI of 1987 and was modified after the transition by Act XC of 1991. The declared total income comprises two categories: "comprehensive income" (*összevont adóalap*) and "separately taxed income" (*különadózó jövedelmek*). During the period of our timeframe the comprehensive income is taxed progressively with the number of tax brackets gradually varying between seven and two, and top marginal rates between 48% to 36%; see Figure (A.2) for the evolution of marginal statutory tax rates, and Section (2.6) for the construction of top marginal tax rates.

Declared income in the comprehensive category is structured along three main income subcategories: (i) income from dependent activity, mainly wages and salaries;

(ii) income from independent activity such as self-employment, income from the exercise of a liberal profession, and small-scale agricultural income; (iii) and other income such as income earned abroad, tax-exempt income such as pensions, scholarships, and maternity benefits. The separately taxed income is formed as a schedular tax on capital income items, with different flat tax rates applied to separate categories of capital income, such as dividends, capital gains, and profit from private businesses.

There is an extensive withholding system in place. Both the personal income tax and payroll taxes (employee social security contributions) are withheld at the enterprise level; employees only receive their net earned income from dependent salaried activity. Employees have to decide whether they want to submit their income report independently, thereby adding other income items e.g. from property. In either case, the employer forwards withheld taxes to the tax authorities.[9] We use two categories of data sources for this period.

Administrative micro-data for the income years 1992-2008 For the income years 1992-2003, the data consist of a random sample of 0.5% of tax filings reported by the employers, and an additional 1% sample of all tax reports submitted directly by the taxpayers themselves. For the income years 2003-2008, the data consist of a random sample of 5% of the universe of all tax filings.

Income Tax Statistics for income years 1996-2001 These are tabulated income tax statistics obtained by the Information Technology Department of the Hungarian Tax Authorities (*Sztadi*), which depict declared income and total number of taxpayers per total income bracket, containing the comprehensive income and separately taxed income, for the universe of tax filings.[10]

[9]The taxpayers have to obligatory self report their income in several instances, namely if the taxpayer has mainly separately taxed income, if the employer declines the request of the taxpayer to forward the tax application form, or if the taxpayer's main occupation is self-employment, or the taxpayer has no employer at the last day of the tax year, and if he determines his cost deductions based on expenses.

[10]The Hungarian Tax Authorities publish tabulated income tax statistics bracketed by the first broad category of income (comprehensive income) for income years 1998-2010. For the period 2004-2010 the tax statistics include the separately taxed income (pertinent to capital income items); however, they are published in a form that is not amenable to our estimation strategy, since they rank the separately taxed income according to brackets that refer to the comprehensive income. Similar data sources are published by the Data Repository of the Hungarian Tax Authorities (TEIR) for the period 1992-2009.

For both sources, the income concept is gross income before deductions, employee's payroll and personal income taxes, and after employers' payroll taxes. The micro-data contain the complete information reported on a tax filing, while the tabulated data contain information on the comprehensive and separately taxed income totals. The two data sources contain the same information, in two different degrees of aggregation; in particular, the aggregate tables do not contain the different income sources that are declared in a tax filing. In order to construct a series of estimates of the composition of the top income shares, we estimate the top income shares based on administrative microdata.[11]

2.5 Realized Capital Gains, 1914-2008

The treatment of capital gains has received different treatment by the tax code during our timeframe. Capital gains of selling property as a non-business activity were tax exempt after the introduction of the personal income tax in 1914, and remained tax exempt also during the interwar period. However, income from realized financial capital gains are not specified as taxable capital income in the tax regulations.[12]

After the transition into the market economy, realized capital gains from selling real estate and movable property had to be reported as part of the comprehensive income, while after 1995 it became part of the separately taxed income. The realized financial gains were reported as separately taxed income. Based on the detailed micro-data we can estimate the top shares excluding and including realized capital gains for the period 1992-2008. The total income denominator of the latter series includes the total amount of the reported realized capital gains.

2.6 Top Marginal Tax Rates, 1914-2008

For 1914-1940 period we compute the top marginal tax rates based on the income statistics tables as follows. First, we take the general income tax rate corresponding to the estimated mean income in a given top percentile; see Figure (A.3). We then further add the different schedular taxes by assuming that the marginal income earned by the taxpayer has the same composition as the overall income in that percentile; see Table (A.7) for different surtax rates. To account for regional differentials in tax rates on income from built property we assume that half of that is located at Budapest and the other half in the province. In case where earnings income was

[11] As a robustness check, we present in Figure (A.7) the estimated shares based on both the micro data sample and the aggregate income tax statistics tables.

[12] Klug and Soltész (1917), p. 166, and the relevant Ministry of Finance Statute of 1925/500 §9.

taxed under a progressive schedular tax, we err on the side of the highest tax rate for the top marginal tax rate calculation. We exclude the wealth surtaxes.

For income years 1914 and 1915 there is information on the composition of the top 0.15% and 0.2%, respectively. We estimate the top marginal rate for the 0.1% assuming similar composition. As no information is available on the composition for income years 1927, 1930, 1931 we assume it was similar to the nearest income year with available income decomposition data (income year 1932.)[13]

The declared total income in the present-day tax code contains two main categories: the comprehensive income part taxed by a progressive personal income tax, and the separately taxed income part including mainly capital income items taxed with various flat schedular tax rates. To compute the top marginal tax rate we again assume that the marginal nominal income has the same composition as the mean income in that top percentile. For example if the mean reported income in the top 1% comprises 70% comprehensive income with a corresponding τ_{PI} top marginal personal income tax rate, 15% dividend income and 15% capital gain income corresponding to τ_D , τ_{CG} flat schedular tax rates, respectively, then the estimated top marginal tax rate is $t = 0,7 \times \tau_{PI} + 0,15 \times \tau_D + 0,15 \times \tau_{CG}$. The comprehensive part mean income on the top 1% was always larger than the highest threshold in the progressive personal income schedule. Hence we include the top marginal statutory tax rate for the calculations; see Figure (A.2). The flat schedular taxes on the separately taxed items differed for various items in various years (taking the values of 10, 20, 25, 27 and 35%). We take the actual tax rates defined in the tax legislation for each item reported in the different cells of the tax report.

3 Earnings Statistics 1951-1988

3.1 Labor Income

For the socialist period, we use the tables reporting the distribution of earnings series found in the Statistical Yearbooks for the period 1951-1968, and published subsequently up to 1988 in the Employment and Earnings Ratios (*Foglalkoztatottság és*

[13] As an example, we assume that the average mean income is 68,500 crowns in the top 0.1% in 1914, that comprises 30% income from land, 20% from real estate, 30% from business activities, 15% from capital and 5% from employment. Consequently, the top marginal tax rate is calculated as follows: the general income tax rate is 4.33% corresponding to the mean level of income, while the schedular surtax is 20% on income from land, 15% on real estate income, 3% on income from business activities and earnings, 5% on capital income. Hence, the top marginal tax rate for the top 0.1% is $4.33\% + (0.2 \times 30\% + 0.15 \times 20\% + 0.03 \times (30\% + 5\%) + 0.15 \times 15\%$.

kereseti arányok) by the Central Statistical Office. The earnings statistics publications complement those that are used in Atkinson and Micklewright (1992). The frequency of the publication series is irregular, with the earliest available statistics referring to 1951. For the period 1955-1962 the censuses were compiled yearly, while from 1962 onwards they were published every two years.

The statistics depict the share of employees in the official sector belonging to specific gross earning brackets based on the employment censuses of state-owned enterprises conducted by the planning authorities. As a result of the reforms of 1968, the official sector underwent several changes as a grouping of statistical units. Earnings statistics refer to workers employed at state-owned enterprises and state-owned farm establishments of the State sector (*Állami szektor*) for the period 1951-1968, and state-owned enterprises, state-owned farms, and at cooperatives in the broader Socialist sector (*Szocialista szektor*) for the rest of the timeframe. From 1982 on to the year of transition, employees in private ventures having a legal entity were also included in the tables. In the earnings statistics referring to the period prior to 1978, the employees include both full time and part-time workers, whereas after 1978 they only include full-time employees.

The statistics depict the distribution of gross monthly earnings, including bonuses, allowances, in-kind benefits, and benefits from profit sharing. The income concept is gross earnings before deduction of the employer social security contributions for the entire period of 1951-1986, and for 1988 also before the deduction of taxes levied under the newly introduced personal income tax.[14] The wage part of the gross earnings figure refers to the actual wage payment in September of a given year for the entire period, except for the 1955-56 statistics, which refers to the wage payment dispensed in June. The monthly gross income figure includes one twelfth of the year-end bonus, and one-ninth of other additional earnings (bonuses, allowances, in kind benefits, benefit from profit sharing received between January and September. Wage supplements (*kiegészítő*) were included in the gross earnings concept after 1980; see Központi Statisztikai Hivatal (1980), p. 150; and Atkinson and Micklewright (1992) p. 92.

As the tables report only the frequencies of workers for a number of gross monthly earnings brackets, we multiply these frequencies with the figures of the total number of employees at the socialist sector to compute the absolute number of workers. We adjust the monthly bracket figures to yearly ones by a factor of twelve.

The earnings statistics before 1970 refer to employment in the State sector. In order to establish comparability for the entire timeframe of the socialist era, we

[14]To estimate comparable shares we add to the constructed income denominator the total personal income tax amount collected by the government in 1988, as reported in Act XXIV.1§ of 1989.

explicitly assume that the distribution of earnings in the Socialist sector (including State and Cooperative sectors) at the top coincides with the distribution of earnings at the State sector. Supporting evidence for this choice is provided by statistics tables published by the KSH on average earnings of employees with specific university degrees employed either at the State or the Cooperative sectors at the year of 1963 and 1967 showing similar earnings amounts; see Table (A.8) and Table (A.9).

During the last decade of socialism, from 1981 on to the transition in 1992, the state permitted the operation of new forms of private enterprises in order to improve the supply of goods and services. Accordingly, the income statistics include workers employed at private enterprises having independent legal entity, and exclude workers at organization forms without legal entity (personal, non-incorporated enterprises). The production base of this liberalized sector employs only 1% of all active earners. Héthy (1990) reports that in 1986, 413.000 people were working at the three major forms of small undertakings without legal entity such as Economic Work Partnership within Enterprises (EWPEs), Specialized Groups of Industrial and Servicing Co-operatives, and Economic Work Partnership of Private Persons (EWPPPs), however only 51.000 of them had their main job in these small undertakings. Lacking information on income from second jobs could possibly downward bias the estimation of the lower%ile top shares (e.g. of the top 10%), but it was not prevalent for those at the very top of the earning distribution to have second jobs.

3.2 Capital Income

The income tax statistics contain earnings data without any capital income. Households' financial asset portfolios were very simple containing cash, and deposits, savings, loans and mortgages at the National Savings Bank (*Országos Takarékpénztár*, OTP) or at the Saving Cooperatives (*Takarékszövetkezet*). The standardized products, conditions, and interest rates were all centrally regulated. Neither rental income, nor capital gains were part of the household income as both the rental and secondary property markets were non-existent, as described in Ábel and Székely (1992). Notwithstanding, we provide an upper bound estimation on possible capital income as a robustness check that confirms the argument that capital income was negligible among the top 1% compared to the market economy era.

We construct the upper bound estimate as follows. There is available information on total capital income in the national accounts for the years of 1960 and 1965-1988. These aggregated yearly capital income figures contain income from lottery income, interest, land rental, insurance and government loan lottery (a lottery for government bond repayments). The nature of the income sources suggests less concentration at

the top. We adopt an extreme assumption as an upper bound estimation, by assuming that during this period the top 1% received the same share of the total capital income as in 1992 (16% including capital gains). We add 16% of the actual national account capital income data to the earnings income accruing to the top 1% and we reassess the top income shares based on this figure. For the years where no capital income data is available in the national accounts, we either linearly interpolate or assume it was the same amount as the nearest available year. With this extreme 16% upper bound assumption we get an upper limit for the capital income component, depicted in Figure (A.6).

4 Income Tax Units

For fiscal years 1914-1940, the tax unit is broadly defined as an enlarged family dwelling under the same housing.[15] In particular, the tax unit consists of either a single individual or a couple with dependent persons, with the head of the family being the major income earner. Dependent persons are considered those related to the head of the family by blood or marriage (grandparents, children, grandchildren, in-laws) and not by contract (e.g. servants and domestics), provided that they are economically dependent on the head of the family. Tax statistics from this period report the aggregate income of the couple and dependent persons, adding up to form total family income.

We approximate the number of households as the total number of population above 15 minus the number of married women for the appropriate demographic groups at the province level reported in decennial censuses. Due to the changes in administrative boundaries, population exchanges, and considerable migration flows as a consequence of the treaties after World War I, it is impossible to interpolate between the censuses bracketing the years between 1910 and 1920. An estimate is obtained under the implicit assumption of constant yearly population growth between the censuses of years 1900 and 1910 at each province, and by extrapolating these province level growth rates for the period between 1910 and 1919. To improve the estimate, we adjust the figures in order to account for the total war casualties reported in Schulze (2005) (p. 81, Table 3.5) by subtracting the number of yearly war casualties. For the interwar period, we obtain an estimate by linearly interpolating the appropriate figures from the censuses of 1920, 1930, 1941, and 1949. We use the census figures consistently referring to the national frontiers of the country after the

[15] See the relevant legislation (Act X. §3 of 1909) and Klug and Soltész (1917), p. 159; Fellner (1927), pp. 12, 14.

Treaty of Trianon of 1920, in order to be consistent with the income control total and income table figures.

For the period of socialism and the period after the transition we retain a population total that consists of the total population above 15 years from the Historical Demographic Yearbooks (*Történeti Demográfia Évkönyvek*); see Table (B.5) for detailed sources of these data.

As pointed out by Atkinson (2007), top shares estimates are sensitive to the change from joint taxation to individual-based taxation depending on the assumption of the joint distribution of income among couples. Considering the two extreme assumptions, we can calculate the correction factors for the top shares when moving to an individual-based taxation system. If all high income individuals are unmarried or have partners with zero income, then moving from joint to individual taxation would raise the shares as the top $X\%$ will include more observations, and hence a larger total income. If all high income couples have equal incomes, then moving to individual taxation would reduce the shares, as the same amount of income is received by a larger share of the population. In the first case, the shares would be raised by a factor of $(1+m)^{1-\frac{1}{\alpha}}$ and in the second case they would be reduced by a factor of $(2/(1+m))^{1-\frac{1}{\alpha}}$, where m is the the number of individuals exceeding the tax units, and α is the Pareto coefficient. For instance, the top 0.1% share in 1940 is estimated at 5.6%. With $m = 0.42, \alpha = 2.2$, the upper and lower bound of the estimate are 4.7% and 6.8%, respectively.

5 Income Total

To construct an income denominator, we first assemble a GDP series during the period of study denominated in current prices. We also compute personal income totals for the years when this statistics are available. For the years when this statistic is not available, we proxy the total personal income by assuming it is the same fraction of the GDP as in the neighboring years.

5.1 Gross Domestic Product

We assemble data on total income during the period of study denominated in current prices. There exist no consistent figures in actual currency rates for national income in the interwar period, due to currency conversions after the two hyperinflation

episodes;see Section (6) of this Appendix.[16]

We use the series reported in Schulze (2005) for the years 1913-1918 that consist of estimates of the gross domestic product in the sixty-four provinces of the Hungarian part of Austria-Hungary, the region of Fiume, and the provinces of Croatia-Slavonia, excluding the provinces in the regions of Bosnia and Herzegovina. The income tax statistics refer to the same geographical area. In turn, Schulze (2005) extends the estimates in Schulze (2000) that are based on a reliable value-added methodology to estimate the trends in GDP growth of Austria-Hungary in the late 19th century. The estimates in 1913 crowns were converted in current prices using the price index constructed as in Section (6).

For the periods 1925-1942 and 1947-1949 we use the measure of net national product at factor cost in Eckstein (1955) denominated in current prices. To get an output measure in market prices we inflate the figures by 5% based on the estimate of indirect tax amount in the year of 1935 in Matolcsy and Varga (1938), pp. 95–105. We further adjust this figure with an estimate of capital depreciation of 5% to obtain the gross national product figures. An implicit assumption in producing the estimate is that the installed capital base, albeit expanding, was relatively modest compared to the European West. Moreover, the difference between GNP and GDP is not large in countries with small capital flows with foreign countries, and this is the case for Hungary in this period as documented by Tomka (2001). The Eckstein figures are computed for calendar periods July 1st year t to June 30th year $t+1$ while the fiscal year in aggregate tax tables is the calendar year. To correct the inconsistency we linearly interpolate between the net national income figures to get calendar year figures. These output figures consistently refer to the post-Trianon borders of Hungary for the period between 1925 and 1949, while from 1938 a territorial expansion took place as a consequence of the war. In order to get consistent top income share estimates we exclude from the income tax statistics the mass of income drawn by taxpayers of the annexed territories.

For the years 1950-1960 we use the Net Material Product series published by KSH, an accounting concept that does not include the contribution of the "unproductive activity" to national income, i.e. the services sector; see Árvay (1974), Ivanov (1987), and Árvay (1992) for detailed accounts of the MPS.[17] We correct the series of KSH by

[16]Estimates reported in Mitchell (2007), whose source is the Maddison project, are denominated in Geary-Khamis dollars and not in current prices.

[17]The Material Product System (or System of Material Product Balances) is a set of national accounting guidelines adopted by the Comecon countries after the end of World War II, and an acceptable standard by the United Nations. Its key characteristic is the definition of a restricted "production boundary" that excludes the contribution of government services (healthcare, defense, education, etc). Studenski (1958), pp. 350-353 describes the origins of these guidelines that lay

using the average fraction of the KSH official GDP and NMP published by Mitchell (2007) between 1961-1988, and apply it to the period 1950-1960 (1.23%). For the period of 1961-1990 we use the official GDP data published by KSH conformal to the SNA guidelines. From 1991 up to today, we use the official Eurostat GDP index. Table (B.1) gives the sources of data used.

5.2 National Income Accounts

For the period between 1914 and 1940 we use the 73% of our GDP series as a proxy for the personal income aggregate. To arrive in this ratio, we reason as follows. The total individual household income series available for the period of 1925-1935 are roughly 77% of our GDP figures. We take the 95% of this 77% ratio to account for missing incomes in the tax reports. The adjustment factors were compiled based on Matolcsy and Varga (1936), p. 97 Table 61.

In the socialist period, we compute a personal income total defined as the sum of labor income, social security contributions (including pension, unemployment benefits, family allowances, maternity benefit, scholarship grants, other social benefits) and an amount of capital income (such as lottery, interest, insurance) from the national income accounts data calculated by the Central Statistical Office for 1960, and for 1965-1987. This total is the definition of total personal income denominator during the entire socialist period, in order to establish consistency across the three periods. We proxy the total personal income when this statistical series are not available (1951-1959, 1961-1964), by assuming it is the same fraction of the GDP as in the neighboring years (1960 and the average of 1960 and 1965, respectively). We add the total personal income amount received by the government to the constructed income denominator in 1988 when the personal income tax was newly introduced; see the relevant Act XXIV(§1) of 1989.

For the period 1991-2010 we use the national income accounts data calculated by the Central Statistical Office. Our constructed personal income total contains the wages and salaries (Item D.11 including cash and in kind), mixed income (Item B.3), property income including net interest (Item D.41), dividends (Item D.421), property income attributed to insurance policy holders (Item D.44) (e.g. income received from insurance enterprises or pension funds), rental income (Item D.45), state social contribution (pension, sickness pay, unemployment benefits, family allowances, maternity benefit) and scholarships and grants. Mixed income in the national accounts

on the labor theory of value of Smith and Marx. Nevertheless, the main aggregates correspond to the Western SNA definitions, as they had to be reported to the UN statistical repositories in a standardized and comparable manner.

includes income from independent small scale activities where it is impossible to separate income from labor and capital. We adjust the mixed income to tax evasion, and include only the third in the income denominator. This is in accordance with Benedek and Lelkes (2011), providing evidence that self-employed report on average only third of their income in Hungary. We add the realized capital gain amounts based on the official summary tables of the Tax Authorities containing items corresponding to the actual tax regulations. For this recent period we also compute a total personal income denominator as the sum of the households net disposable income (Item B.6.n) and paid taxes (Item D.5), minus 5% of the net disposable income to account for fixed capital consumption. The difference between the personal income denominators calculated by these two methods is less than 5% in each year. Table (B.2) gives the sources of data used.

6 Prices

We assemble data from several published series in order to construct a CPI that honors the currency worth from 1913 until today, given that historical statistics on CPI indices for Hungary are rare and often incomplete. Due to the hyperinflation episodes that occur in the period of study, we choose to complement official statistics with secondary price indices that are closer to actual price movements.

In the period of study, Hungary experiences two hyperinflation episodes. After the end of the First World War, the two parts of Austria-Hungary secluded their respective currency banknotes in circulation, which then became a debt of the respective governments of the dissolved Empire. In Hungary, this conversion takes the form of a transition from the Austro-Hungarian crown to the "krone" (*korona*), that experienced an acute inflationary episode; see Sargent (1982) and Wicker (1986)). The korona was stabilized by June 1924, and it gave its place to the pengő on March 1925 on a parity of 1:12,500, whereas the exchange rate with the dollar was fixed in somewhere between 2.90 and 3.03 cents to the korona. The second hyperinflation episode after the end of the Second World War prompted another currency change, and the present-day forint was introduced in August 1946 with a conversion rate of 1:400,000 quadrillion pengő (Bomberger and Makinen (1983), Anderson et al. (1988))

Due to the hyperinflation episodes that occur in the period of study, we choose to provide complementary evidence from unofficial but actual price indices that are closer to actual price movements. For the period 1913-1924, we use the cost of living series published by the Bulletin of the Trade Union (*Szakszervezeti értesítő*) found in Molnárfi (1973). It is calculated on the basis of the subsistence minimum consumption of 23 goods and services for a five-member working class family. This

series partially overlaps and exhibits the same rate of growth during 1921-1924 with the Pester Lloyd index in Molnárfi (1973), which is constructed as a non-weighted average of 57 goods and services. We use the Pester Lloyd index for the years 1924-1940, and we use the cost of living in Budapest index in Mitchell (2007) from 1940 to 1950. For the period 1950-1960, we use the historical series from KSH (1996). Finally, we use the official CPI index published by the KSH from 1960 up to today. Table (B.6) gives the sources of the data used.

7 Supply and Relative Prices of Skills

We proxy the skill supply in each year with the percentage of the labor force with completed secondary or university education. The available decennial censuses contain the percentage of the adult population with secondary and tertiary education degrees in each ten years (1920, 1930, 1941, 1949, 1960, 1970, 1980, 1990, 2001, 2011). We estimate the skill supply between the census years using the flow of individuals graduating each year for the years between 1950-2012, and by linear interpolation for the years before this period (1920-1949). In terms of relative prices of skills, we construct the wage premium of skilled workers with the log ratio of average wages of intellectual and manual workers. The average wage series is assembled based on various Statistical Yearbooks published by the KSH; see sources in Table (B.9).

For the interwar period the statistical yearbooks cite the number of administrative and engineer functionaries (*igazgatási és műszaki tisztviselő, altiszt*) and workers on the 1st of October each year for the mining metallurgy (*bányászat*) and industrial (*gyáripar*) sectors. The total yearly wage bill including cash and in kind benefits are reported separately, allowing us to calculate average earnings for the skilled and unskilled workers. For 1921-1926 the earnings are denominated in crowns (korona), while for 1927-1942 they are reported in pengő figures, and in 1947 in forints. From 1935 onwards, white collar workers employed at the companies' headquarters are included in the wage and employee statistics.[18]

For 1955-1975 the KSH reports the average wage separately for workers, administrative workers and skilled technicians, with the latter two groups representing the non-manual workers. For the period from 1975 the statistical tables cite manual

[18]Földvári (2011) uses the wages of administrative and manual workers at the industrial sector from these statistical yearbooks to estimate yearly return to education based on skill premiums between two groups with an average eight years of attained university schooling. Our approach is different as we are interested in an overall skill premium, and hence we include the engineer functionaries, and managerial employees. Our estimates are based on data from all listed sectors to cover a broader segment of the labor force.

(*fizikai munkás*) and non-manual (*szellemi munkás*) average wages. Comparing the skill premium in 1975 based on the two definitions yields practically the same result. For the years prior to 1967, the official statistics include wage data only in the state industry and construction sectors. rom 1968 onwards, the wages from the total socialist industry and construction sectors are jointly reported.

From 1967 and with a gap during the years 1978-1979, we obtain the wage data in the state agricultural sector (*állami gazdaság*), while from 1975 we gather the wage data in the cooperative agricultural sector (*termelőszövetkezet*) that are separately reported. We compute the main wage premium series based on the industrial and construction sectors, and report also separate series containing the state agricultural sector (from 1967) and the total agricultural sector (from 1975) that are showing similar trends.[19] The wage concept is gross wage including allowances and premia for 1954-1969, and from 1970 gross earnings including also benefits from profit sharing schemes (year end bonuses, profit premia, profit allowances); see the relevant Statistical Yearbooks (1956), p 70, (1968), p 88 , SY (1970), p 102.

For the years after the transition all sectors of the economy are depicted at the average wage tables in the Statistical Yearbooks. After the transition till 1998 only the full time employees at enterprises with more than 10 employees are included, whereas from 1999 those employees working at enterprises with more than 4 employees are also included in the statistics. The statitics report gross earnings before deduction of the employee social security contribution and the personal income tax. We report our results in Table (A.12).

8 The Capital Stock Ratio

To proxy the relative non-financial capital stock amount in the economy we construct the ratio of net stock of fixed assets over GDP. According to the United Nations SNA, the net stock of fixed assets is defined as produced assets that are used repeatedly in the production process for more than one year. These include the market value of dwellings, other non-residential buildings (e.g schools, hospitals, factory and office buildings) and structures (e.g. motorways, roads, railways, dams), transport equipment (public transportation, cars, railways), machinery and equipment (factory or office machinery, equipment and computers, television and communication equipment, medical instruments, furniture), cultivated assets (including livestock, fruit

[19] After computing the skill premium series for the period of 1955-1988, we found Cukor (1990) estimating similar series based on the same Statistical Yearbook wage data. Her paper additionally provides detailed estimates on different level managerial earning premiums for 1976-1988.

plantations, vineyards and all land improvement, but not the value of the land), and intangible assets (e.g computer software). Inventories, valuables (e.g. jewellery, precious metals) and consumer durables not used for production (such as cars and furniture) are not part of the fixed asset. We use this definition to construct the series for the three periods corresponding to the top shares, namely the first part of the 20th century, the socialist period, and the years after the transition to the market economy.

Frigyes Fellner estimated national wealth for the periods of 1899/1901, 1911/1913 and 1927/1928; see Fellner (1901, 1913, 1929). His calculations include data on the market value of the following assets: cultivated land, mines, dwellings, industrial and governmental buildings, transport and communication equipment (i.e roads, bridges, railways, ships, cars, public transportation vehicles, telegraph and cable system, post offices) and movable goods (machinery, livestock, inventories, stock of crop, furniture, precious metals and jewellery). To have comparable data between the periods, we exclude the value of inventories of firms, stock of crop, furniture, valuable precious metals and jewellery from Fellner's stock of movable goods estimate. The 1898 figures are based on the assumption that the adjustment ratios are those of the year 1910. We then construct estimates based on market values of assets.

For the socialist period we use the yearly balance of fixed asset net of depreciation figures published by KSH (Központi Statisztikai Hivatal (1974, 1979, 1980, 1981)) for the period of 1959-1980. The published statistics conform to the Material Product System accounting standard. The figures are referring to year-end holdings and include holdings that a) worth more than 5,000 forint and b) have a lifespan of more than 3 years. The wealth estimates include dwellings, public and industrial buildings, structures (roads, bridges, dam), cultivated assets (plantations, land improvement, but livestock is excluded), machinery, equipment, transportation and communication equipment, other equipment, vehicles in the material and in the service (personal, health, culture, social) sectors. We add the livestock figures published in the inventory tables to get consistent series with the Fellner and the SNA figures.

Figures are net of depreciation, but prices are reflecting the book value increased with price subsidies as in other socialist countries, and are re-evaluated in every 6-8 years (re-evaluations took place in 1968 and 1976). Hence the stock data is actually a mixture of different year prices referring to when the capital acquisition took place. Due to the re-evaluation the 1968 and 1976 stocks are reported at replacement cost, while in the years just after the re-evaluation the book value is close to the market value, and in later years the book value starts lagging behind. There is no need for large corrections if the investment price index is low, which was on average only yearly 2% according to Árvay (1976). He also calculates that in 1976, already 8

years after the previous re-evaluation, the book value of fixed assets was only 10% less than the re-evaluated replacement value in that year. This estimate provides an upper bound- 5% of book value - for the actual replacement value in 1980 (latest year we have data for) four years after the last re-evaluation. An additional argument in favor of that the gap between the reported KSH value and replacement value of fixed assets is not large is that only half of the assets were valued at book value, while the other half mainly containing dwellings, roads, bridges, dams, private sector was reevaluated each year based on replacement cost (investment price index).

After the transition Hungary abandoned the Material Product System and joined the United Nations SNA. For the period of 1995-2010 we use the market value net fixed asset stock figures from the official national account volumes. For 1991-1994 no stock of assets data are available, only the gross fixed capital formation of new assets. (see sources in Table (B.8)). The denominator of the calculated ratio is the GDP series; see the yearly figures of the fixed capital per GDP series at Table (A.11) and Figure (A.10).

9 The Capital Share

To proxy the part of capital in total income we construct the operating surplus ratio to GDP. For the period 1991-2011 this series is equivalent to the capital factor share of the factor price GDP based on official national accounts. We opt for dividing gross capital income, including depreciation, by the GDP at factor prices in line with the construction of the capital share for United States in Bengtsson and Waldenström (2015). As GDP at market prices is generally larger than at factor prices, our figure is providing an upper bound for the capital share.

The GDP at factor prices (i.e the price the producer receives) equals the GDP at market prices (i.e the price the consumer pays) minus the net amount of taxes and subsidies on the production and imports (items D.2, D.3). Hence, we operate on the following accounting identity:

	B2.n (Households)
+	B2.n (Financial Corporations)
+	B2.n (Non-Financial Corporations)
+	K.1
+	D.1 (Households)
+	B3.n (Households)
	Gross Domestic Product
-	(D.2-D.3)
	Gross Domestic Product in Factor Prices

The capital factor share corresponds to the net operating surplus (B2.n) of the household sector (income from property), and the net operating surplus of the non-financial and financial corporation sectors, augmented by the amount of depreciation (K.1). The labor factor share equals the wages and salaries accruing to households (D.1). We compute the depreciation as the difference between the GDP and NDP. For the net mixed income (B3.n) of the household sector containing income of small and personal, non-incorporated enterprises, self-employment, and household production we assume the same capital and labor composition as estimated for the total economy excluding this income. We therefore implicitly assume that non-incorporated enterprises accrue the same ratio of income to wages and salaries as incporporated enterprises, as reflected in the national accounts and in accordance with the discussion in Gollin (2002).

Discontinuities of provided information exist for 1991-1994, with the only the disclosure of gross operating surplus (B.2g) and gross mixed income (B.3g) in published national accounts. Based on the identity below and our assumption of same capital and labor share for mixed income, we can calculate the capital share as the ratio between the gross operational surpluses and the GDP at factor prices.

	B2.g (Households)
+	B2.g (Financial Corporations)
+	B2.g (Non-Financial Corporations)
+	D.1 (Households)
+	B3.g (Households)
	Gross Domestic Product
-	(D.2-D.3)
	Gross Domestic Product in Factor Prices

Due to the peculiarity of state ownership structure the concept of operating surplus is not identical between the socialist and market economies. During socialism the state is the sole capital owner, and allocates the surpluses of the production sector via the

profit and income tax (*nyereség és jövedelemadó*). The state achieved specific goals in production using subsidies (*termelési támogatás*) for those enterprises operating in less advantageous conditions and extracted income (*termelési elvonás*) from those with better conditions. We opt in excluding the turnover tax (*forgalmi adó*) and price subsidies (*árkiegészítés*) in the calculation as the central government was using these as social policy instruments directed to households, affecting directly household disposable income.

To get a comparable proxy for capital factor share, we compute the net income of state-owned enterprises, that include profit and income tax, and the net of production subsides and production tax. We define the capital share as the ratio of this figure over GDP. For the period of 1968-1982 the Statistical Office provides these figures on taxes and subsidies covering all enterprises, cooperatives and private small scale activities both in the material and non-material sectors. For a detailed description of the production, income, and distribution accounts, see Központi Statisztikai Hivatal (1971), pp 108-126, and the sources cited in Table (B.7). Actual constructed figures at Table (A.10). For comparisons with the Bengtsson and Waldenström (2015) database, see Figure (A.9).

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	Income categories 1914-1915		Income categories 1932-1940
I	Land and forestry	I	Land
		VII	Land lessee income
II	Built property, real estate	II	Built property, real estate
III	Industrial, commercial activities	III	Crafts
		IV	Industrial income
		V	Trade
		VI	Mine ownership
		VIII	Other lessee income
		IX	Doctors
		X	Lawyers
		XI	Other liberal professionals
		XII	Tantiem income
IV	Capital income	XIV	Capital income
		XV	Annuities, value in kind
V	Employment income	XIII	Employment income

Table A.1: Income categories in the tax code, 1914-1940

Table A.2: CPI, Population, Tax Units, GDP, Income Denominator, 1950-2010

Year	CPI (2010=100)	Population (thousands)	Population Denominator (thousands)	Nominal GDP (million forint)	Income Denominator excl. capital gains (million forint)	Income Denominator to Tax Units Ratio	Income Denominator excl. capital gains to GDP Ratio	Income Denominator incl. capital gains	Real GDP per capita index (2010=100)
1913	0.26	21 459	9 468	9 952	7 265	767	0.73		6.67
1914	0.38	21 559	9 467	12 204	8 909	941	0.73		5.48
1915	0.55	21 622	9 429	18 229	13 307	1 411	0.73		5.71
1916	0.78	21 909	9 613	22 818	16 657	1 733	0.73		4.94
1917	1.28	22 112	9 713	32 863	23 990	2 470	0.73		4.29
1918	1.95	22 342	9 838	43 992	32 114	3 264	0.73		3.73
1919	6.10								
1920	12.32	7 980	3 894						
1921	16.76	8 051	3 947						
1922		8 122	3 999						
1923		8 193	4 051						
1924		8 263	4 103						
1925		8 334	4 155	5 927	4 327	1 041	0.73		
1926	0.24	8 405	4 207	6 258	4 569	1 086	0.73		11.70
1927	0.24	8 476	4 259	6 295	4 596	1 079	0.73		11.25
1928	0.25	8 547	4 311	6 774	4 945	1 147	0.73		11.50
1929	0.24	8 618	4 363	7 022	5 126	1 175	0.73		12.41
1930	0.22	8 688	4 416	6 589	4 810	1 089	0.73		12.50
1931	0.22	8 746	4 450	5 815	4 245	954	0.73		11.11
1932	0.21	8 803	4 483	5 188	3 788	845	0.73		10.34
1933	0.20	8 861	4 517	4 931	3 600	797	0.73		10.32
1934	0.20	8 918	4 551	4 967	3 626	797	0.73		10.49
1935	0.21	8 975	4 585	5 243	3 828	835	0.73		10.48
1936	0.21	9 033	4 619	5 681	4 147	898	0.73		11.29
1937	0.21	9 090	4 653	6 035	4 405	947	0.73		11.57
1938	0.21	9 148	4 687	6 333	4 623	986	0.73		12.26
1939	0.21	9 205	4 721	6 998	5 109	1 082	0.73		13.08

Table A.2 – *Continued from previous page*

Year	CPI	Population	Pop. Denom.	Nominal GDP	Inc. Denom. excl. cap. gains	Inc. Denom. to Tax Units	Inc. Denom. excl. cap. gains to GDP	Inc. Denom. incl. cap. gains	GDP per capita index
1940	0.25	9 263	4 755	7 881	5 753	1 210	0.73		12.68
1941	0.30	9 320	4 789	9 195	6 712	1 401	0.73		12.32
1942	0.34	9 306	4 793	11 386	8 312	1 734	0.73		13.15
1943	0.41	9 291	4 798						
1944	0.51	9 277	4 802						
1945		9 262	4 806						
1946	0.95	9 248	4 810	14 283	10 426	2 168	0.73		5.98
1947	1.07	9 234	4 814	18 920	13 812	2 869	0.73		7.07
1948	1.12	9 219	4 818	26 248	19 161	3 977	0.73		9.37
1949	1.19	9 205	4 822	34 597	25 256	5 237	0.73		11.69
1950	1.26	9 293	6 980	57 179	36 014	5 160	0.63		18.08
1951	1.52	9 383	7 040	80 337	50 601	7 187	0.63		20.83
1952	2.13	9 463	7 094	90 813	57 199	8 063	0.63		16.65
1953	2.12	9 545	7 148	102 059	64 282	8 993	0.63		18.62
1954	2.02	9 645	7 204	105 294	66 320	9 206	0.63		19.99
1955	2.00	9 767	7 261	115 979	73 050	10 061	0.63		21.93
1956	1.98	9 883	7 334	101 523	63 944	8 719	0.63		19.17
1957	2.03	9 829	7 273	131 991	83 135	11 430	0.63		24.46
1958	2.04	9 850	7 301	135 275	85 203	11 670	0.63		24.94
1959	2.01	9 913	7 364	157 727	99 344	13 491	0.63		29.28
1960	2.02	9 961	7 432	174 178	109 706	14 762	0.63		31.95
1961	2.04	10 007	7 481	185 256	116 533	15 578	0.63		33.53
1962	2.05	10 052	7 535	195 404	122 917	16 313	0.63		35.03
1963	2.04	10 074	7 597	205 613	129 339	17 024	0.63		37.00
1964	2.05	10 108	7 673	216 140	135 961	17 719	0.63		38.61
1965	2.06	10 140	7 749	214 987	135 061	17 430	0.63		38.02
1966	2.09	10 166	7 823	237 449	146 017	18 664	0.61		41.40
1967	2.09	10 203	7 900	256 757	156 568	19 819	0.61		44.43
1968	2.09	10 244	7 967	281 078	167 830	21 067	0.60		48.59
1969	2.12	10 284	8 047	312 352	181 228	22 521	0.58		53.06
1970	2.14	10 322	8 146	332 548	199 698	24 516	0.60		55.54

Table A.2 – *Continued from previous page*

Year	CPI	Population	Pop. Denom.	Nominal GDP	Inc. Denom. excl. cap. gains	Inc. Denom. to Tax Units	Inc. Denom. excl. cap. gains to GDP	Inc. Denom. incl. cap. gains	GDP per capita index
1971	2.19	10 352	8 227	360 847	211 519	25 710	0.59		58.93
1972	2.25	10 378	8 290	390 960	225 866	27 245	0.58		61.91
1973	2.32	10 410	8 334	429 006	246 772	29 612	0.58		65.54
1974	2.37	10 442	8 366	448 948	270 983	32 391	0.60		67.15
1975	2.46	10 501	8 390	481 477	292 694	34 886	0.61		69.02
1976	2.58	10 563	8 406	527 572	312 497	37 177	0.59		71.58
1977	2.68	10 615	8 413	580 585	342 854	40 755	0.59		75.43
1978	2.80	10 660	8 410	628 336	368 539	43 824	0.59		77.72
1979	3.05	10 687	8 400	680 873	400 380	47 662	0.59		77.15
1980	3.33	10 709	8 368	721 031	437 735	52 309	0.61		74.75
1981	3.48	10 705	8 356	779 912	472 052	56 489	0.61		77.31
1982	3.72	10 695	8 348	847 871	507 716	60 818	0.60		78.69
1983	4.00	10 671	8 350	896 367	551 654	66 063	0.62		77.72
1984	4.33	10 640	8 354	978 456	607 790	72 756	0.62		78.56
1985	4.63	10 599	8 359	1 033 658	666 323	79 714	0.64		77.86
1986	4.88	10 560	8 361	1 088 800	724 051	86 594	0.66		78.15
1987	5.30	10 509	8 363	1 226 370	793 812	94 922	0.65		81.43
1988	6.12	10 464	8 371	1 440 364	932 327	114 301	0.65		83.15
1989	7.16	10 421	8 386	1 722 833					85.37
1990	9.23	10 375	8 244	2 089 313					80.68
1991	12.46	10 373	8 291	2 498 319					71.47
1992	15.32	10 374	8 327	2 942 668	1 963 036	235 730	0.67	1 998 626	68.45
1993	18.77	10 365	8 352	3 548 262	2 303 602	275 809	0.65	2 351 487	67.43
1994	22.30	10 350	8 366	4 364 811	2 750 669	328 786	0.63	2 805 599	69.92
1995	28.58	10 337	8 376	5 819 221	3 408 658	406 967	0.59	3 464 142	72.83
1996	35.32	10 321	8 376	7 103 898	4 044 570	482 886	0.57	4 130 794	72.04
1997	41.79	10 301	8 372	8 812 386	4 823 761	576 150	0.55	4 902 573	75.69
1998	47.76	10 280	8 364	10 443 144	5 712 268	682 989	0.55	5 816 527	78.56
1999	52.54	10 253	8 347	11 637 865	6 399 749	766 697	0.55	6 516 602	79.88
2000	57.69	10 222	8 326	13 321 531	7 311 225	878 122	0.55	7 529 184	83.52
2001	62.99	10 200	8 508	15 383 442	8 439 205	991 879	0.55	8 666 798	88.52

Table A.2 – *Continued from previous page*

Year	CPI	Population	Pop. Denom.	Nominal GDP	Inc. Denom. excl. cap. gains	Inc. Denom. to Tax Units	Inc. Denom. excl. cap. gains to GDP	Inc. Denom. incl. cap. gains	GDP per capita index
2002	66.33	10 175	8 515	17 421 576	9 501 740	1 115 917	0.55	9 791 314	95.43
2003	69.45	10 142	8 509	19 077 348	10 659 538	1 252 785	0.56	11 038 589	100.13
2004	74.17	10 117	8 511	21 023 630	11 829 842	1 390 009	0.56	12 077 391	103.58
2005	76.84	10 098	8 518	22 470 802	12 822 808	1 505 404	0.57	13 052 124	107.06
2006	79.84	10 077	8 523	24 153 022	13 769 879	1 615 588	0.57	14 118 663	110.99
2007	86.23	10 066	8 537	25 560 380	14 627 907	1 713 571	0.57	14 999 355	108.88
2008	91.49	10 045	8 537	27 071 868	15 421 041	1 806 462	0.57	15 592 625	108.91
2009	95.33	10 031	8 538	26 297 412	15 210 563	1 781 437	0.58	15 317 901	101.67
2010	100.00	10 014	8 537	27 085 900	15 340 268	1 796 817	0.57	15 429 220	100.00

Source: Table (B.6), Table (B.1), Table (B.2), Table (B.5)

Table A.3: Top Income Share Estimates, 1914-2008

	Top income share estimates excl. realized capital gains					Top income share estimates incl. realized capital gains				
Year	10%	5%	1%	0.1%	0.01%	10%	5%	1%	0.1%	0.01%
1914				7.281	2.908					
1915				7.329	3.57					
1927			17.771	7.476	2.745					
1930				5.434	1.724					
1931		27.066	15.234	5.742	1.771					
1932		27.071	15.196	5.417	1.589					
1933		26.911	15.026	5.197	1.479					
1934		27.13	14.784	5.057	1.437					
1935		27.578	14.548	5.176	1.5					
1936		26.105	14.511	5.232	1.595					
1937		25.537	14.735	5.339	1.573					
1938		25.733	15.048	5.458	1.689					
1939		25.36	14.929	5.445	1.629					
1940		26.011	15.233	5.632	1.747					
1951	21.648	12.994	3.707	0.554	0.081					
1955	19.459	11.381	3.104	0.47	0.071					
1956	23.34	13.56	3.643	0.523	0.075					
1957	21.924	12.757	3.423	0.51	0.076					
1958	22.017	12.688	3.354	0.491	0.072					
1960	19.996	11.516	3.137	0.487	0.076					
1961	19.79	11.403	3.119	0.488	0.076					
1962	19.121	10.984	2.977	0.459	0.071					
1964	19.325	11.187	3.123	0.503	0.081					
1966	19.156	10.97	2.894	0.419	0.061					
1968	18.049	10.398	2.79	0.421	0.064					
1970	20.114	11.716	3.213	0.496	0.077					
1972	18.996	11.032	3.004	0.451	0.068					
1974	18.275	10.56	2.815	0.403	0.058					
1976	17.74	10.199	2.715	0.394	0.057					
1978	17.642	10.187	2.763	0.416	0.063					
1980	16.968	9.738	2.632	0.403	0.062					
1982	16.657	9.567	2.552	0.378	0.056					
1984	15.286	8.878	2.474	0.396	0.064					

Table A.3 – *Continued from previous page*

Year	10%	5%	1%	0.1%	0.01%	10%	5%	1%	0.1%	0.01%
1986	15.691	9.205	2.637	0.44	0.073					
1988	17.7	10.902	3.498	0.687	0.135					
1992	25.616	17.071	6.507	1.527	0.39	26.417	17.903	7.227	1.952	0.508
1993	25.9	17.39	6.846	1.899	0.612	26.525	18.088	7.476	2.225	0.72
1994	26.292	17.659	6.856	1.525	0.286	26.534	17.981	7.178	1.725	0.382
1995	25.316	17.229	7.049	1.892	0.513	25.477	17.427	7.277	2.071	0.6
1996	25.883	17.942	7.755	2.417	0.763	27.027	19.042	8.634	3.039	1.095
1997	26.713	18.67	7.937	2.209	0.614	27.194	19.131	8.221	2.307	0.645
1998	26.94	18.969	8.196	2.426	0.722	27.592	19.601	8.618	2.633	0.807
1999	28.342	19.949	8.596	2.483	0.71	30.238	21.745	10.032	3.465	1.206
2000	28.401	20.133	8.968	2.694	0.811	30.003	21.658	10.023	3.151	0.992
2001	29.487	21.034	9.539	3.239	1.17	30.711	22.2	10.255	3.514	1.27
2002	29.673	21.01	9.163	2.717	0.795	31.007	22.224	9.727	2.838	0.82
2003	29.798	20.916	8.969	2.708	0.83	31.148	22.208	9.716	2.961	0.913
2004	28.916	20.292	8.801	2.837	0.955	29.61	21.002	9.319	3.119	1.137
2005	30.074	21.416	9.733	3.399	1.276	30.995	22.305	10.381	3.81	1.538
2006	31.325	22.189	10.06	3.536	1.347	32.502	23.44	11.067	4.276	1.853
2007	33.44	23.675	10.47	3.365	1.102	34.738	24.95	11.506	4.063	1.487
2008	32.095	22.479	9.639	3.024	1.001	33.109	23.539	10.719	3.992	1.668

Notes: The table reports the percentage of total income received by each of the top groups. At the first five columns taxpayers are ranked by gross income (excluding realized capital gains); income excludes capital gains and fractiles are defined by total income excluding capital gains. At the last five columns taxpayers are ranked by gross income (including realized capital gains); income includes capital gains and fractiles are defined by total income including capital gains. Source: Computations by authors.

Table A.4: Decomposition of Top Income Shares, 1914-1940

Year	Labor	Business	Land	Rents	Capital	Other	Labor	Business	Land	Rents	Capital	Other
	Top 0.01%						Top 0.1%					
1914							6.19	31.08	26.63	16.88	17.77	1.07
1915							4.56	44.94	24.07	11.79	13.51	0.54
1932	14.97	9.72	20.83	42.95	4.79	6.75	21.37	14.83	14.65	42.30	4.17	2.68
1933	19.98	16.50	27.89	28.45	2.39	4.78	21.73	16.88	16.35	37.09	4.62	3.34
1934	20.01	19.30	29.56	22.13	6.73	2.28	24.93	19.93	17.96	31.14	4.38	1.65
1935	20.01	19.30	29.56	22.13	6.73	2.28	24.93	19.93	17.96	31.14	4.38	1.65
1936	16.64	19.05	37.02	18.69	6.62	1.99	21.88	21.79	21.87	28.54	4.08	1.85
1937	17.35	24.21	34.18	16.84	4.95	2.47	21.08	25.59	21.22	26.44	3.58	2.09
1938	18.63	22.09	34.56	15.64	7.67	1.40	21.33	25.94	22.41	22.86	6.01	1.45
1939	20.12	28.87	29.39	12.64	7.28	1.70	23.43	30.41	19.83	19.13	5.54	1.66
1940	11.17	41.36	29.29	8.85	6.59	2.75	17.36	40.84	18.85	15.14	5.55	2.26
	Top 1%						Top 5%					
1932	31.44	19.58	12.35	32.17	2.33	2.11	27.64	22.88	20.96	25.25	1.50	1.78
1933	32.16	20.86	11.91	28.91	3.15	3.01	27.58	23.98	18.65	25.31	2.02	2.45
1934	35.40	22.48	12.55	25.59	2.72	1.26	30.41	24.41	17.36	24.53	2.12	1.16
1935	35.40	22.48	12.55	25.59	2.72	1.26	30.41	24.41	17.36	24.53	2.12	1.16
1936	32.91	24.06	14.53	24.55	2.48	1.48	29.32	25.92	18.93	22.54	1.87	1.42
1937	31.98	26.12	14.67	23.36	2.32	1.56	27.84	28.08	19.49	21.31	1.78	1.51
1938	30.28	27.30	15.88	21.48	3.78	1.28	26.45	29.46	20.59	19.50	2.70	1.30
1939	30.90	29.91	14.84	19.29	3.67	1.40	27.04	31.14	19.83	17.99	2.67	1.33
1940	27.54	36.07	13.91	16.98	3.63	1.86	26.47	34.86	17.97	16.31	2.66	1.74

Notes: The table reports the income decomposition of total income received by each of the top groups. Taxpayers are ranked by gross income (excluding realized capital gains); and fractiles are defined by total income excluding capital gains. Labor income includes remunerations of employees in the public and the private sector, pensions, bonuses and executive compensation. Business income includes income from business activity in industrial, commercial and other sectors, income from liberal professons. Land is income form land. Real estate is actual and imputed rent. Capital income includes income from capital holdings, dividends, annuities, interest from savings, securities, royalties. Source: Computations by authors.

Table A.6: Decomposition of Top Income Shares, 1914-2008.

Year	Labor	Mixed	Capital	Labor	Mixed	Capital	Upper bound capital estimate
	Top 0.1%			Top 1%			
1914	0.45	2.26	4.54				
1915	0.33	3.29	3.66				
1932	1.16	0.8	3.46	4.78	2.98	7.44	
1933	1.13	0.88	3.19	4.83	3.13	7.06	
1934	1.26	1.01	2.79	5.23	3.32	6.23	
1935	1.29	1.03	2.85	5.15	3.27	6.13	
1936	1.14	1.14	2.95	4.78	3.49	6.25	
1937	1.13	1.37	2.85	4.71	3.85	6.18	
1938	1.16	1.42	2.88	4.56	4.11	6.38	
1939	1.28	1.66	2.51	4.61	4.47	5.85	
1940	0.98	2.3	2.35	4.2	5.49	5.54	
1951	0.55			3.71			0.54
1955	0.47			3.10			0.37
1956	0.52			3.64			0.43
1957	0.51			3.42			0.33
1958	0.49			3.35			0.32
1960	0.49			3.14			0.25
1961	0.49			3.12			0.29
1962	0.46			2.98			0.30
1964	0.50			3.12			0.34
1966	0.42			2.89			0.36
1968	0.42			2.79			0.38
1970	0.50			3.21			0.37
1972	0.45			3.00			0.39
1974	0.40			2.82			0.45
1976	0.39			2.72			0.39
1978	0.42			2.76			0.41
1980	0.40			2.63			0.42
1982	0.38			2.55			0.45
1984	0.40			2.47			0.54
1986	0.44			2.64			0.59
1988	0.69			3.50			0.57

Continued on next page

Table A.6 – continued from previous page

Year	Labor	Mixed	Capital	Labor	Mixed	Capital	Upper bound capital estimate
	Top 0.1%			Top 1%			
1992	0.88	0.41	0.67	4.87	1.31	1.05	
1993	0.86	0.51	0.86	4.77	1.35	1.35	
1994	0.97	0.35	0.41	5.23	1.08	0.87	
1995	0.79	0.4	0.89	4.62	1.18	1.47	
1996	1.37	0.42	1.25	5.22	1.03	2.39	
1997	1.18	0.53	0.6	5.4	1.36	1.46	
1998	1.46	0.3	0.88	5.62	0.85	2.16	
1999	1.91	0.22	1.34	6.36	0.63	3.04	
2000	1.67	0.37	1.11	5.87	0.99	3.17	
2001	2.22	0.11	1.18	7.11	0.35	2.8	
2002	1.78	0.15	0.9	6.52	0.47	2.74	
2003	1.76	0.08	1.12	6.29	0.31	3.12	
2004	1.65	0.08	1.38	6.81	0.19	2.31	
2005	1.63	0.1	2.08	6.71	0.24	3.43	
2006	1.78	0.24	2.26	7.03	0.39	3.65	
2007	1.49	0.1	2.48	6.71	0.27	4.52	
2008	1.61	0.2	2.18	7.28	0.37	3.07	

Notes: The table reports the income decomposition of total income received by each of the top groups. For 1914-1940 income excludes capital gains and fractiles are defined by total income excluding capital gains. For 1951-1988 income includes earnings only and fractiles are defined by total income including capital income, but excluding capital gains. See description for upper bound capital estimate for 1951-1988 in Section 3.2. For 1992-2008 income includes capital gains and fractiles are defined by total income including capital gains. See definition of labor, capital and mixed labor income in Table (**??**). Source: Computations by authors.

	Labor	Business	Dividend	Realized Gains (Financial)	Realized Gains (Real)	Other Capital	Labor	Business	Dividend	Realized Gains (Financial)	Realized Gains (Real)	Other Capital
	Top 0.01%						Top 0.1%					
1992	36.55	21.23	0.21	42.01	0	0	44.92	20.89	1.54	32.64	0	0
1993	34.53	19.61	19.65	26.1	0.1	0	38.52	22.86	15.27	23.28	0.08	0
1994	55.14	18.82	7.86	17.77	0.41	0	56.1	20.19	7.1	16.25	0.37	0
1995	38.01	19.15	30.02	11.51	0.6	0.72	38.01	19.15	30.02	11.51	0.6	0.72
1996	45.12	13.89	20.04	15.84	5.04	0.07	45.12	13.89	20.04	15.84	5.04	0.07
1997	51	22.89	16.22	3.33	5.92	0.64	51	22.89	16.22	3.33	5.92	0.64
1998	55.34	11.4	21	6.67	5.24	0.35	55.34	11.4	21	6.67	5.24	0.35
1999	55.08	6.28	12.82	16.66	7.4	1.76	55.08	6.28	12.82	16.66	7.4	1.76
2000	53.01	11.81	12.86	6.96	13.61	1.76	53.01	11.81	12.86	6.96	13.61	1.76
2001	63.09	3.27	11.73	5.17	9.96	6.78	63.09	3.27	11.73	5.17	9.96	6.78
2002	62.85	5.31	14.57	1.23	12.75	3.28	62.85	5.31	14.57	1.23	12.75	3.28
2003	59.29	2.83	15.41	5.6	12.97	3.9	59.29	2.83	15.41	5.6	12.97	3.9
2004	47.18	2.56	33.9	13.15	2.68	0.55	52.94	2.69	29.5	10.1	4.17	0.6
2005	38.47	2.83	37.78	12.81	4.08	4.04	42.76	2.7	35.1	10.89	4.6	3.95
2006	39.04	5.98	30.08	20.06	3.55	1.28	41.53	5.64	28.87	18.49	4.01	1.46
2007	36.7	2.35	35.21	16.03	7.44	2.27	36.7	2.35	35.21	16.03	7.44	2.27
2008	38.65	5.01	25.01	26.83	2.23	2.26	40.38	4.92	24.57	25.62	2.23	2.28
	Top 1%						Top 5%					
1992	67.37	18.11	0.96	13.43	0.12	0	79.39	12.84	0.65	6.97	0.14	0
1993	63.87	18.09	5.22	12.65	0.17	0	78.39	12.69	2.46	6.27	0.19	0
1994	72.86	15.04	4.37	7.53	0.21	0	81.88	11.53	2.39	3.99	0.22	0
1995	63.49	16.26	14.32	5.2	0.21	0.52	77.82	11.62	7.12	2.83	0.15	0.46
1996	60.43	11.92	13.35	9.39	4.84	0.06	74.61	8.77	7.38	5.19	3.95	0.1
1997	65.69	16.56	9.67	2.23	5.53	0.32	77.98	11.54	5.1	1.26	3.93	0.19
1998	65.16	9.81	15.5	4.45	4.82	0.26	78.31	7.1	8.2	2.49	3.78	0.12
1999	63.44	6.3	9.82	10.94	8.04	1.46	75.74	5.41	5.72	5.3	6.58	1.26
2000	58.52	9.84	11.55	5.28	13.37	1.44	72.74	6.98	6.66	2.62	9.69	1.3
2001	69.29	3.39	8.61	3.07	11.31	4.34	78.33	3.63	4.97	1.59	8.46	3.02
2002	66.98	4.84	10.22	1.14	14.15	2.68	75.92	4.41	5.86	0.75	11.08	1.99
2003	64.75	3.14	10.81	3.77	14.31	3.22	76.42	2.95	5.86	1.75	10.87	2.16
2004	73.1	2.07	13.9	3.96	6.61	0.35	84.03	1.8	7.23	1.89	4.8	0.26
2005	64.62	2.35	19.32	4.25	6.71	2.74	78.01	2.19	10.41	2.02	5.45	1.91
2006	63.49	3.52	16.85	7.69	6.54	1.91	77.03	2.93	9.29	3.76	5.48	1.51
2007	58.33	2.39	23.1	6.88	7.21	2.09	74.09	2.51	12.97	3.38	5.55	1.51
2008	67.94	3.44	14.69	10.19	1.66	2.08	81.89	3.05	7.69	4.73	1.15	1.49
	Top 10%											
1992	83.66	10.63	0.52	5.04	0.15	0						
1993	83.26	10.28	1.77	4.55	0.15	0						
1994	85.39	9.76	1.72	2.94	0.19	0						
1995	82.78	9.38	5.13	2.16	0.13	0.43						
1996	79.89	7.46	5.49	3.95	3.11	0.09						
1997	82.49	9.46	3.77	0.99	3.1	0.19						
1998	82.76	6.19	6.13	1.87	2.96	0.09						
1999	80.55	4.83	4.4	3.87	5.21	1.14						
2000	78.11	6.05	5.13	1.93	7.59	1.19						
2001	82.31	3.55	3.86	1.19	6.61	2.48						
2002	80.55	4.06	4.41	0.6	8.69	1.69						
2003	81.26	2.8	4.38	1.28	8.47	1.81						
2004	87.72	1.67	5.33	1.37	3.69	0.22						
2005	82.75	2.07	7.76	1.47	4.37	1.59						
2006	81.9	2.67	6.94	2.76	4.43	1.29						
2007	79.64	2.42	9.71	2.48	4.49	1.26						
2008	85.89	2.85	5.67	3.38	0.96	1.25						

Table A.5: Decomposition of Top Income Shares Including Realized Capital Gains, 1992-2008

Notes: The table reports the income decomposition of total income received by each of the top groups. Taxpayers are ranked by gross income (including realized capital gains); and fractiles are defined by total income including capital gains. Labor includes labor related income such as wages and salaries, bonus, in kind benefit, stock option, and employee stock, taxable cost compensations, pension, unemployment and maternity benefit, scholarship. Business is self-employed and partnership income, liberal profession, agricultural income. Dividend includes general dividends, and dividends received through partnership. Real capital gain is realized gain from selling property, movable goods, rights. Financial capital gain is realized gain from selling financial assets. Other capital income includes any other taxable capital income such as rent, annuities and interest not taxed at the source.

Income Years 1914-1915			
	Schedules	*Tax rates*	*Legislation*
I.	Income from Land	20% (based on the cadaster of the agricultural land in the property registry, not on income)	1909 V
II.	Income from Built Property	16% (Budapest), 14% (urban centers), 11% (rural areas) on imputed and acual rent	1909 VI
III.	Earnings	1%-3% above 800 K income	1912 LIII
IV.	Capital, annuity	5% (10% for some exemptions)	1909 VII
V.	Wealth	0,12-0,5% above 50.000 K	1916 XXXII
Income Years 1927 - 1940			
I.	Income from Land	20% (based on the cadaster of the agricultural land in the property registry, not on income)	1929 XXIII
II.	Income from Built Property	24% (Budapest), 20% (urban centers), 15% (rural areas) on imputed and acual rent	1922 XXII
		20% 18% 15%	1927 V
		17% 16% 14%	1929 II
III.	General earnings tax	5% (on income from industrial, commercial and business activity, liberal professions)	1925 PM 300 /18
IV.	Earnings of employees	0,5-7,5% above 80 K monthly employment earnings	1927 V
V.	Wealth	0,1-1% above 4000K (1% above 16 million K)	1924 PM 51.000
		0,1-1% above 5000K (1% above 20 million K)	1927 PM 50.000

Table A.7: Schedular surtax rates for income years 1914-1915, 1927-1940

Notes: Compiled from the relevant legislation. See Section (2) for a description of the tax system in-between the two World Wars.

	State Sector		Agricultural Cooperatives		Commerce in Cooperatives	
	Mean wage	Employees	Mean wage	Employees	Mean wage	Employees
Mechanical engineer	3651	32573	3283	98	3268	12
Agrarian engineer	2870	8274	3599	1844	2577	54
Other university degrees	2731	108651	3352	697	2682	898
Mechanical technician	2553	74553	2676	694	2433	93
Agrarian technician	1994	8408	2730	3026	2066	186
Other high school degrees	1865	276331	2259	8069	2019	7840
Total	2277	508790	2603	14428	2093	9083

Table A.8: Average earnings of employees with specific degrees employed at the state or cooperative sectors at the year of 1963

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(Source: reproduced by Központi Statisztikai Hivatal (1966), p. 64, Table 1)

	State Sector		Cooperatives	
	Mean Wage	Employees	Mean Wage	Employees
TOTAL university degree	*2910*	*164090*	*3479*	*6280*
Mechanical engineering	3568	36306	3315	570
Science	3093	3633	2614	13
Agrarian engineering	2943	8728	3775	3287
Veterinary Sciences	3216	2642	3154	101
Economics	3216	9894	3409	822
Law	3171	13505	2974	1179
Medicine	3241	19402		
Pharmacy	2518	5031	2167	3
Education	2268	47886	2837	126
Liberal arts	2781	2307	2976	44
Other university graduates	2923	14756	2963	135
TOTAL Vocational technicians	*1969*	*21607*	*2710*	*3861*
Mechanical vocational technician	2638	5807	2790	344
Agrarian vocational technician	2311	2076	2641	3006
Economist vocational technician	2630	2572	3094	489
Teacher vocational technician	1710	11152	2290	22
TOTAL University or vocational technician	*2734*	*185697*	*3186*	*10141*
TOTAL Secondary education	*2228*	*210019*	*2329*	*24334*
Mechanical technician	2619	76896	2607	2953
Agrarian technician	2052	10154	2737	7171
Economist technician	1985	83225	2064	13665
Teacher technician	1924	39744	2105	545
TOTAL Secondary or tertiary education	*2523*	*395716*	*2581*	*34475*

Table A.9: Average earnings of employees with specific degrees employed at the state or cooperative sectors at the year of 1967

(Source: Központi Statisztikai Hivatal (1969), p. 93, Table 3.2 and p. 94, Table 3.3)

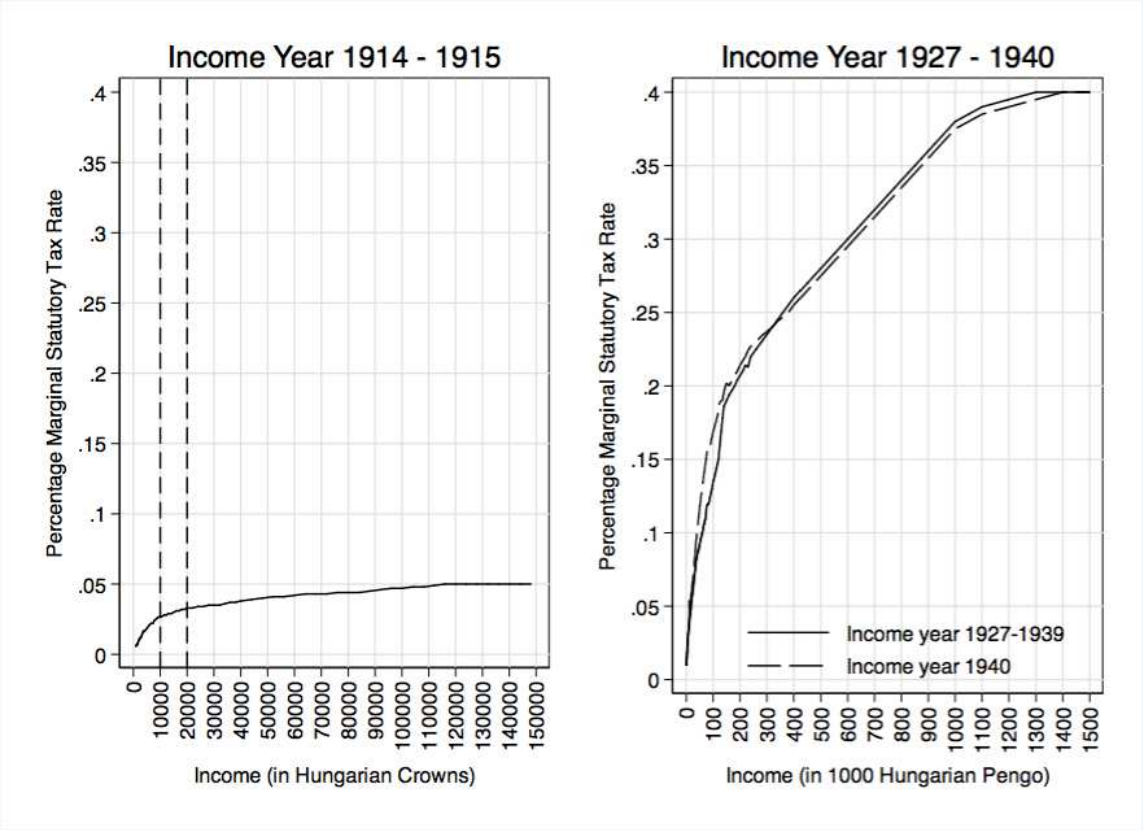


Figure A.1: Statutory tax rates, 1914-1940.

Notes: Reporting threshold was above 20.000 crowns at income years 1914-1916, and 10.000 Crowns after 1917. Source: Official statutes (Act X§24 of 1909, Act V§15. of 1927, Act XXII§36 of 1940).

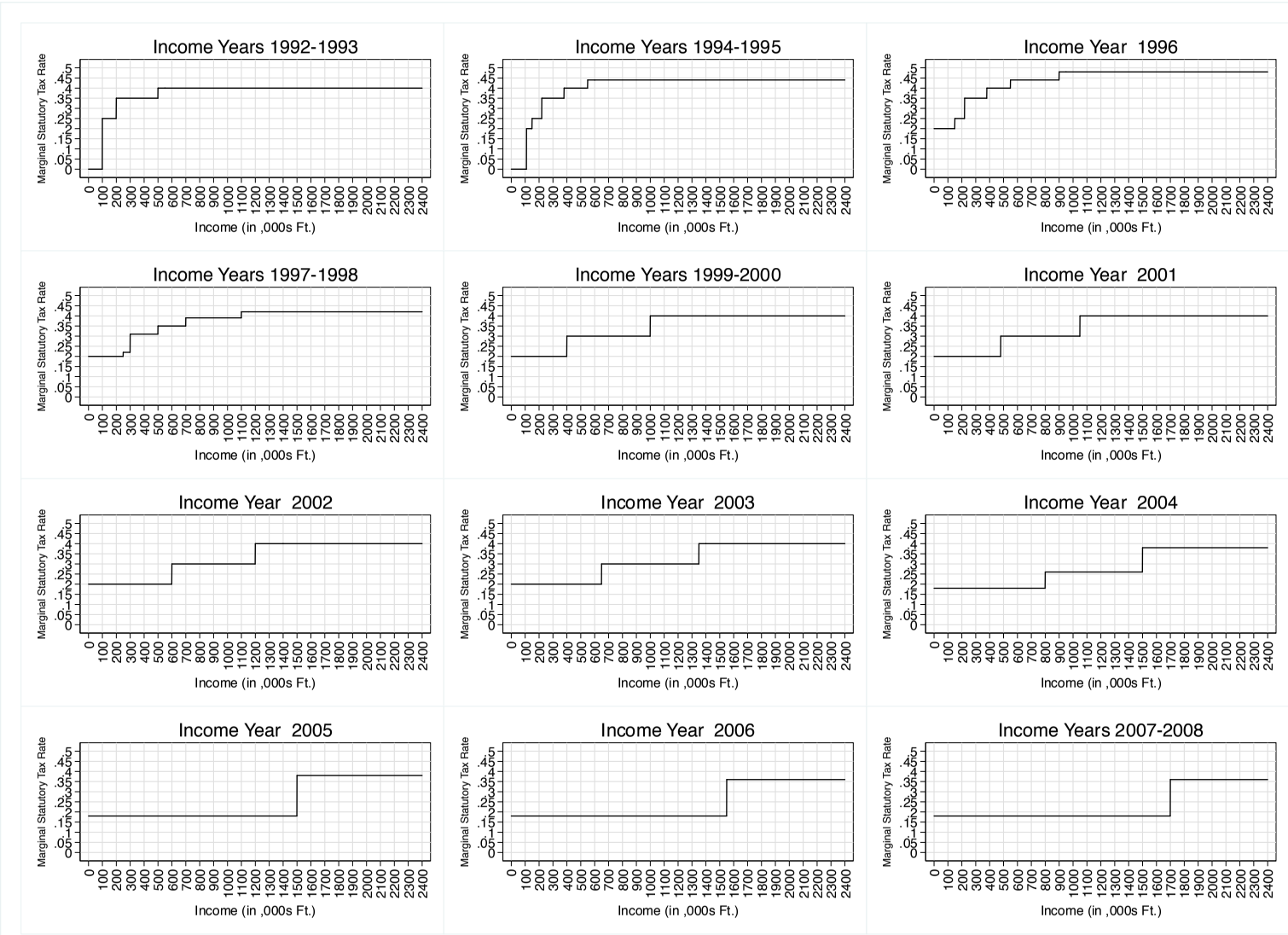


Figure A.2: Statutory income tax rates, 1992-2008 (NAV, Hungarian Tax Authority)

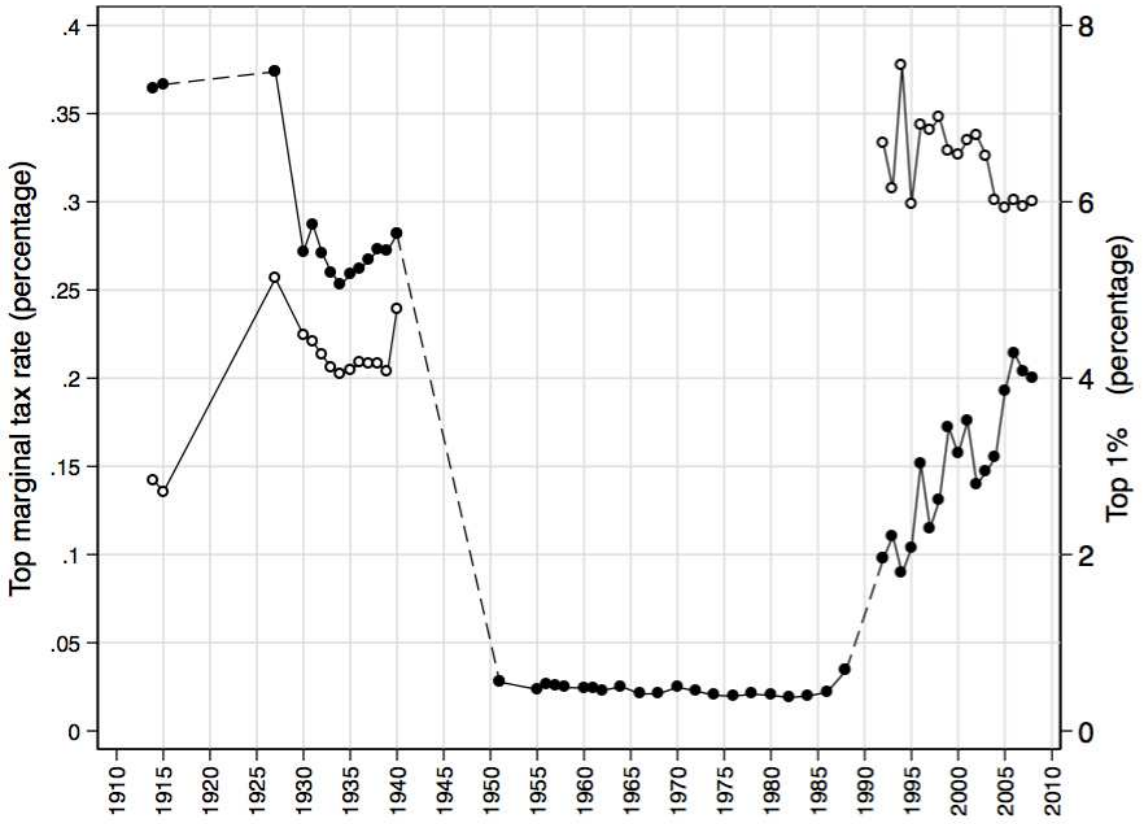
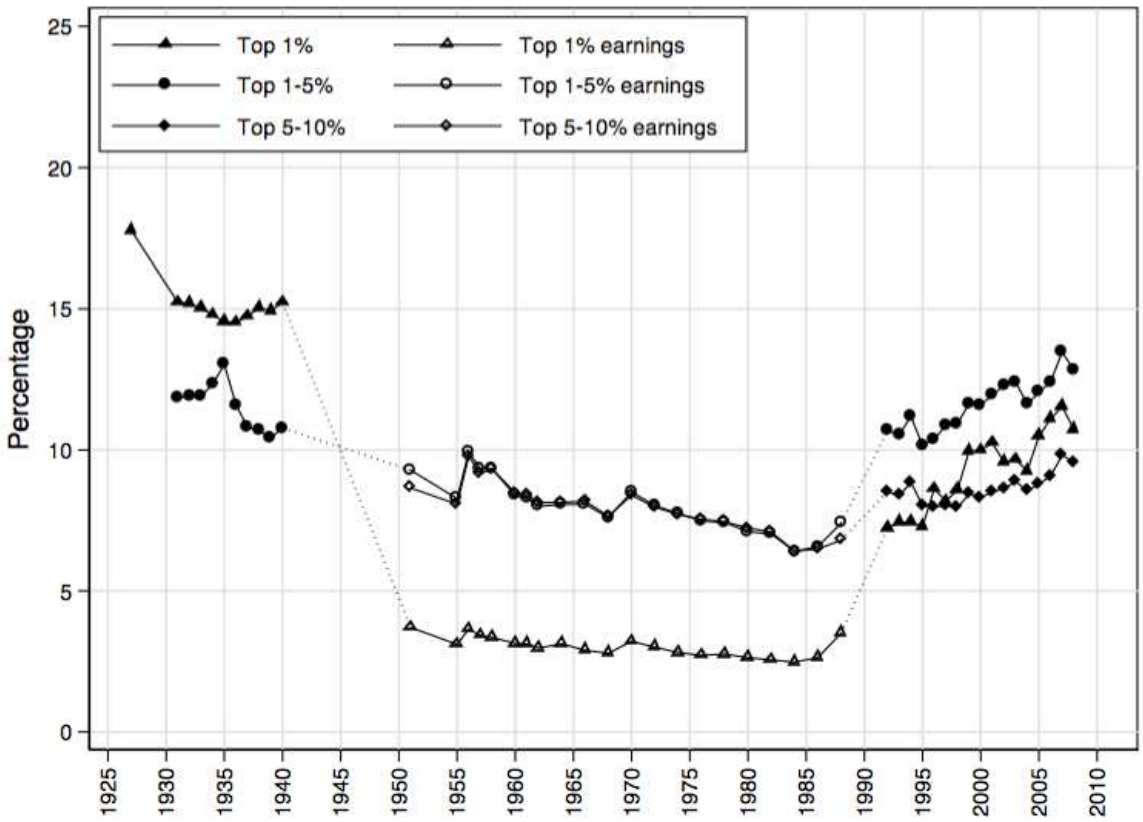


Figure A.3: Top 0.1% income share and top marginal income tax rate, 1914-2008.

Notes: For construction of the top marginal tax rates see Section (2.6). The top 1% income share series for 1927-1940 excludes capital gains, for 1992-2008 includes the capital gains, and for 1951-1988 it is based on earning tables. Source: Authors' computation using tax returns data and tax return law. For top 1% share series see Table (A.3).

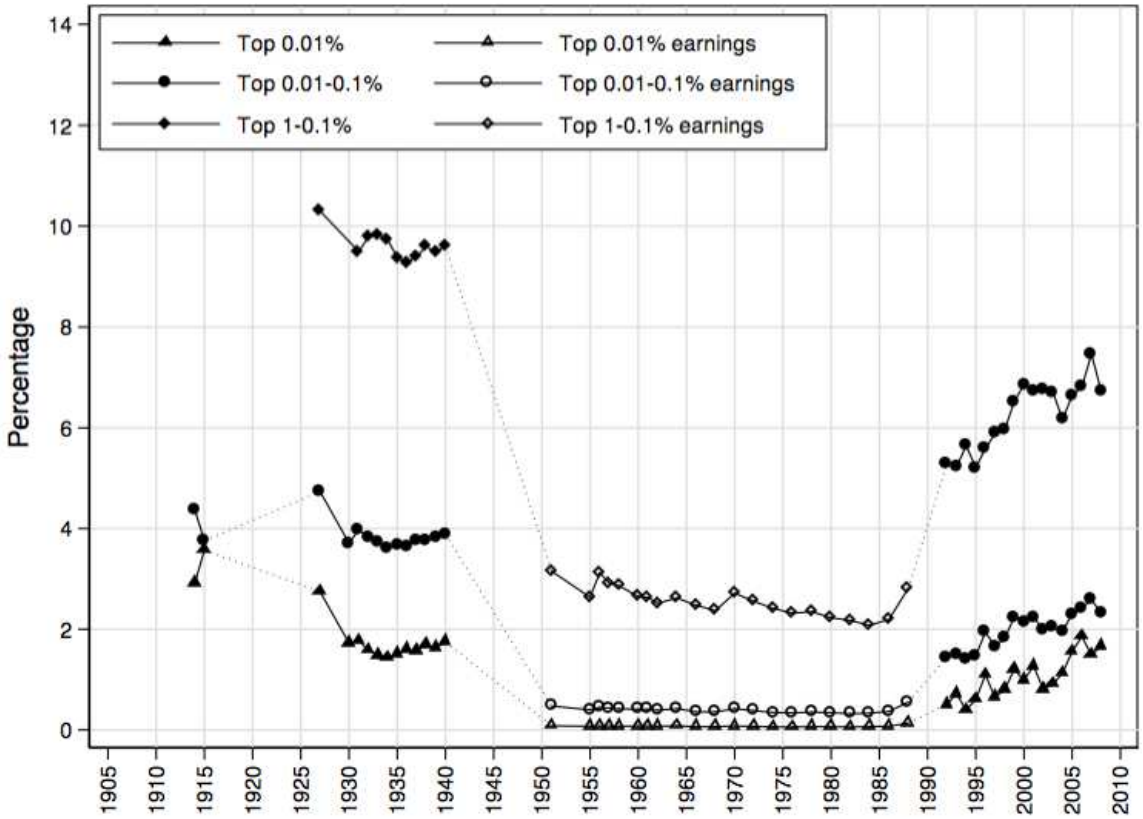
Figure A.4: Top income shares for P99-P95, P95-P99 and P99-P100 in Hungary, 1927-2008.



*Note:*Percentage of total income received by each of the top groups. Income is defined before taxes and excludes capital gains for 1927-1940, and includes capital gains for 1992-2008. For 1951-1988 income is based on earning tables. For 1927-1988 the fractiles are defined by total income excluding realized capital gains, and for 1992-2008 including realized capital gains also. (For details see Appendix chapter 2, 3 and 6.)

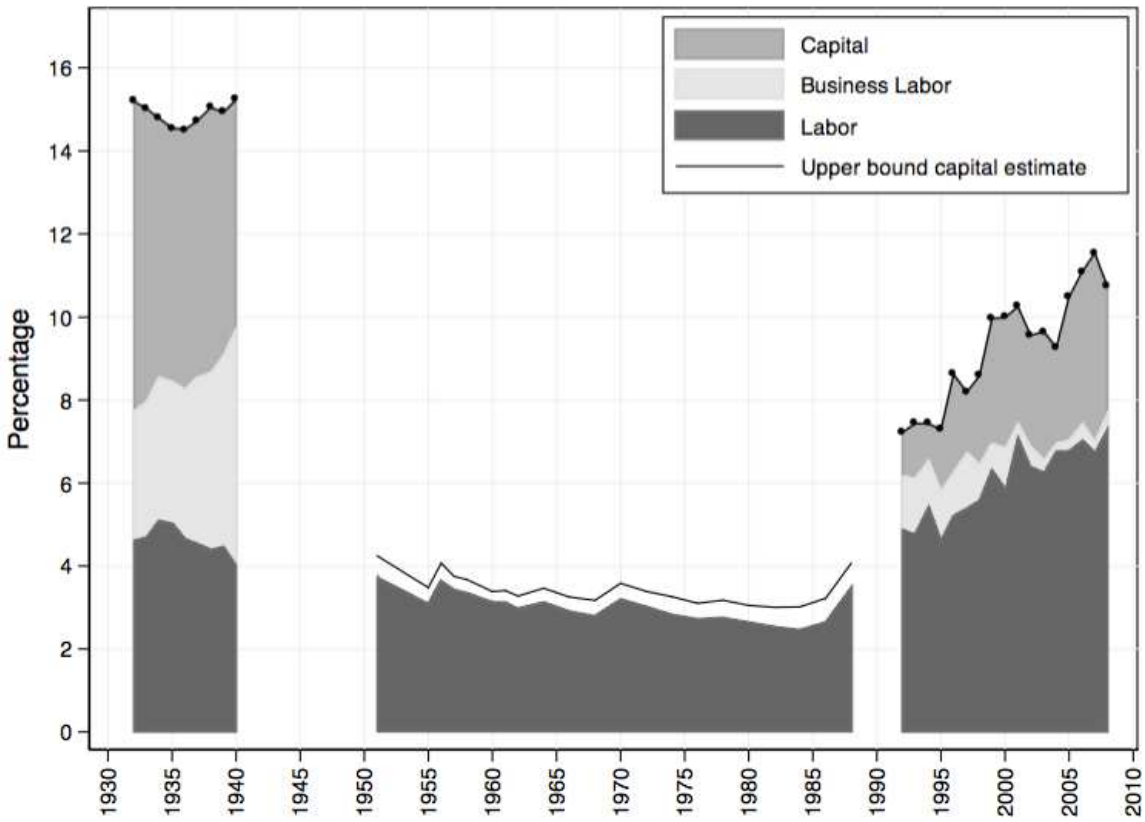
Source: Table (A.3)

Figure A.5: Top income shares for P99-P99.9, P99.9-P99.99 and P99.99-P100 in Hungary, 1914-2008.



*Note:*Percentage of total income received by each of the top groups. Income is defined before taxes and excludes capital gains for 1927-1940, and includes capital gains for 1992-2008. For 1951-1988 income is based on earning tables. For 1927-1988 the fractiles are defined by total income excluding realized capital gains, and for 1992-2008 including realized capital gains also. (For details see Appendix chapter 2, 3 and 6.)

Source: Table (A.3)



Note: Capital: income from capital assets, land and buildings, for 1992-2008 also realized capital gains are included. Labor: wages and salaries and other employment income. Business: mixed income. See Table 11 for detailed income categories.

Source: Table (A.6)

Figure A.6: Upper bound capital estimate for the top 1% during socialism.

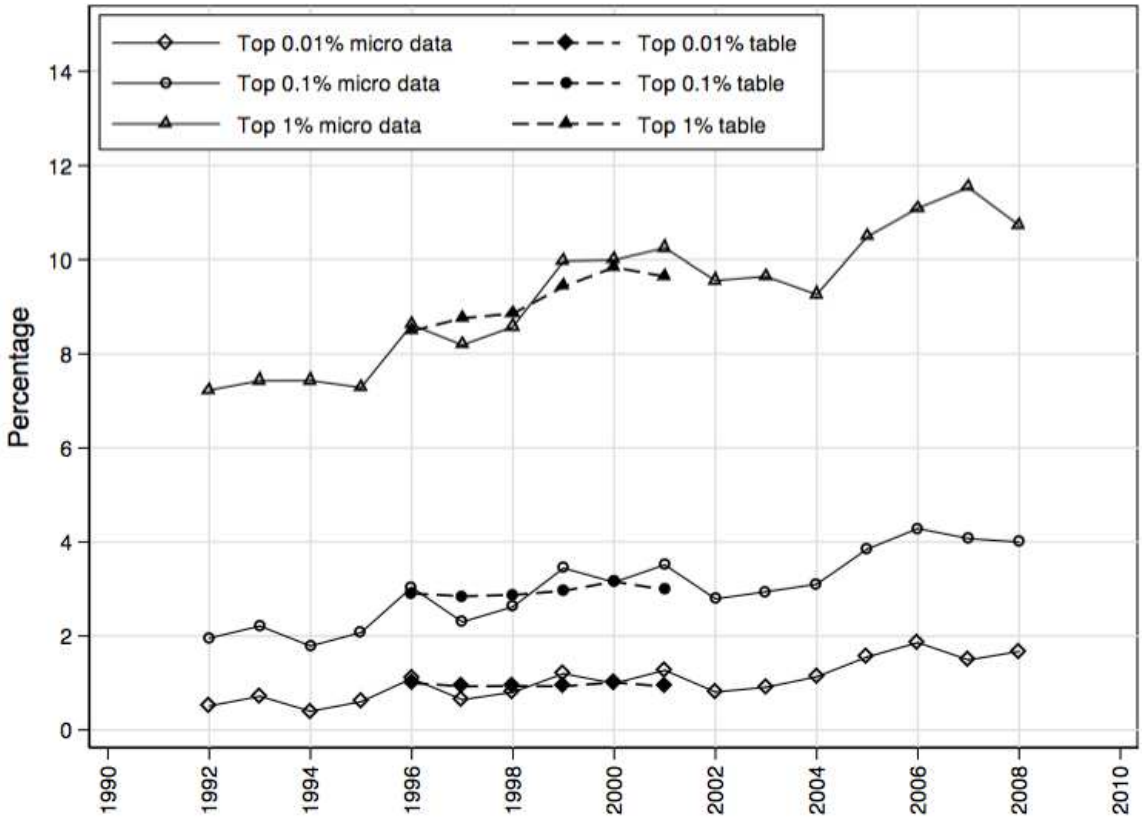


Figure A.7: Top share estimates based on the administrative micro data sample, and the income tax statistics tables compiled for the universe of taxpayers (Including realized capital gains).

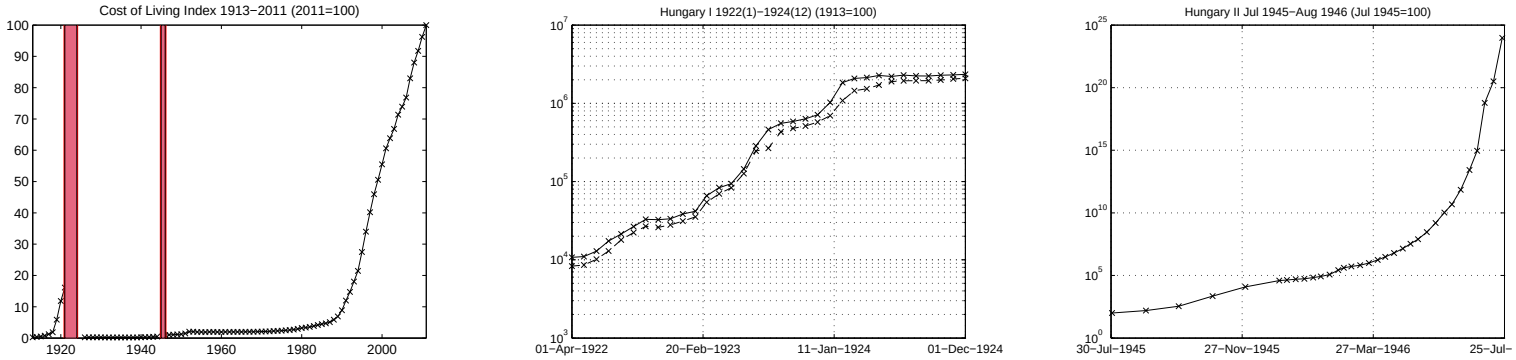


Figure A.8: Cost of living in Hungary, 1913-2011 (2011=100, annual frequency), interspersed with Hungary I and Hungary II hyperinflation episodes (log scale).

Sources: Hungary I: Molnárfi (1973), p. 410 and Sargent (1982), Table H3, pp. 62-63; Hungary II: Bomberger and Makinen (1983), Anderson et al. (1988).

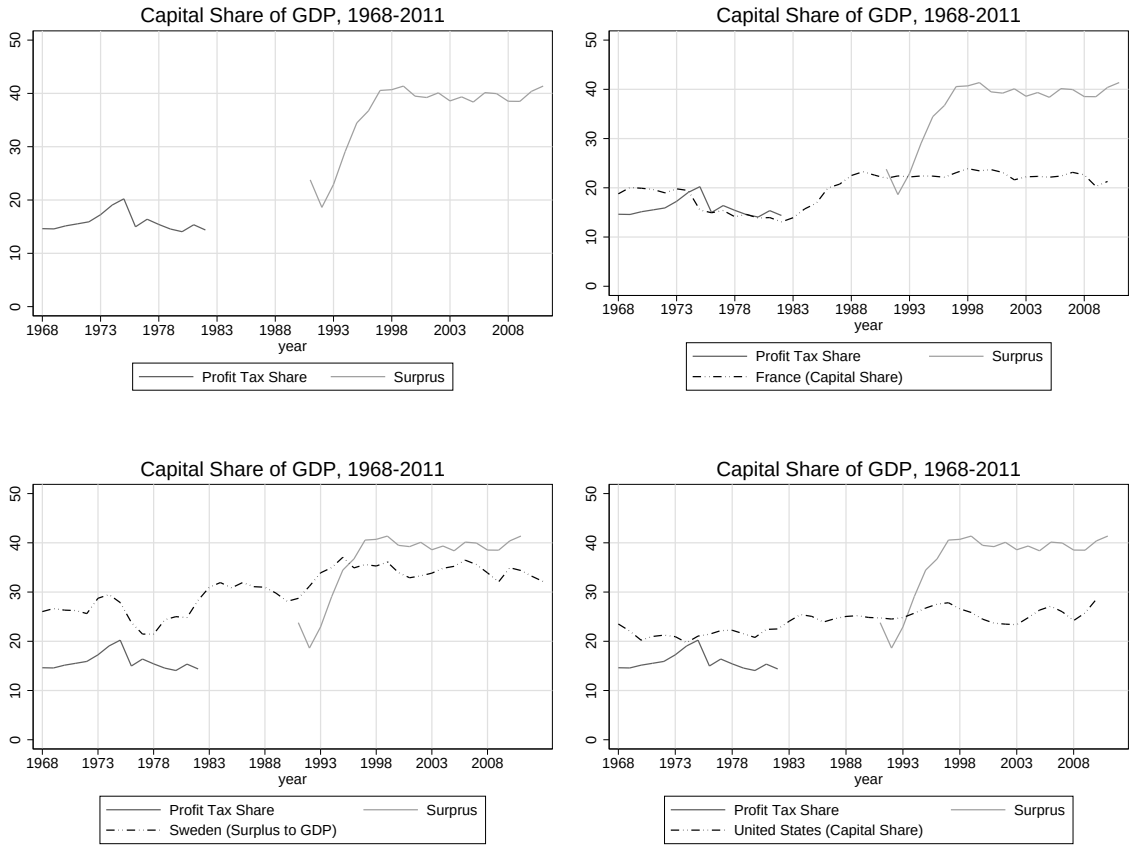


Figure A.9: Capital Share Ratios, 1968-2011.
(Source: own calculations and Bengtsson and Waldenström (2015))

Table A.10: Capital Income Share, 1968-2010

Year	Enterprise Profit Tax share	Enterprise profit tax + Net production Subsidies share	Gross Operating Surplus (Firms, Households, Mixed income) Share
1968	0.15	0.12	
1969	0.15	0.12	
1970	0.15	0.14	
1971	0.16	0.16	
1972	0.16	0.17	
1973	0.17	0.18	
1974	0.19	0.21	
1975	0.20	0.24	
1976	0.15	0.20	
1977	0.16	0.20	
1978	0.15	0.19	
1979	0.15	0.18	
1980	0.14	0.15	
1981	0.15	0.16	
1982	0.14	0.16	
1991			0.24
1992			0.19
1993			0.23
1994			0.29
1995			0.34
1996			0.37
1997			0.41
1998			0.41
1999			0.41
2000			0.39
2001			0.39
2002			0.40
2003			0.39
2004			0.39
2005			0.38
2006			0.40
2007			0.40
2008			0.39
2009			0.39
2010			0.40

Notes: For 1991-2011 the series report the capital factor share (gross operating surplus of households and firms). For 1968-1982 the series report a proxy as the net income the state extracted from state-owned enterprises, i.e. profits and income tax. An alternative series at column 2 includes additionaly also the net of production subsides and production tax. Data sources in Table (B.7).

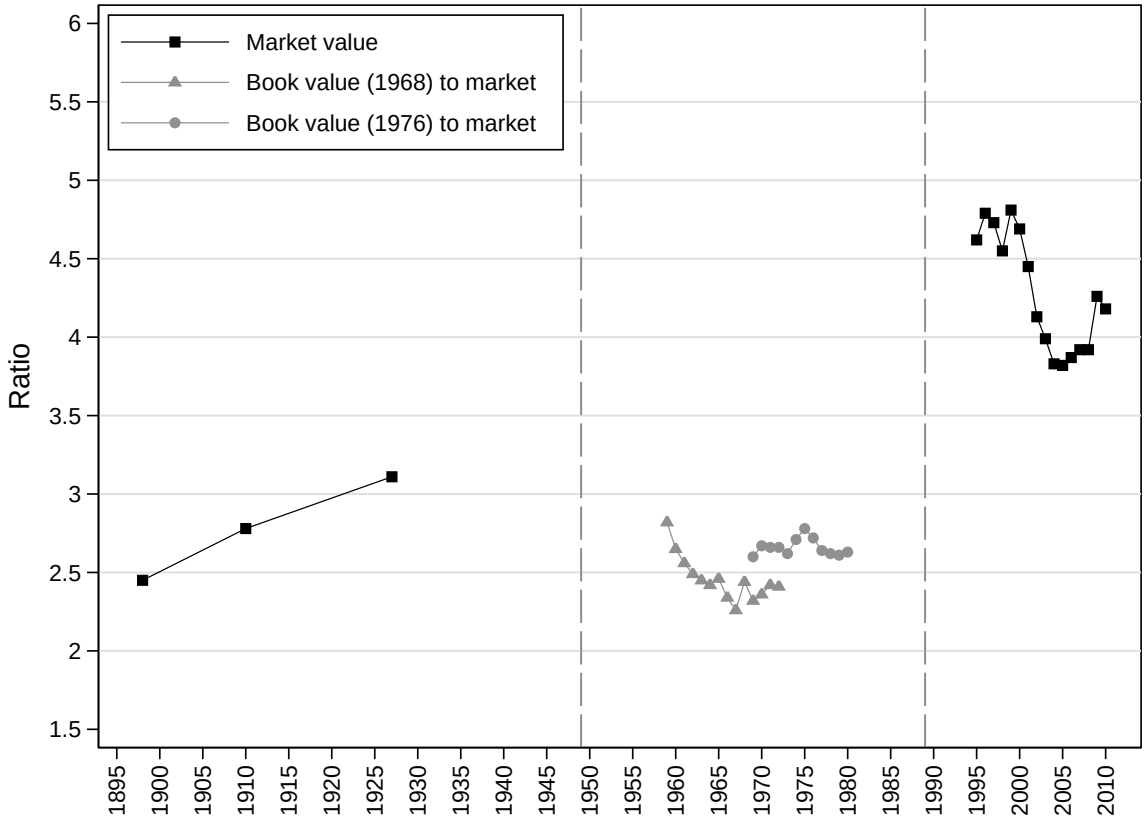


Figure A.10: Fixed capital stock to GDP Ratio, 1898-2010

Year	Fixed capital stock per GDP			
	Market value	Market/1968 book value	Market/1976 book value	Market value
1898	2.45			
1910	2.78			
1927	3.11			
1959		2.82		
1960		2.65		
1961		2.56		
1962		2.49		
1963		2.45		
1964		2.42		
1965		2.46		
1966		2.34		
1967		2.26		
1968		2.44		
1969		2.32	2.60	
1970		2.36	2.67	
1971		2.42	2.66	
1972		2.41	2.66	
1973			2.62	
1974			2.71	
1975			2.78	
1976			2.72	
1977			2.64	
1978			2.62	
1979			2.61	
1980			2.63	
1995				4.62
1996				4.79
1997				4.73
1998				4.55
1999				4.81
2000				4.69
2001				4.45
2002				4.13
2003				3.99
2004				3.83
2005				3.82
2006				3.87
2007				3.92
2008				3.92
2009				4.26
2010				4.18

Table A.11: Fixed capital stock to GDP, 1898-2010.

Details: for the construction of the estimates, see Section (8); for the primary sources, see Table (B.8).

Year	Log wage premium	% high school,
	industry, mining	university degree
1920		0.026
1921	0.250	0.027
1922	0.276	0.027
1923	0.322	0.028
1924	0.410	0.028
1925	0.474	0.029
1926	0.502	0.029
1927	0.452	0.030
1928	0.436	0.031
1929	0.443	0.031
1930	0.476	0.032
1931	0.490	0.031
1932	0.527	0.031
1933	0.544	0.031
1934	0.528	0.031
1935	0.531	0.030
1936	0.500	0.030
1937	0.505	0.030
1938	0.482	0.029
1939	0.482	0.029
1940	0.449	0.029
1941	0.450	0.029
1942		0.030
1943		0.031
1944		0.032
1945		0.034
1946		0.035
1947		0.036
1948		0.037
1949		0.039
1950		0.041
1951		0.043
1952		0.045
1953		0.047
1954		0.049

Year	Log wage premium			% high school,
	industry, construction	+ state agriculture	+cooperative agriculture	university degree
1955	0.155			0.051
1956	0.154			0.053
1957	0.113			0.056
1958	0.120			0.058
1959	0.119			0.060
1960	0.115			0.062
1961	0.114			0.067
1962	0.110			0.072
1963	0.097			0.077
1964	0.098			0.083
1965	0.105			0.088
1966	0.104			0.093
1967	0.111	0.116		0.098
1968	0.104	0.111		0.104
1969	0.104	0.106		0.109
1970	0.124	0.125		0.114
1971	0.120	0.121		0.120
1972	0.116	0.117		0.126
1973	0.104	0.105		0.132
1974	0.102			0.138
1975	0.096	0.098	0.110	0.144
1976	0.092	0.094	0.101	0.150
1977	0.085	0.087	0.095	0.156
1978	0.079			0.162
1979	0.078			0.168
1980	0.081	0.083	0.091	0.174
1981	0.084	0.086	0.094	0.179
1982	0.085	0.088	0.097	0.183
1983	0.092	0.096	0.106	0.188
1984	0.096	0.100	0.115	0.192
1985	0.109	0.113	0.122	0.196
1986	0.121	0.124	0.132	0.201
1987	0.132	0.136	0.143	0.205
1988	0.187	0.191	0.199	0.210
1989	0.213	0.213		0.214

Year	Log wage premium	% high school, university degree
1990		0.219
1991	0.238	0.226
1992	0.249	0.234
1993	0.247	0.242
1994	0.254	0.249
1995	0.253	0.257
1996	0.247	0.265
1997	0.260	0.273
1998	0.273	0.280
1999	0.287	0.288
2000	0.294	0.296
2001	0.297	0.304
2002	0.302	0.313
2003	0.325	0.323
2004	0.326	0.332
2005	0.336	0.342
2006	0.331	0.352
2007	0.319	0.361
2008	0.322	0.371
2009	0.312	0.380
2010	0.302	0.390
2011	0.294	0.400

Table A.12: Skill Supply and Relative Price of Skills 1920-2011.

Details: Skill supply is the percentage of people completed secondary school or university at the total population. Skill premium is the ratio of log average wages of non-manual and manual workers. For 1920-1941 average wages cover industrial and mining metallurgy sectors. For 1955-1989 average wages cover industry and construction sectors, while from 1967 an alternative series is reported covering additionaly the state agricultural sector, and from 1975 both the state and the cooperative agricultural sectors. For 1992-2011 average wages cover all sectors of the economy. Source: Table (B.10) and Table (B.9).

B Annex: Data Sources

Period	Series	Sources
1913-1918	GDP	Schulze (2005), p. 83, Table 3.8
1925-1942, 1947-1949	NNP (net national product)	Eckstein (1955), p. 165, Table 1
1950-1960	NMP (net material product)	KSH (1996), p. 94, Table 2, col 2
1961-1988	NMP (net material product)	Mitchell (2007), pp. 1021, 1029, col 1
1961-1990	GDP	KSH (1996), p. 96, Table 2, col 2
1991-2012	GDP	Eurostat

Table B.1: GDP Statistics

Period	Income denominator	Source
1960-1974	Wages	A lakosság jövedelme és fogyasztás 1966-1980 (Ksh, Bp, 1982), p8, Table1.1, col2
	Social transfers	A lakosság jövedelme és fogyasztás 1966-1980 (Ksh, Bp, 1982), p16, Table61/a, col10
	Gross capital income	A lakosság jövedelme és fogyasztás 1966-1980 (Ksh, Bp, 1982), p19, Table7.1, col8
1975-1987	Wages	A lakosság jövedelme és fogyasztás 1970-1987 (Ksh, Bp, 1988), p12, Table2.1, col2
	Social transfers	A lakosság jövedelme és fogyasztás 1970-1987 (Ksh, Bp, 1988), p21, Table7.1/a, col8
	Gross capital income	A lakosság jövedelme és fogyasztás 1970-1987 (Ksh, Bp, 1982), p24, Table8.1, col8
1992-2010	Wages, mixed income, ownership income	Magyarország Nemzeti Számlái (KSH): Table 5.2. A háztartások jövedelemszámlái, D.11, B.3.n, D.4,
	Social transfers	Magyarország Nemzeti Számlái (KSH): Table 5.5 A társadalmi juttatások folyó áron
	Realized asset/financial capital gains	Apeh Table 4

Table B.2: Income Total Statistics

Income Year	Income tax statistics	Income components	
1914	p 12-13, line 10, p96-97, line 10		Jövedelemadósztatisztika, Magyar Királyi Állami Nyomda, Bp, 1916
1915	p 12-13, line 10, p55-56, line 10		Jövedelemadósztatisztika, Magyar Királyi Állami Nyomda, Bp, 1917
1927	pp 124-125, line 15		Adóstatisztika, Füzet 1, Magyar Királyi Pénzügyminisztérium, Bp, 1929
1930	p 133, col 2-3		Adóstatisztika, Füzet 2, Magyar Királyi Pénzügyminisztérium, Bp, 1932
1931	p 120, col 2-3		Adóstatisztika, Füzet 3, Magyar Királyi Pénzügyminisztérium, Bp, 1933
1932	pp 212-213, col 1, 3, 10	pp 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, col 9-10	Adóstatisztika, Füzet 4, Magyar Királyi Pénzügyminisztérium, Bp, 1934
1933	pp 230-231, col 1, 3, 10	pp 186, 189, 192, 195, 198, 201, 204, 207, 210, 216, 219, 222, 225, col 1-2	Adóstatisztika, Füzet 5, Magyar Királyi Pénzügyminisztérium, Bp, 1935
1934	pp 174-175, col 18, pp 176- 177, col 18, p 178 col 7	pp 176-177, col 2-19	Adóstatisztika, Füzet 6, Magyar Királyi Pénzügyminisztérium, Bp, 1936
1935	p 222, col 1, pp 224-225, col 17, pp 226-227, col 6	pp 224-225, col 2-19	Adóstatisztika, Füzet 7, Magyar Királyi Pénzügyminisztérium, Bp, 1938
1936	p 270, col 1, pp 272-273, col 18, pp 274-275, col 8	pp 272-273, col 2-19	Adóstatisztika, Füzet 8, Magyar Királyi Pénzügyminisztérium, Bp, 1938
1937	p 270, col 1, pp 272-273, col 18, pp 274-275, col 8	pp 272-273, col 2-19	Adóstatisztika, Füzet 9, Magyar Királyi Pénzügyminisztérium, Bp, 1940
1938	p 250, col 1, pp 252-253, col 18, pp 254-255, col 8	pp 252-253, col 2-19	Adóstatisztika, Füzet 10, Magyar Királyi Pénzügyminisztérium, Bp, 1941
1939	p 288, col 1, pp 290-291, col 18, pp 292-293, col 8	pp 290-291, col 2-19	Adóstatisztika, Füzet 11, Magyar Királyi Pénzügyminisztérium, Bp, 1942
1940	p 278, col 104, p 288, col 104, pp 270-271, col 2-4, pp 280-281, col 2-4,	pp 272-273, col 29-48, pp 282–283, col 29-48	Adóstatisztika, Füzet 12, Magyar Királyi Pénzügyminisztérium, Bp, 1943
1992-2008	p 278, col 104, p 288, col 104 administrative micro data sample		

Table B.3: Sources of income tax statistics

Income Year	Earnings census statistics	Sources
1951	p 113 T19	Statisztikai Évköny 1971, KSH, Bp, 1972
1955	p 69 T16	Statisztikai Évköny 1957, KSH, Bp, 1959
1956	p 69 T16	Statisztikai Évköny 1957, KSH, Bp, 1959
1957	p 69 T16	Statisztikai Évköny 1957, KSH, Bp, 1959
1958	p 73 T20	Statisztikai Évköny 1958, KSH, Bp, 1960
1960	p 59 T15	Statisztikai Évköny 1966, KSH, Bp, 1967
1961	p 84 T16	Statisztikai Évköny 1968, KSH, Bp, 1969
1962	p 84 T16	Statisztikai Évköny 1968, KSH, Bp, 1969
1964	p 84 T16	Statisztikai Évköny 1968, KSH, Bp, 1969
1966	p 60 T16	Statisztikai Évköny 1966, KSH, Bp, 1967
1968	pp 122-123 T7	Foglalkoztatottság és kereseti arányok 1970, KSH, Bp, 1972
1970	pp 198-199 T9 row 33	Foglalkoztatottság és kereseti arányok 1970, KSH, Bp, 1972
1972	pp 236-237 T11 row 33	Foglalkoztatottság és kereseti arányok 1972, KSH, Bp, 1974
1974	pp 136-137 T9 row 33	Foglalkoztatottság és kereseti arányok 1974, KSH, Bp, 1976
1976	pp 78-79 T20 row 39	Foglalkoztatottság és kereseti arányok 1976, KSH, Bp, 1978
1978	pp 18-19 T9	Foglalkoztatottság és kereseti arányok 1984, KSH, Bp, 1986
1980	p 26 T20 lower part col 2	Foglalkoztatottság és kereseti arányok 1980, KSH, Bp, 1981
1982	p 72 T5.13	Foglalkoztatottság és kereseti arányok 1984, KSH, Bp, 1986
1984	pp 22-23 T11 row 30	Foglalkoztatottság és kereseti arányok 1986, KSH, Bp, 1987
1986	pp 100-101 T21 row 39	Foglalkoztatottság és kereseti arányok 1986, KSH, Bp, 1987
1988	pp 64-65 T11 r39	Foglalkoztatottság és kereseti arányok 1988, KSH, Bp, 1989

Table B.4: Earnings Censuses (1951-1988)

Period 1900-1949	Definition of Tax Base:	Total Adult Population minus Married Women		Sources
	Total Civilian Population	*Underaged Population (< 15 yrs)*	*Total Number of Married Women*	
Census Year 1900	pp. 7-9, Table 2, Col. 30	pp. 126-128, Table 15, Col. 5	pp. 201-203, Table 20, Col. 15	Magyar Kiralyi Központi Statisztikai Hivatal (1907) A Magyar Szent Korona Országainak 1900. Évi Népszámlálása, Harmadik Rész: A Népesség Részletes Leirása. Pesti Könyvnyomda-Részvénytársaság, Budapest.
Census Year 1910	p. 12,18, Table 5, Col. 5	p. 74-75, Table 9, Col. 4	p. 110-111, Table 14, Col. 4	Magyar Királyi Központi Statisztikai Hivatal (1916) A Magyar Szent Korona Országainak 1910. Évi Népszámlálása, Ötödik Rész: Részletes Demográfia. Pesti Könyvnyomda-Részvénytársaság, Budapest.
Census Year 1920	p. 8, Table 6, Sum of Col. 3, 4	p. 34, Table 9, Col. 4	p. 58, Table 16(b), Col. 4	Központi Statisztikai Hivatal (1928) 1920 évi népszámlálás, 5. kötet: Részletes Demográfia. Pesti Konyvnyomda-részvénytársaság , Budapest
Census Year 1930	p. 234, Table 20, Col. 5	p. 220, Table 18, Col. 8,11,14	p. 234, Table 20, Col. 10	Központi Statisztikai Hivatal (1936) 1930. évi népszámlálás, 5. kötet: Részletes Demográfia. Stephaneum Nyomda Részvénytársaság, Budapest
Census Year 1941	p. 4, Table 1, Col. 3	p. 5 Table 1, Col. 46	p. 6, Table 2, Col. 12	Központi Statisztikai Hivatal (1947): 1941. évi népszámlálás, Demográfia adatok. Stephaneum Nyomda Részvénytársaság, , Budapest
Census Year 1949	p. 294, Table 4, Col. 2	p. 294, Table 4, Col. 3	p. 311, Table 8, Col. 5	Központi Statisztikai Hivatal (1950): 1949. évi népszámlálás, 9. kötet: Demográfiai Eredmények. Állami Nyomda, Budapest
1914-1918	Total Number of War Casualties			Schulze, M.-S. (2005) Austria-Hungary's economy in World War I, in Broadberry, S., and M. Harrison (eds), The Economics of World War I. Cambridge University Press.
Period 1950-2010	Definition of Tax Base:	*Total Population Above 15 yrs*		KSH: Demografia Evkonyv, 2010, CD

Table B.5: Sources of population denominator

Period	Series	Sources
1913-1924	Szakszervezeti értesítő Cost of Living	Molnárfi (1973), pp. 410-411, Table 1, col9
1924-1940	Pester Lloyd Cost of Living	Molnárfi (1973), pp. 424-425, Table 5, col14
1940-1950	Cost of Living	Mitchell (2007), pp. 963, Table H2, col11
1950-1960	CPI	KSH (1996), p. 207, Table 5, col 9
1960-2012	CPI (Official)	KSH Official Statistics (available online)

Table B.6: Cost of Living Statistics

Year	Source	
	Profit and Income tax, Production Subsidies, Production tax	
1968-1969	Népgazdasági mérlegek 1960-1970 (KSH, 1971)	pp. 180-181 T7.7, pp. 182-183 T7.8
1970-1975	Jövedelemelosztás a népgazdaságban 1978 (KSH, 1979)	pp. 22-23 T10, pp. 24-25 T11, pp. 26-27 T12 pp. 28-29 T13, pp. 30-31 T14, pp. 32-33 T15
1976-1982	Jövedelemelosztás a népgazdaságban 1976-1982 (KSH, 1984)	pp. 16-17 T1.9/col 18, pp. 18-19 T1.10/col 18, pp. 20-21 T1.11/col 18, pp. 22-23 T1.12/col 18 pp. 24-25 T1.13/col 18, pp. 26-27 T1.14/col 18 pp 28-29 T1.15/col 18
	Gross operating surplus of households, financial and non financial corporations, wages and salaries, mixed income	
1991-1994	Magyarország Nemzeti Számlái, 1991-1994 (KSH, 1996)	pp. 108-109 T 4.3, pp. 116-117 T 4.5.2, pp. 150-151 T 6.3
1995-2007	Magyarország Nemzeti Számlái, 1995-2007 (KSH, 2009)	pp. 346-358 T 3.2.1, pp. 372-384 T 3.3.1, pp. 530-542 T 5.2
2008	Magyarország Nemzeti Számlái, 2008-2010 (KSH, 2011)	p. 102 T3.3.1, p. 106 T3.5.1, p. 158 T5.2
2009-2011	Magyarország Nemzeti Számlái, 2009-2011 (KSH, 2012)	p. 108 T3.31, p. 112 T3.5.1, p. 166 T5.2

Table B.7: Capital Share

Year	Sources	
	Minerals and ores, real estate, transportation, movable goods	
1989	Fellner (1901)	pp. 19-23
1910	Fellner (1913)	pp. 47-49, 67
1927-1928	Fellner (1929)	pp. 54-56, 71
	Stock of assets, livestock	
1959-1972	A Nemzeti vagyon és az állóeszközállomány 1960-1973 (KSH 1974)	pp. 30-31 T9/row 18, pp. 36-37 T15/row 6
1969-1978	A Nemzeti vagyon és az állóeszközállomány 1970-1978 (KSH 1979)	p. 114 rows 13, p. 20 T16/ row 2
1979	A Nemzeti vagyon és az állóeszközállomány 1979 (KSH 1980)	p. 25 T3, p. 26 T4
1980	A Nemzeti vagyon és az állóeszközállomány 1980 (KSH 1980)	p. 21 T3, p. 22 T4
1981	A Nemzeti vagyon és az állóeszközállomány 1981 (KSH 1981)	p. 21 T3, p. 22 T4
	Stock of fixed assets net of depreciation	
1995-2007	Magyarország Nemzeti Számlái, 1995-2007 (KSH 2009)	pp. 880-892 T8.2.2
2008	Magyarország Nemzeti Számlái, 2008-2010 (KSH 2011)	p. 217 T8.2.2
2009-2010	Magyarország Nemzeti Számlái, 2009-2011 (KSH 2012)	p. 225 T8.2.2, p. 227 T8.2.4

Table B.8: Fixed Capital Stock

Skill supply	Sources
	Population
1920	1920. évi népszámlálás, 5. kötet, p. 8, table 6, sum of col 3, 4
1930	1930. évi népszámlálás, 5. kötet, p. 234, table 20, col 5
1941	1941. évi népszámlálás, Demográfia adatok, p. 4, table 1, col 3
1949-2010	KSH STADAT 1.1 Népesség, népmozgalom, col 2
	Number of high school and university graduates of the population in the census
1920-2011	Népszámlálás online, Table 30.1.6 col2, Table 30.1.11 col2
	Yearly number of new high school and university graduates
1949-1959	SY 1964, p360, T1.4, col3,6
1960-2010	KSH STADAT 2.5, col 15, 17

Table B.9: Labor Market Statistics: Skilled Labor Supply

Year	Publication (SY: Statistical Yearbook)
	Average wage of skilled and unskilled workers
1955	SY 1949-1955, p88, row43,p91, row 23,43,44, SY 1956, p 105, col 2,3,6,7
1956	SY 1956, p77, row 46, p 105, col 2,3,6,7
1957	SY 1957, p92, col4-6, p96, col4-6, p130, T.3 col 4,6,7,9,11,12,13
1958	SY 1958, p96, col4-6, p100, col4-6, p142, T.3 col 4,6,7,9,11,12,13
1960	SY 1960, p96, col4-6, p102, col4-6, p138, T.5 col 4,6,7,9,11,12,13
1962	SY 1962, p94, col4-6, p146, T.6 col 4,6,7,9,11,12,13
1964	SY 1964, p84, col2-4, p96,col2-4, p128, T.6 col 4,6,7,9,11,12,13
1967	SY 1967, p92, T.8,col2-4, p98, T.14, ,col2-4, p126, T.6 col 4,6,7,9,11,12,13
1968	SY 1968, p116, T.10, col2-4, p125, T.19,col2-4, p157, T.9 col 4,6,7,9,11,12,13
1969	SY 1969, p116, T.10, col2-4, p131, T.21, col2-4, p163, T.9 col 4,6,7,9,11,12,13
1970	SY 1975, p141, T.17, col2-4, p147, T.23 ,col7-9, p190, T.22 col 3-5 , 11-13
1971	SY 1971, p150, T.11, col2-4, p157, T.18 ,col7-9, SY 1973 p217 T14 col 5-7, 10-12
1972	SY 1972, p170, T.14, col2-4, p177, T.21 ,col7-9, SY 1973 p217 T14 col 5-7, 10-12
1973	SY 1973, p168, T.14, col2-4, p175, T.21 ,col7-9, p217 T14 col 5-7, 10-12
1974	SY 1975, p141, T.17, col2-4, p147, T.23 ,col7-9, p190, T.22 col 3-5 , 11-13
1975	SY 1975, p141, T.17, col7-9, p147, T.23, col7-9, p190, T.22 col 3-5, 7-9, 11-13
1976	SY 1976, p137, T.17, col2-4, p143, T.23, col7-9, SY 1977, p218, T23., col8
1977	SY 1977, p170, T.19, col3-5, p175, T.24, col7-9, p218, T23., col9
1978	SY 1978, p178, T.19, col3-5, p183, T.24, ,col7-9, SY 1979, p230, T23, col8,9
1979	SY 1979, p180, T.19, col3-5, p185, T.24, col7-9, p230, T23, col8,9
1980	SY 1980, p184, T.19, col2-4, p189, T.24, col7-9, p234, T23, col9
1981	SY 1981, p127, T.9.22, col2-4, p132, T.9.27, col7-9, p152, T10.17, col4
1982	SY 1982, p120, T.9.23, col2-4, p125, T.9.28, col7-9, p146, T10.19, col5
1983	SY 1983, p123, T.9.25, col2-4, p128, T.9.30, col7-9, p149, T10.20, col6
1984	SY 1984, p121, T.9.25, col2-4, p126, T.9.30, col7-9, p144, T10.20, col7
1985	SY 1985, p121, T.8.25, col2-4, p126, T.8.30, col7-9, p144, T9.17, col6
1986	SY 1986, p114, T.8.17, col5, p131, T9.17, col6
1987	SY 1987, p115, T.8.17, col6, p133, T9.17, col6
1988	SY 1988, p108, T.8.18, col6, p108, T8.19, 2-3, p127, T9.15, col6, T9.16, col2-3
1989	SY 1989, p105, T.8.17, col6, p105, T.8.18, col4, p120, T9.13, col6, T9.14, col5-6
1991-1995	SY 1995, p75, T.4.14. col 2,4
1996-2000	SY 2000, p90, T.4.12. col 2,4
2001-2006	SY 2006, p72, T.3.1.12. col 2,4
2008-2012	KSH Stadat T2.1.36., row A-S, T2.1.37., row A-S

Table B.10: Labor Market Statistics: Skill Premium