Inequality in Imperial Austria, 1911

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Abstract: The paper addresses the problem of income distribution in an economy with growing income and growing industrial and service sectors. The Austrian lands represent economies at extremely different levels of development. The north-eastern and the south-eastern lands were backward both in terms of income and of sectorial structure, whereas the central region around Vienna and other parts of the Alpine lands and the Czech lands enjoyed high productivity in all sectors. The analysis is restricted to just one time-period. Thus, the relation between income distribution and the level of development is analysed with regard to regions at different levels of development at one point of time (not at the change of distribution in a longer time period). Preliminary findings suggest that income distribution depended mostly on the level of income a region had attained in 1911, on the sectoral structure, on migration patterns and other findings. These findings are in accordance with previous research on wealth distribution which suggest that the distribution of wealth in Austria tended to widen only up to 1890/1900. This means that the more advanced regions of Imperial Austria had already arrived at an advanced stage whereas the backward regions showed still the signs of economies in their early phase of development.

Keywords: wealth, Kuznets curve, distribution, inequality, Austria, 19th century, regional comparison

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Introduction

Modern economic growth means higher rates of growth of population, product per capita, productivity of all factors, a shrinking agricultural sector, the establishment of large firms, urbanisation, and other changes. None of that was new in the late 18th and 19th centuries, but this was the time when changes happened faster and irreversibly. Sustained growth was not necessarily high in an absolute sense, but it was higher than in the early modern period.

The relation between modern economic growth and the distribution of income is far from obvious. In a global perspective, the time from the late 18th century on was a period of rising inequality for most of the time. Only recently the global income distribution has narrowed. The reason is, up to about 1980 the gap between Europe, North America and a few others on the one hand, and the rest of the world on the other, became ever wider. But in the last thirty years modern economic growth has reached major parts of the world. Rapid growth in China, India, and some other countries has narrowed the gap between these countries and the early industrialised economies (Bourguignon et al. 2006, 5). In other words, for many decades the income distribution between countries has continued to widen and increased global inequality. But in the last three decades it has narrowed enough to allow global inequality to decrease. In this sense, growth in the formerly less and least developed countries has an equalising effect.

But income distribution between countries is not income distribution within countries. In the first half of the 19th century, when between-country inequality was small, within-country inequality accounted for about 80 per cent of global inequality. One and a half centuries later, this share had decreased to just 40 per cent (Bourguignon and Morrisson 2002, 733–734). The relation between growth in a country and distribution within the same country can take either way. Even if we allow for growth in real income in all income classes in the 19th and 20th centuries, the gap between the lower and the higher classes may still have widened: If the lower classes get their share of the gains, and the upper classes get an even larger share, a rising standard of living for all will coincide with widening inequality.

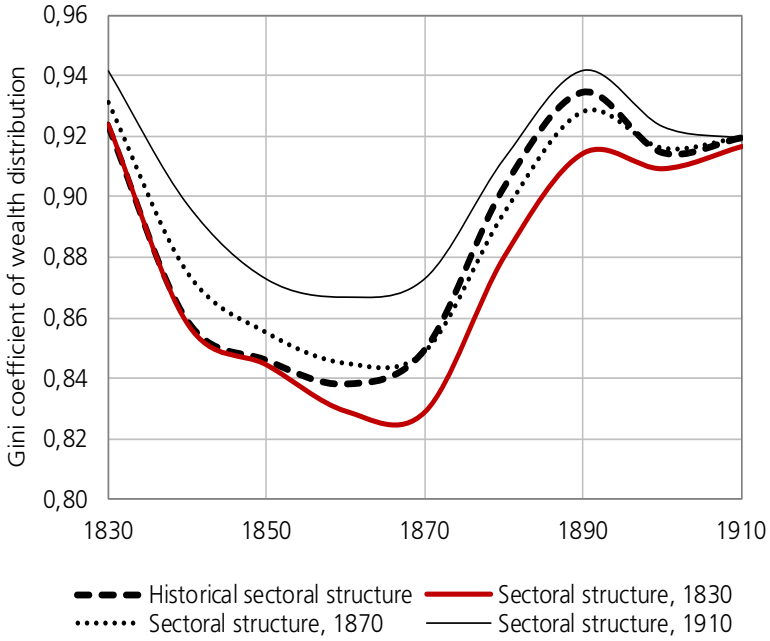
This study examines income distribution in the whole of Imperial Austria at one point of time. The research questions are:

- Is there any systematic relation between the income level of a region and the degree of inequality in the same region? Do regions with higher incomes display a larger degree of inequality? Or, are higher incomes distributed rather more equally, and lower incomes more unequally?
- If we find a systematic relation between income and inequality: Do we talk about direct effects of growth on distribution? Or, are other factors that are associated with growth (like changes in the sectoral structure, migration, urbanisation, and education), the driving force behind a change in the income distribution?

Imperial Austria (officially 'The Kingdom and Lands Represented in the Parliament') was the non-Hungarian part of the Austro-Hungarian Empire. It covered more or less the area of today's Republic of Austria, the Czech Republic, Slovenia, parts of Croatia, northern Italy, southern Poland, western Ukraine, and northern Rumania, with a population of close to 30 million inhabitants in 1910.

The analysis is restricted to the situation in one year, in 1911. Although economic growth is obviously a process over time, the specific Austrian situation allows such a restriction: Economically as well as ethnically, Imperial Austria was an extremely heterogenous country. Lower Austria (in terms of population about half of the Alpine lands, that is, the lands that were to become the Republic of Austria in 1918) and the Czech lands were among the more advanced regions on the European continent, with a large and productive industrial sector, and a respectable financial sector in Vienna. Large parts of the country, especially the crown-lands of Galicia and Bukovina in the north-east, and the southern lands of Littoral (except the city of Trieste), Carniola and Dalmatia, were very much backward, with a large and not especially productive agricultural sector. Much of the Alpine lands were

Figure 1: Distribution of wealth in the Alpine lands: Historical distribution and hypothetical distributions with sectoral structures of 1830, 1870, and 1910. Source: Pammer (2002), Table 59.



placed in between. Metaphorically speaking, travelling from Vienna in Lower Austria, to Brody in eastern Galicia in 1911, amounted to a time travel of several decades back. Thus, comparing the situation in regions as diverse as Austrian provinces and districts, means comparing regions at different levels of development, that is, different income levels, different sectoral structure, and, perhaps, different levels of inequality.

Therefore such a comparison may come close to an analysis of one country or region over time. Clearly, such an analysis would be desirable all the same. Unfortunately, in the Austrian case, there are not the sources for it at hand: usable income data start from about 1900 on. The choice of 1911 (and not, for instance, 1908 or 1913) as the reference year has also to do with the sources: On New Year's Eve of 1910, the Austrian government conducted a general census that informs about the demographic, economic, and cultural situation at the time. If an explanation of the income distribution includes such matters, it is sensible to focus on the adjacent period, and that is 1911.

Income distribution in a growing economy

As mentioned at the beginning, the rise and fall in global inequality in the 19th and 20th centuries can be attributed in part to inequality between countries. In addition, within-country inequality may have undergone a rise and fall as well, although both the timing and the basic mechanism may have been different: the assumption is, within-country inequality in a typical early industrialising country such as Great Britain, the United States, or Germany, may have risen up the end of the 19th century, and then decreased. The graphical expression, the ∩ curve with its peak around 1890 or 1900, is the well-known Kuznets curve from 1954/5 (Simon Kuznets formulated his ideas in his presidential address at the Annual Meeting of the American Economic Association on December 29, 1954) (Kuznets 1955).

The ∩ curve has been under discussion whenever economic historians investigated changes in inequality in industrialising economies. In a number of cases, the findings were less clear than the hypothetical scenario would suggest (see, for instance, the contributions to Borodkin and Lindert 1998; Soltow 1989; Rossi et al. 2001; differently Williamson and Lindert 1980a; Williamson and Lindert 1980b; Steckel/Moehling 2001; Lampman 1962; Morrison and Snyder 2000; for the post-World War II period, Ahluwalia 1976; Ram 1992; Ram 1995; Pammer 2001). This is not so surprising given the fact that Kuznets arrived at his ideas looking actually at just the three countries mentioned above, that is, the United States, England, and Germany – hardly representative for economies that include cases as diverse as Belgium, France, Denmark, Spain, Sweden, Norway, and Austria-Hungary.

Which explanations for his curve did Kuznets offer? His focus lay on matters which underwent a profound change in the last two centuries in connection with modern growth: sectoral structure, technology, urbanisation, education, wealth structures in various income classes, market efficiency, and institutions (for a discussion of these aspects, see Bacha 1979; Chiswick 1971; Browning 1976; Kravis 1960, 413; Lecaillon et al. 1986, 16–22). One might add various aspects of demography like migration and the age composition of the workforce and the population in general. Changes in these areas may have raised or reduced inequality, depending on the period.

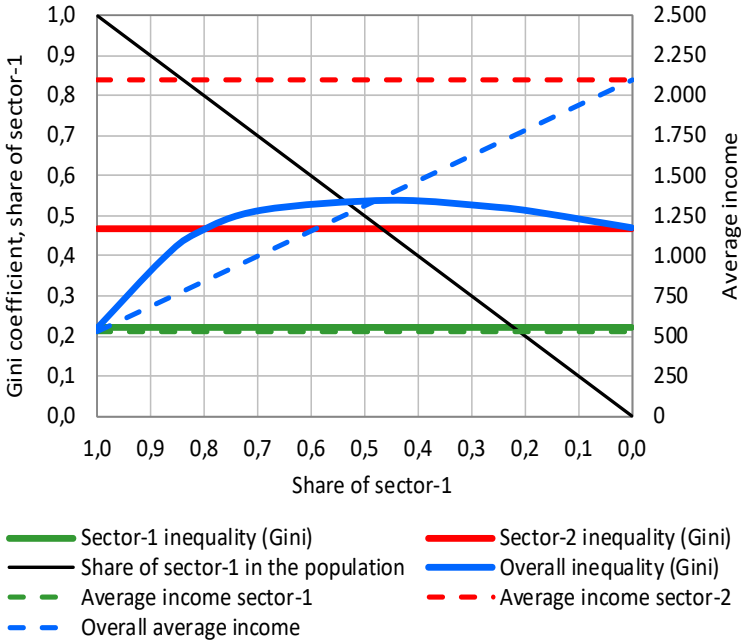


Figure 2: Simulated effects of sectoral shifts: Two sectors with two invariate income levels each. Sector-1: 400 crowns (89 per cent of the population) / 1,600 crowns (11 percent). Sector-2: 800 crowns (75 per cent) / 6,000 crowns (25 percent). Share of sector-1: 100 per cent, decreasing to 0 per cent.

The decreasing proportion of the agricultural sector in growing economies (one of the most conspicuous changes in the era of modern growth) was among the factors that changed the income distribution. The reason lies in the shifting balance between inequality within sectors and inequality between sectors.

Within-sector inequality was usually low in agriculture and high in the industrial and service sectors. This, in turn, was the result of a more capital-intensive production in the industrial sector, and a high importance of education for earnings in the service sector. High productivity and high incomes in the secondary and tertiary sectors attracted labour from agriculture (labour productivity in agriculture rose as well, and the sector could dispense with many workers). Altogether, a sector with lower income and an egalitarian distribution was shrinking, while the sectors with higher, more unequally distributed income were growing.

Since the usual statistical measures calculate inequality basically as a sum of differences between individuals, this process translates straightforwardly into changes in overall inequality. Agriculture was more egalitarian because the income differentials between the individuals involved (farmers, farm-labourers, day-labourers) were relatively small. Income differentials in the secondary sector (for instance, between business-people and workers) were larger. In such a setting, overall inequality will grow if the egalitarian sector is shrinking and the unequally structured one is growing, even if income differentials in typical constellations (between farmers and farm-labourers, or, between business-people and workers) remain unchanged. This is so, simply because constellations with small income differentials become rarer, and constellations with large differentials become more frequent – after all, inequality is a sum of differentials. That is, even if inequality within every single sector remains unchanged, the sum of these within-sector inequalities will grow. Figure 1 compares empirical findings about the distribution of wealth (not income, in this case) in the Alpine lands from the mid-19th century up to World War I, with hypothetical distributions that are calculated under the assumption of an unchanged sectoral structure of 1830, 1870, or 1910, respectively. That is, wealth differentials were treated at the value they had at the respective point of time. But the proportions of sectors in the population were treated as hypothetically constant throughout the period. The findings suggest that the gap between the typical upper-class person and the typical lower class person grew indeed in the course of the 19th century, raising overall inequality. But in addition, overall inequality grew even more, simply by the fact that the sectoral composition of the economy changed, changing the relative weight of the respective groups.

Beyond that, however, sectoral change had another effect that works in the opposite direction: Because incomes in the industrial and service sectors were higher than in agriculture, a demographic shift from agriculture to the other sectors raised incomes for ever more people. From a certain point on, this effect becomes so strong that it dominates further changes and offsets the other effects of sectoral change. The reason is, between-sector inequality decreases enough to offset the rise in the sum of within-sector inequality. Therefore, the sheer shift in the sectoral composition of the economy produces a Kuznets curve even if income differentials within every single sector remain unchanged.

Figure 2 simulates this in a simplified model with just two sectors. Each sector has two classes of income

earners: In sector-1, everyone in the lower class (89 per cent of the sector's population) earns 400 crowns per year; in the upper class of sector-1, everyone earns 1,600 crowns. In sector-2, lower class people (75 per cent of the sector's population) earn 800 crowns, upper class persons receive 6,000 crowns. Clearly, on the average, sector-2 offers higher average income, although the upper class in the low-income sector earns more than the lower class in the high-income sector. Sector-1 is rather egalitarian: the Gini coefficient of the distribution within sector-1 is about 0.22. Sector-2, by comparison, has a Gini coefficient of 0.47. Both within-sector distributions are supposed to remain constant over time.

Now, what are the effects of a change in the shares of the two sectors in the economy? The extent of overall inequality depends on the share of the sectors in the population. For most of the time, the distribution in the whole economy is more unequal than any of the within-sector distributions because there is not just within-sector inequality but also between-sector inequality (resulting from the difference in mean sectoral income, and from the fact that the distributions of the two sectors overlap). With sector-1 taking a large share, overall inequality is modest: The simulation starts with sector-1 taking 100 per cent of the population, which results in an overall Gini coefficient equal to the within-sector coefficient of sector-1. A decreasing share of sector-1 results in an ever more unequal distribution, until sector-2 has grown to 55 per cent of the population, and the overall Gini coefficient has risen to almost 0,54. In this simulation, this is the point where overall inequality begins to decrease again, due to decreasing between-sector inequality. When sector-2 has grown to 100 per cent of the population, the overall Gini coefficient is, of course, the same as in sector-2

Therefore, *ceteris paribus*, the typical sectoral change of the 19th and 20th centuries (a shrinking agricultural sector that is characterised by relatively low income and a relatively low degree of inequality) results in a Kuznets curve. Of course, the *ceteris paribus* condition need not necessarily be fulfilled. If within-sector inequality does not remain constant, the distribution curve will behave differently.

One of the things usually not being equal is education. Generally, education spread in the population in the course of the 19th and 20th centuries, due to a more effective enforcement of compulsory schooling, and to an active promotion of higher education. Compulsory schooling and the promotion of schools on the secondary and tertiary levels are institutional matters, whether it be the policy of state institutions, or informal institutions like changing mentalities. On the average, better education and better skills raise income on the individual level, and therefore advances in the educational system are positively associated with income. If education raises income, a rising educational level has, *ceteris paribus*, an egalitarian effect: In a hypothetical economy where education is the only source of income, with a rising proportion of educated people, the distribution of income becomes monotonously more equal.

The positive effect of education on income may also work the other way round because high-income countries spend more on education and therefore achieve better results in schooling and skills. A counteracting force, however, may be migration, if high income regions attract immigrants with low skills who lower the general educational level and earn low wages. Thus, an inward flow of such migrants will raise the level of inequality (Anderson 2001, 97–101; Williamson 1996, 288–295). Migration is indirectly linked with distribution in an additional sense: Typical emigration countries (like Norway, Sweden, Italy, and others) were backward regions with a high supply of labour and a scarce supply of land, whereas immigration countries (like the United States, Canada, or Australia) faced labour shortage but had abundant land. In any setting, trade flows favoured the abundant factor, which means that in backward European countries real wages were low, but the share of wages in GDP was relatively high (and therefore, inequality low), whereas in overseas countries land, capital, and special skills were favoured (and, correspondingly, inequality was high). Immigration countries offered relatively high real wages, and therefore attracted large numbers of immigrants, which led to falling shares of wages in GDP. In the interwar period of deglobalisation and barriers to immigrants in overseas countries, inequality in those countries tended to decrease (Williamson 1998, 256–257).

Income in Imperial Austria

Existing estimates of income in Imperial Austria suggest this was an economy that grew slowly and steadily from the early 19th century on. In the last decades prior to World War I, Austria did not experience a phase of rapid growth similar to Germany. Therefore the country (and even more so Austria-Hungary put together) clearly was at a lower income level than most Western European countries.

Estimates of Austrian income so far used mostly two approaches: First, a proxy data approach, where data that are associated with GDP, are used to estimate income, even at the regional level (Crafts 1983; Pichler 1996, 266–278; Pichler 2001, 53–55; Good 1991; Good 1994; Good 1997; Good/Ma 1998; Good/Ma 1999). This approach has been invented for countries or regions where income data are scarce (such as least developed countries in the 20th century, or countries in the 19th century), but other data are at hand. These other data, such as mortality, savings deposits, or the number of letters sent, are somehow correlated to GDP, and are therefore called 'proxy data'.

A statistical relationship between GDP and the proxies is estimated using data from other countries (usually more developed ones), and the resulting equation is applied to the backward countries or regions. As pointed out in an earlier paper, this approach is unsound and produces arbitrary and sometimes inconsistent results (Pammer 1997). Its only advantage is in needing few data.

Second, income has been estimated using production data. This approach may start with just one significant branch such as coal but can be extended liberally (for coal in Austria, see Gross 1971). Production series used to estimate Austrian and Hungarian GDP include the total of agriculture and the most relevant industrial branches (for agriculture, see Sandgruber 1978; for industry: Rudolph 1975; Komlos 1983; for GDP and single sectors: Kausel 1979; Schulze 2000). Although the results suggest a precise estimate of production, one has to consider that in part they rely on presuppositions and extrapolations that affect the outcome. Most important among them are:

- Contemporary estimates of agricultural production (which are the basis of modern estimates) are in fact a general assessment of the potential output, combined with short-term modifications according to weather conditions.
- Some estimates of industrial production are in fact the result of a proxy data approach, where the output of certain single products is extrapolated to a whole branch.
- For production in handicrafts, contemporary statistics provide no reliable information. The estimates are mostly extrapolations from findings about large firms and based on general assumptions about the share of handicrafts production in overall secondary sector production.
- Production in the service sector is measured not by output but essentially by input, that is, by employment numbers.
- Production estimates are meant as estimates of value added, but contemporary data usually inform just about gross output. The proportion of intermediate consumption can usually be estimated only roughly.

To a certain degree, these imponderabilities will cancel out each other, and the available estimates can still be used as a rough measure of GDP. In the following, they will be used as a benchmark for assessing data of a different kind.

The data used in the present study come from the personal income tax statistics of 1911. The personal income tax was introduced in a new form in 1896, and was effective from 1898 on. It was a tax on all personal income whether it was income from labour, capital, businesses, and landed property, including subsistence incomes and fictitious incomes from property used by the owners themselves (see Appendix 1). It seems that it took some time for the new tax regime to work properly, therefore it is sensible to choose a later period. As mentioned above, 1911 is a good choice as it is the year after the census of 1910, which produced many additional relevant data.

Essentially, the personal income tax was a tax on all domestic income, with a few exceptions: Undistributed profits were subject to corporate tax but not to income tax (distributed profits were subject to both). The amount of undistributed profits cannot reliably be assessed, but we have the data on business incomes and capital incomes and can therefore simulate the effect of different hypothetical scenarios. In addition, some persons (the Emperor, his family with respect to their appanages, diplomats, and so on) were exempted from the personal income tax. However, in the context of overall income, the incomes of these persons were probably of little weight.

Personal income as taxed by the income tax is similar to GDP insofar as both variables measure domestic income or production, respectively, and they do so at factor cost. However, there remains still a considerable difference between the GDP estimates and personal income estimates. It is due to at least three terms:

The first is capital consumption allowances. The GDP estimates are value added estimates, that is, they include depreciation, whereas personal income excludes depreciation. The proportion of capital consumption allowances in GDP is unknown. We may assume that in 1911 it was lower than today (in 2010 in countries like Germany or Austria, capital consumption allowances amounted to almost 18 per cent of GDP).

Second, we are not informed about the income of persons who earned not more than the basic tax-free allowance of 1,200 crowns per year. These incomes are not documented in tax statistics in any way. The sources list the number of persons who had incomes of more than 1,200 crowns; therefore we know, of course, the number of the persons below this threshold. The amount of their incomes, however, remains unknown. Since we dispose of abundant demographic data, we know the proportions of those parts of the population that are most likely to constitute the income class of 1,200 crowns or less: children, agricultural labourers, blue collar workers, house servants, young people in education, and so on. On the country-wide level, the numbers of these groups nearly add up to the number of lowest class income earners as reported in the official tax statistics. However, on the level of districts, this is not the case: the proportion of people who were exempted from the tax varied considerably between districts whereas the proportion of lower class professions showed relatively little regional variation. Obviously in some regions, for instance, a number of blue collar workers earned enough income to pay tax, whereas in other regions all blue collar workers remained under the minimum taxed income. Anyway,

Table 1: GDP estimates and personal income, Imperial Austria, 1911

GDP at factor cost	17,759	
Indirect taxes	1,287	1,287
Capital consumption allowance		1,905
Undistributed profits		222
Gross declared personal income		5,382
Personal income of 1,200 crowns or less		8,814
Undeclared personal income		1,436
GDP at producer price	19,046	19,046

Sources: GDP at factor cost: Schulze (2000); Indirect taxes: Central-Rechnungs-Abschluß 1911; declared personal income: Mitteilungen des k. k. Finanzministeriums. Wages: Foltz (1878), Waizner (1927–28), Mesch (1984).

Notes: Numbers in million crowns. Capital consumption allowance = 10 percent of GDP at producer price; Undistributed profits = 10 percent of business and capital incomes; Income of 1,200 crowns: agricultural labourers 475 crowns; blue-collar workers 800 crowns; house-servants 300 crowns; children 200 crowns.

applying typical wages of those professional groups as given in the literature, to the census results, we get an impression at least of the order of magnitude of country-wide tax-free incomes (for wages, see, for instance, Foltz 1878, ix; Waizner 1927–28; Mesch 1984).

Third, we may assume some under-declaration of income for tax reasons, although the tax rate was low. Under-declaration may be the result of an unclear income situation (especially with subsistence incomes) or outright tax evasion. In a study on income distribution, under-declaration would be of no importance if it were uniform among all classes of income, all sources of income, and all regions. If this is not the case, the result may be distorted. It may be, for instance, that tax evasion happened more often in the lower part of the income distribution (especially near the 1,200 crown threshold) or, that subsistence income was declared less reliably than market income. The effects would probably affect different income classes and different sectors in different ways.

Table 1 compares an estimate of GDP with the results of a personal income approach. According to Schulze (2000), GDP at factor cost was about 18.5 billion crowns at 1913 prices, that is, 17.8 billion at 1911 prices. GDP at producer price would therefore be 19.0 billion crowns. GDP at factor cost is supposed to be equal to the sum of depreciation, undistributed profits, and personal income. For capital consumption, we assume 10 per cent of GDP at producer price; further, we assume undistributed profits to be 10 per cent of business and capital incomes; these assumptions are, of course, just more or less plausible assumptions. Income according to the tax statistics is estimated at 14.2 billion (for the estimation, see Appendix 2). 5.4 billion were declared and taxed, the remainder of 8.8 billion is the income of people below the 1,200 crown tax-free threshold. Under these assumptions, about 1.4 billion crowns of personal income were not tax-free and not declared, which would mean that 21 per cent of declarable income (that is, income of more than 1,200 crowns), or 9 per cent of all household income remained undeclared. Using Kausel's estimate of GDP of 17.3 billion crowns (at 1911 prices), undeclared income is 1.15 billion crowns, which would be equal to 16 per cent of declarable income and 7 per cent of all household income (Schulze 2000; Kausel 1978). It is perfectly conceivable that tax evasion amounted to one tenth of GDP; by modern standards, such an degree of tax evasion would rather be regarded as moderate (see, for instance, of many papers by the same author: Schneider 2014). Given the fact that the reference estimates of GDP are, of course, subject to a certain margin of error as well, the tax data seem to be a quite useful source.

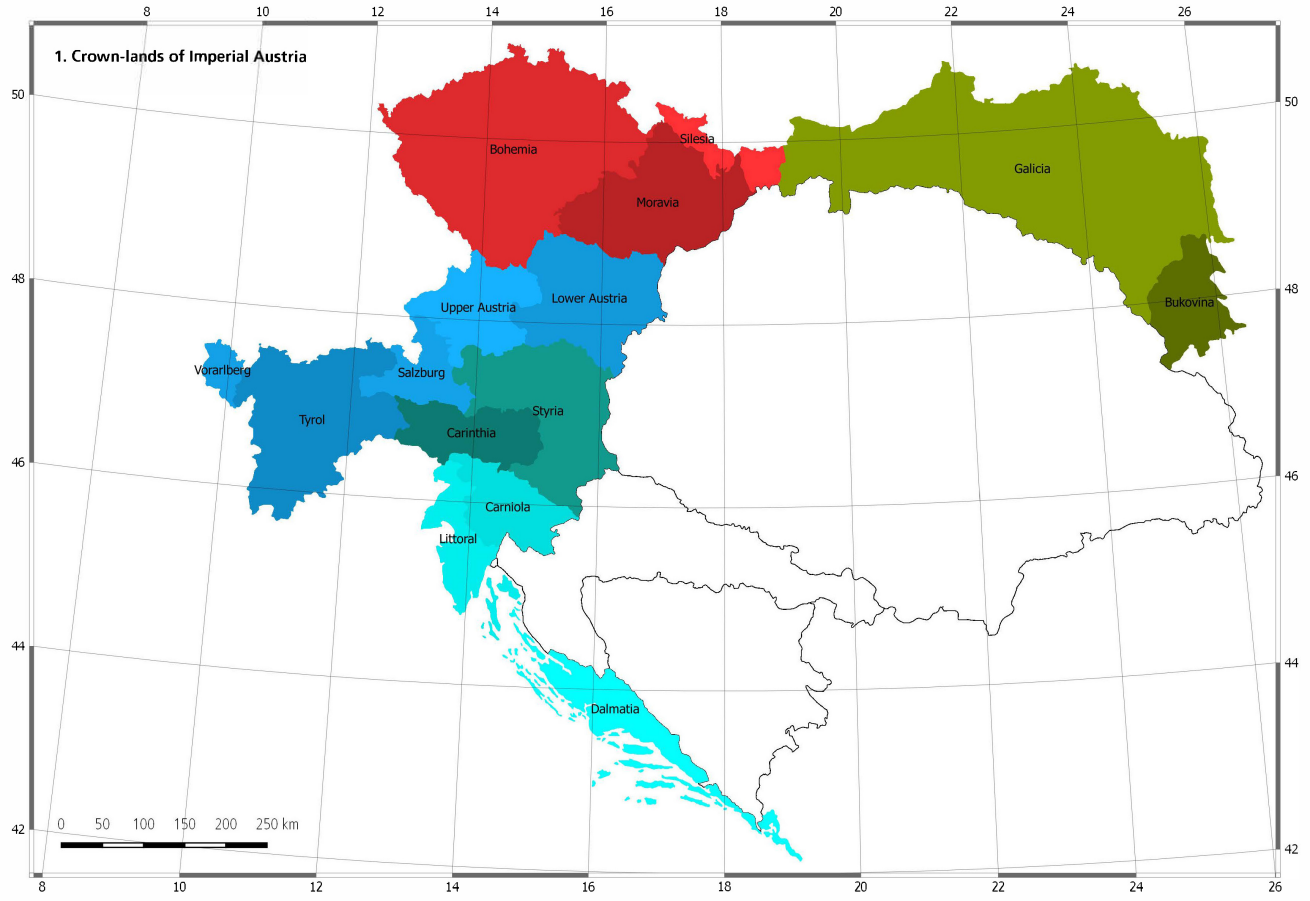
Regional income and income distribution

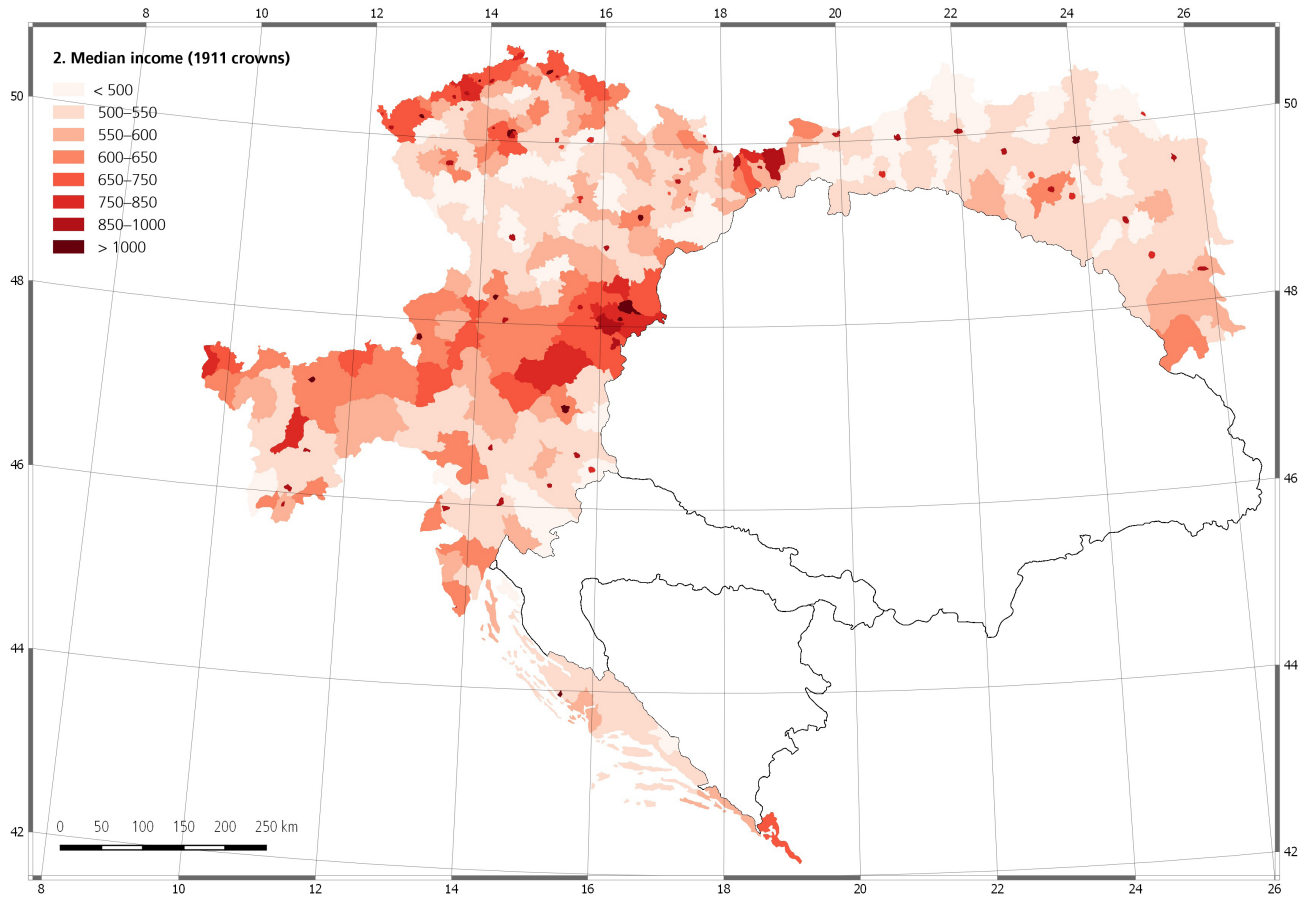
In the following, regional income and inequality are estimated using the tax data (for the method, see Appendix 2). Units of analysis are the political districts and townships; there were about 440 districts, all crown-lands are included (Map 1).

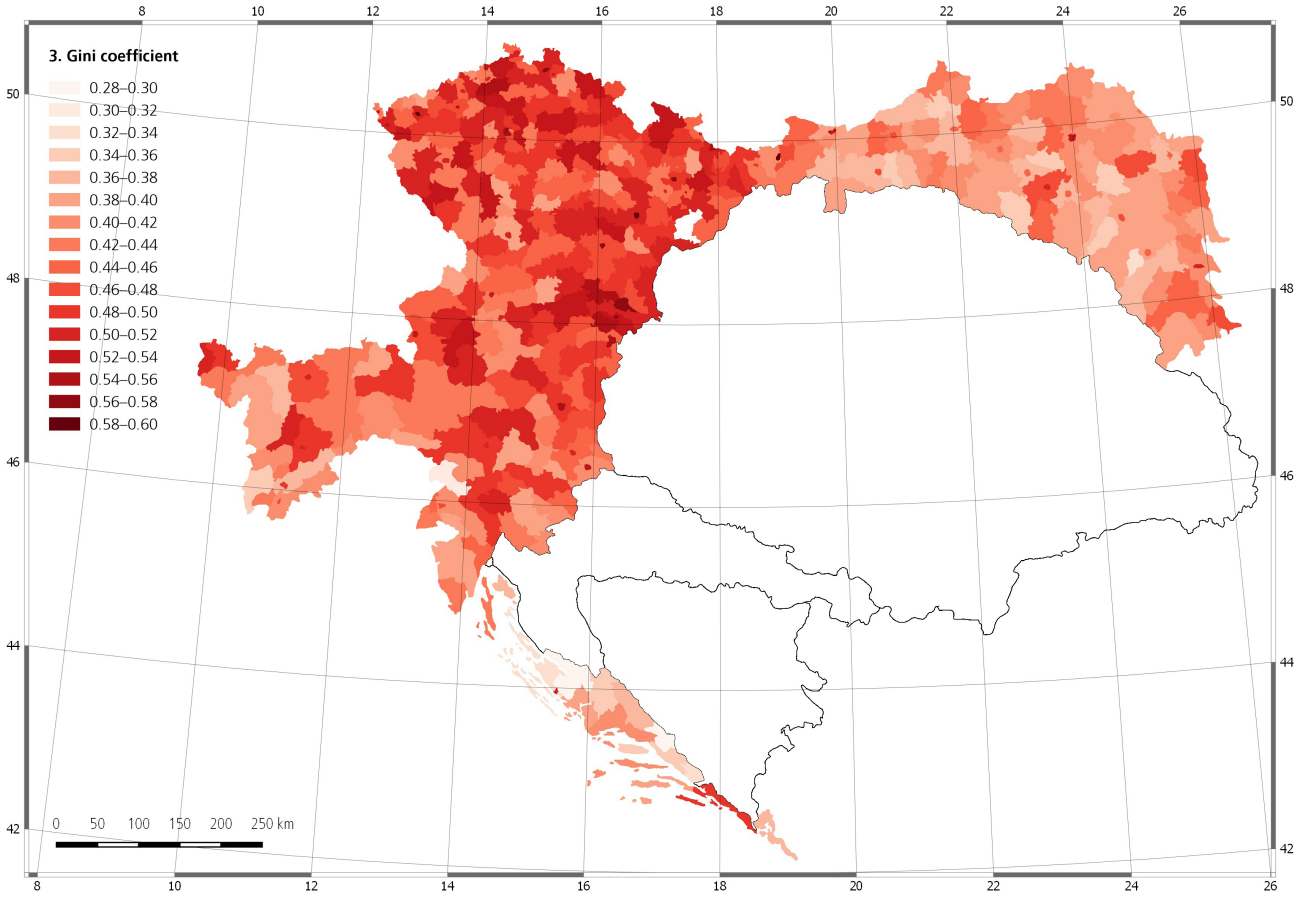
For brevity, among all possible income measures, the analysis focuses on the median because it is not sensitive to outliers. The regional distribution is shown in Map 2. Median income was relatively high in the Alpine lands, particularly in the industrialised area reaching from the Vienna municipal area south to Upper Styria, in North and Central Bohemia, and in Silesia. Some of these areas were densely populated (such as the Vienna area, and North Bohemia), but generally population density shows no particular connection with income. For instance, major parts of Galicia were densely populated as well, but incomes in Galicia were low almost everywhere.

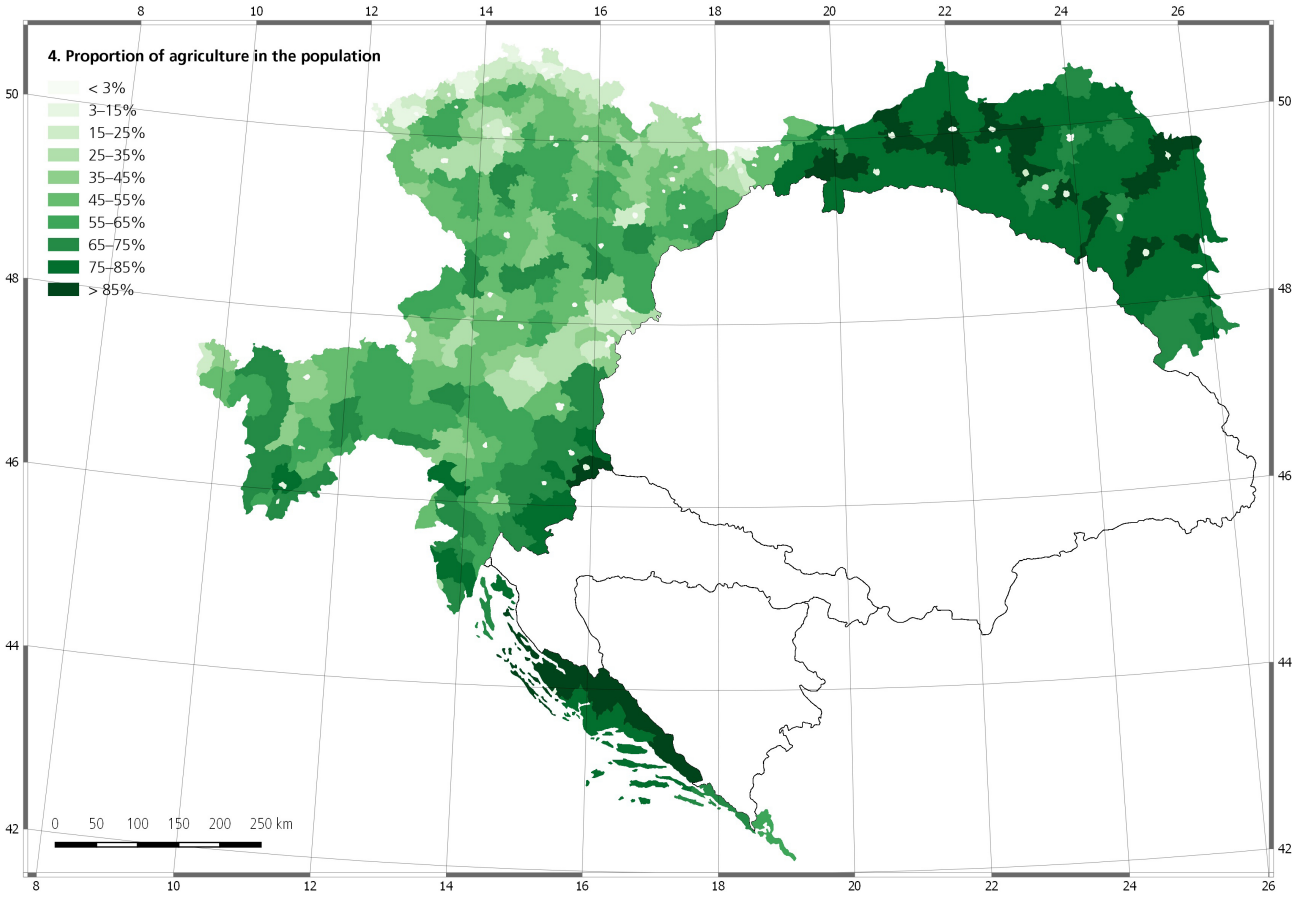
Income distribution shows a somehow similar pattern, although not a perfect replication. Map 3 shows Gini coefficients for all districts. Again, the coefficients are high in the Alpine lands, but also everywhere in the Bohemian lands (not just in North Bohemia and Silesia). Galicia, Bukovina and Dalmatia had a rather egalitarian distribution, but other low-income areas like, for instance, Carniola, had not.

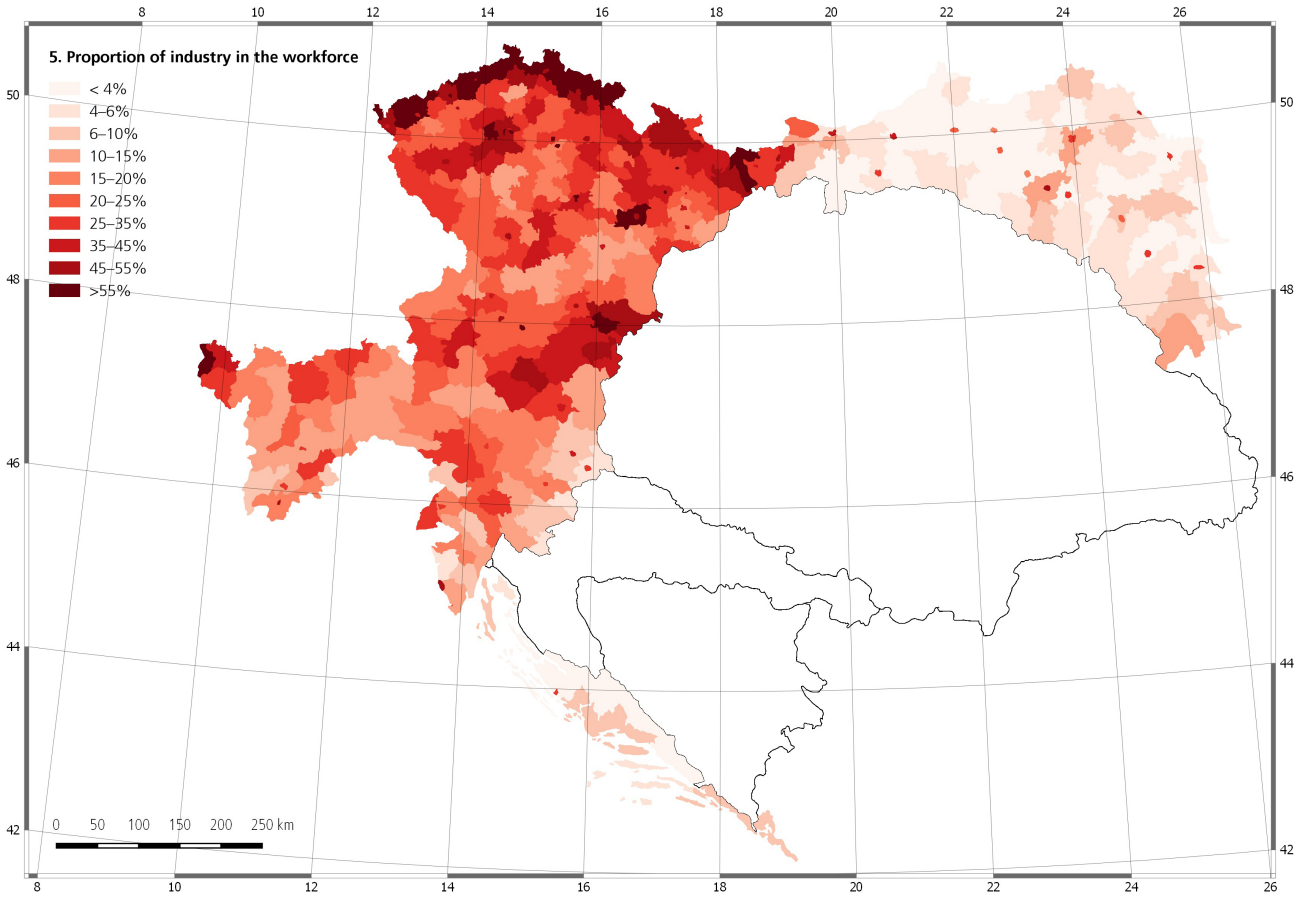
Model 1 in Table 2 gives estimates of a regression where the standard deviation of the income distribution is the dependent variable, and the logarithm of the median income is the independent one (both are estimated as described in Appendix 2). As expected upon visual inspection of the maps, the effect is positive and highly significant.











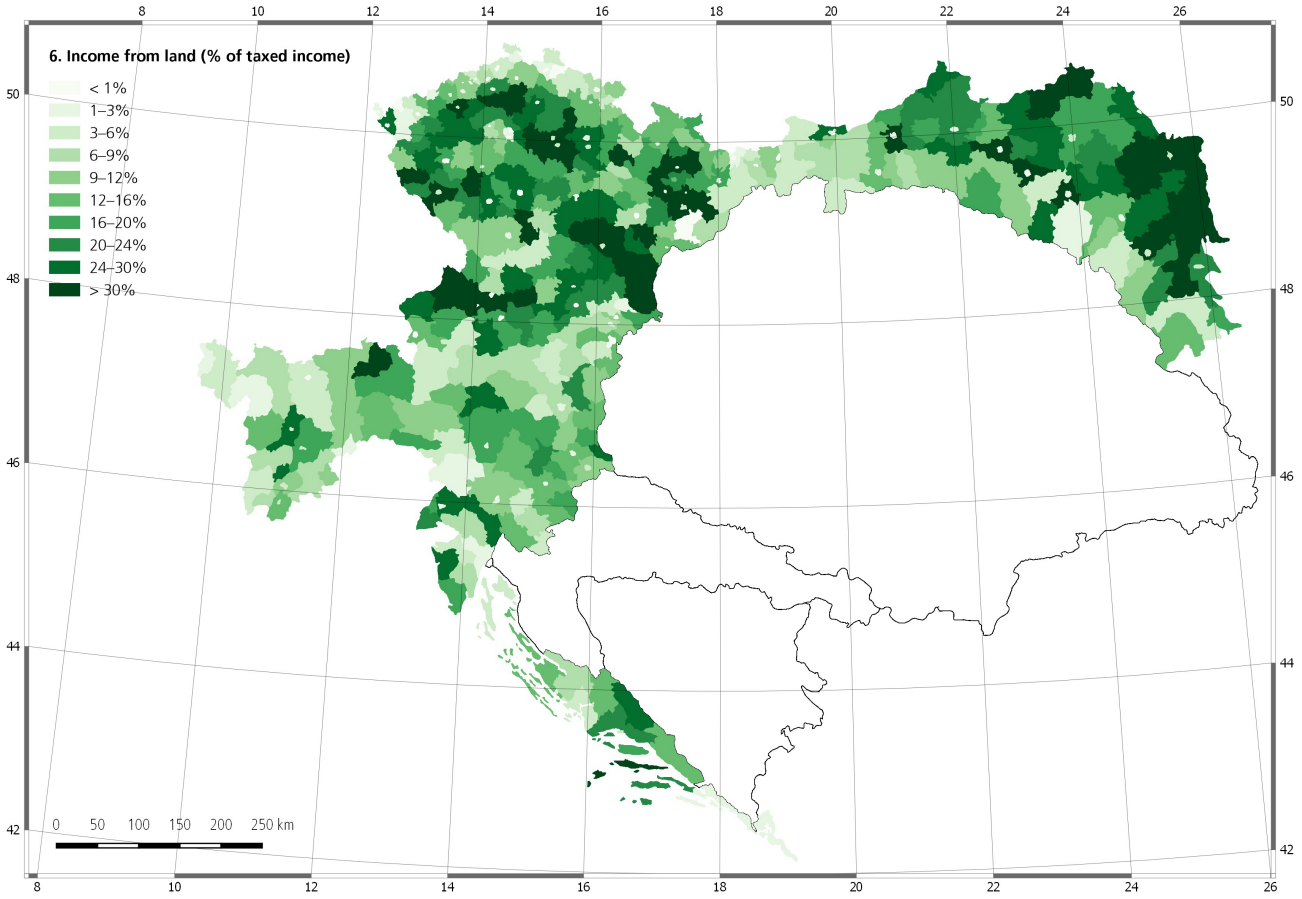


Table 2: Factors for the income distribution, Austria, 1911

	Model 1			Model 2			Model 3		
Constant	–1.005	(–7.148)	***	,405	(.095)		1.001	(119.278)	***
μ	.291	(13.266)	***	–,142	(–.108)				
μ²				,033	(,331)				
% Agriculture / population							–.003	(–19.469)	***
Adj. R^2	0.28			0.28			0.46		
N	443			443			443		

Sources: Mitteilungen des k. k. Finanzministeriums 18 (1912); Ergebnisse der Volkszählung 1910.

Notes: The dependent variable is the standard deviation of the log-income distribution. μ = log of median district income. Values in parentheses are t-statistics. *, **, *** significant at the 5 per cent, 1 per cent, and 0.01 per cent level.

So far, it seems that higher income produced a higher degree of inequality. An extended model addresses the question whether there was a counteracting tendency in areas with highest incomes, in other words, a Kuznets curve. If inequality rose only up to a certain level of income and started to decrease afterwards, the Gini coefficient would be positively connected with income, but negatively with squared income. Model 2 (Table 2) shows no sign of such a relation: the income variables have the wrong signs and, above all, they have no significant effect on the Gini coefficients.

Therefore, on the whole, it seems that in regions at different levels of development, higher income was associated with higher inequality.

Following the argument outlined in the first section, it makes sense to include other factors like the sectoral structure, education, and migration, in the analysis. In all of Imperial Austria, 48 per cent of the population belonged to the agricultural sector in 1910 (this is not the proportion in the workforce but in the overall population). Map 4 shows the share of the agricultural sector in the population, Map 5 the share of industry in the labour force. Upon visual inspection, it is obvious that areas with a large share of agriculture, and a small share of industry, have both low income and a low degree of inequality. This is especially true for income: A regression with the log of median income as the dependent variable, and the share of agriculture as the independent one, shows an extremely strong negative relation, with an R^2 of 0.73 (not shown in the tables). The relation between the share of agriculture and inequality is also very strong (Model 3, Table 2): Again, the effect is negative and highly significant, with an R^2 of 0.46.

Both effects are the expected ones: income growth in the 19th century happened in countries and regions with a shrinking primary sector, and the inequality in the primary sector was considered low. But what does this mean for the direct relation between income and inequality? Is there still any relation between the two, if we take the sectoral structure into account?

Model 4 in Table 3 combines the previous (bivariate) models, employing both the share of agriculture, and (log) median income as independent variables (the Gini coefficient is the dependent variable again). In this model, the share of agriculture keeps its strong influence on distribution: a lower share of agriculture means a higher degree of inequality. This effect remains practically unaltered in all other models, employing other variables like income from various sources (land, capital, and others), alphabetisation, migration variables, and so on (most models are not shown in the tables). Thus, the share of agriculture has a strong and robust negative effect on inequality.

The effect of income growth on distribution is more complex. Employed in its simple form, rising income leads to a lower degree of inequality, provided the sectoral share is corrected for. In other words, we expected a rather unequal distribution in districts with a small share of agriculture and high income, because the agricultural sector is more equally structured than the other sectors. In fact, in these districts the distribution is indeed more unequal than in underdeveloped districts, but it is so to a lesser extent than expected. This means that within-sector inequality seems to have decreased.

However, this change seems to have happened up to a certain point only. Employing the income variable not in its simple form but in combination with its squared version, we see that income is still negatively related to inequality, but squared income is positively related to it (Model 5, Table 3). In other words, up to a certain income level within-sector inequality is decreasing, but from that level on, it is rising again – the opposite of a Kuznets curve. The turning point is more or less the same in different models. If b_1 is the coefficient of income, and b_2 the coefficient of income squared, then the turning point y is found at $(b_1 / [2 \cdot b_2])$. Various models (not shown in the tables) yield consistent results with little variation, with a median income (that is, e^y) of around 900 crowns per year as the turning point. There were not many districts above this level: 90 per cent of the Austrian districts had

Table 3: Factors for the income distribution, Austria, 1911

	Model 4			Model 5			Model 6		
Constant	1.658	(6.734)	***	14.341	(3.789)	**	15.505	(4.267)	***
μ	–.098	(–2.672)	**	–3.960	(–3.441)	**	–4.283	(–3.865)	**
μ²				.294	(3.358)	**	.319	(3.772)	**
% Agriculture / population	–.004	(–12.422)	***	–.004	(–13.001)	***	–.004	(–10.535)	***
% Capital income / overall income							.263	(2.292)	*
% Labour income / overall income							–.341	(–7.623)	***
% Analphabets / population +10 yrs							–6.410E–05	(–2.316)	*
Adj. R^2	0.47			0.48			0.63		
N	443			443			361		

Sources: Mitteilungen des k. k. Finanzministeriums 18 (1912); Ergebnisse der Volkszählung 1910.
Notes: The dependent variable is the standard deviation of the log-income distribution. μ = log of median district income. Values in parentheses are t-statistics. *, **, *** significant at the 5 per cent, 1 per cent, and 0.01 per cent level.

still a median income of less than 900 crowns in 1911. Still, it seems that the equalising effect of income growth was strong at the lower level of development and grew weaker with continuing growth.

Tax data reveal also the sources of income, distinguishing between taxed income from land, from capital, from labour, and from other sources (Maps 6, 7, and 8). The respective proportion of these sources in overall income are closely associated with income distribution: Typically, districts with a high proportion of income from land and from capital show a higher degree of inequality, whereas districts with a high proportion of income from labour were more equally structured (Model 6, Table 3; income from land is not included in this model). These effects are not particularly surprising.

The effects of education are harder to assess. The census data contain some data on alphabetisation, such as the number of people able to read, or able to write. Therefore, we get a crude measure of analphabetism, that is, people without any basic reading and writing abilities (Map 9). Since Austria had had compulsory schooling from the 18th century on, analphabetism in 1911 is rather a sign of institutional disfunction in areas where school authorities were not able to enforce schooling completely. Those areas were usually economically backward rural areas with low income which incidentally had a low degree of inequality. Therefore in the statistical models, analphabetism is associated with a rather equal distribution. However, the effect is not particularly robust.

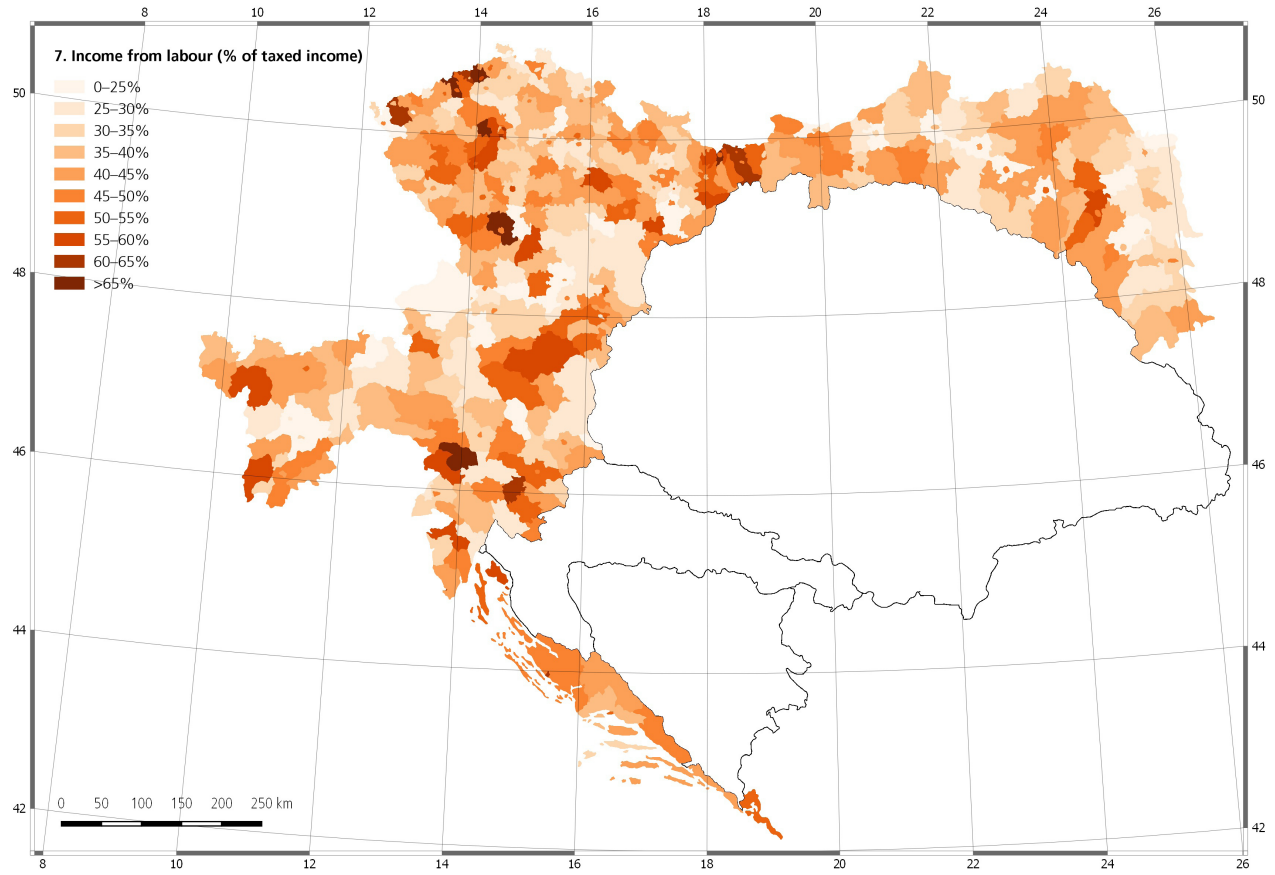
In the Austrian case, migration has no appreciable effect on distribution. The census informs about people born outside the district or outside the province of residence, and about migration gains of districts in previous years (Map 10). A growing labour force of unskilled migrants might be expected to have raised inequality. However, no such effect is so far visible in the statistical results. Migration seems not to have had any significant effect on distribution.

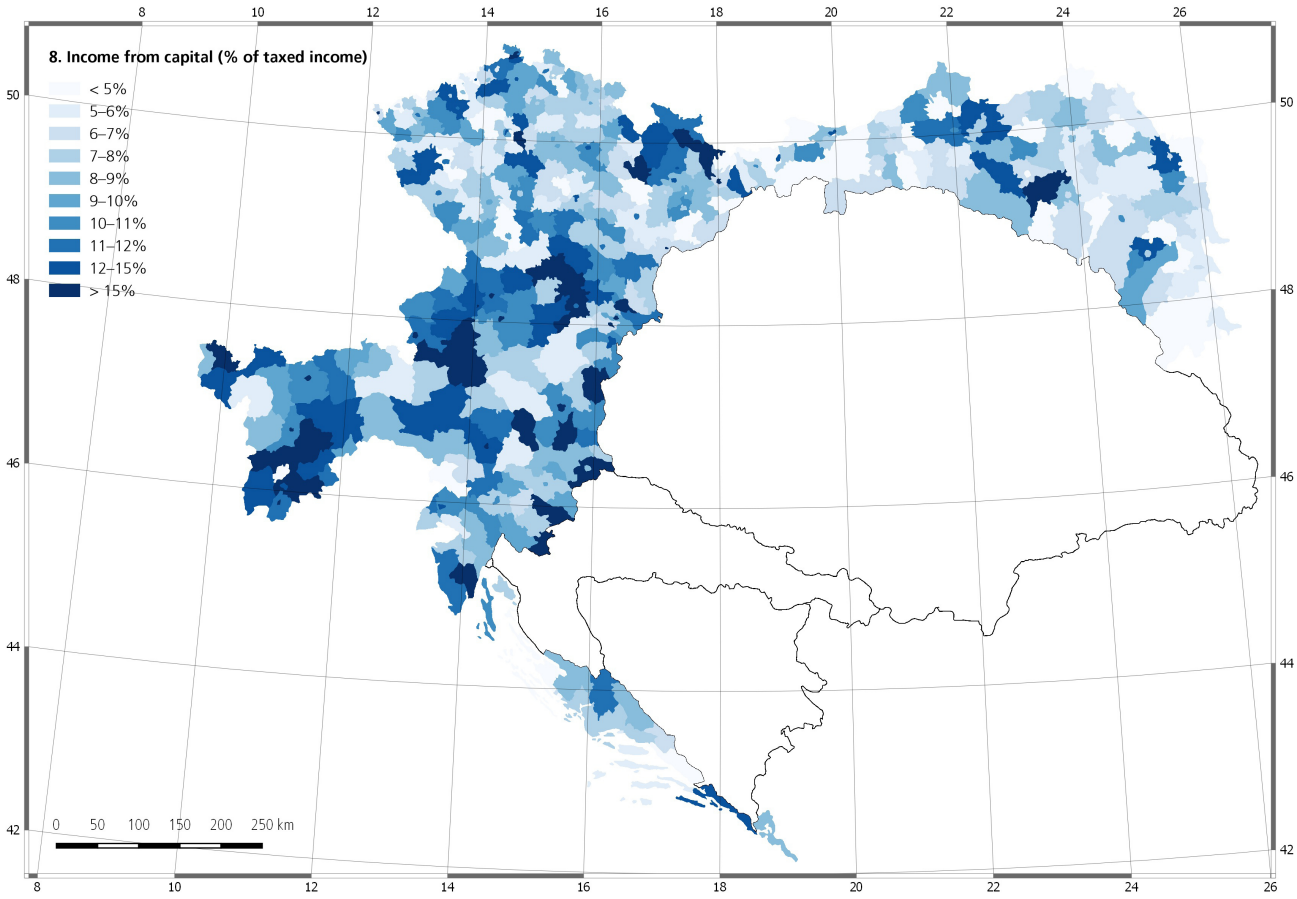
Conclusions

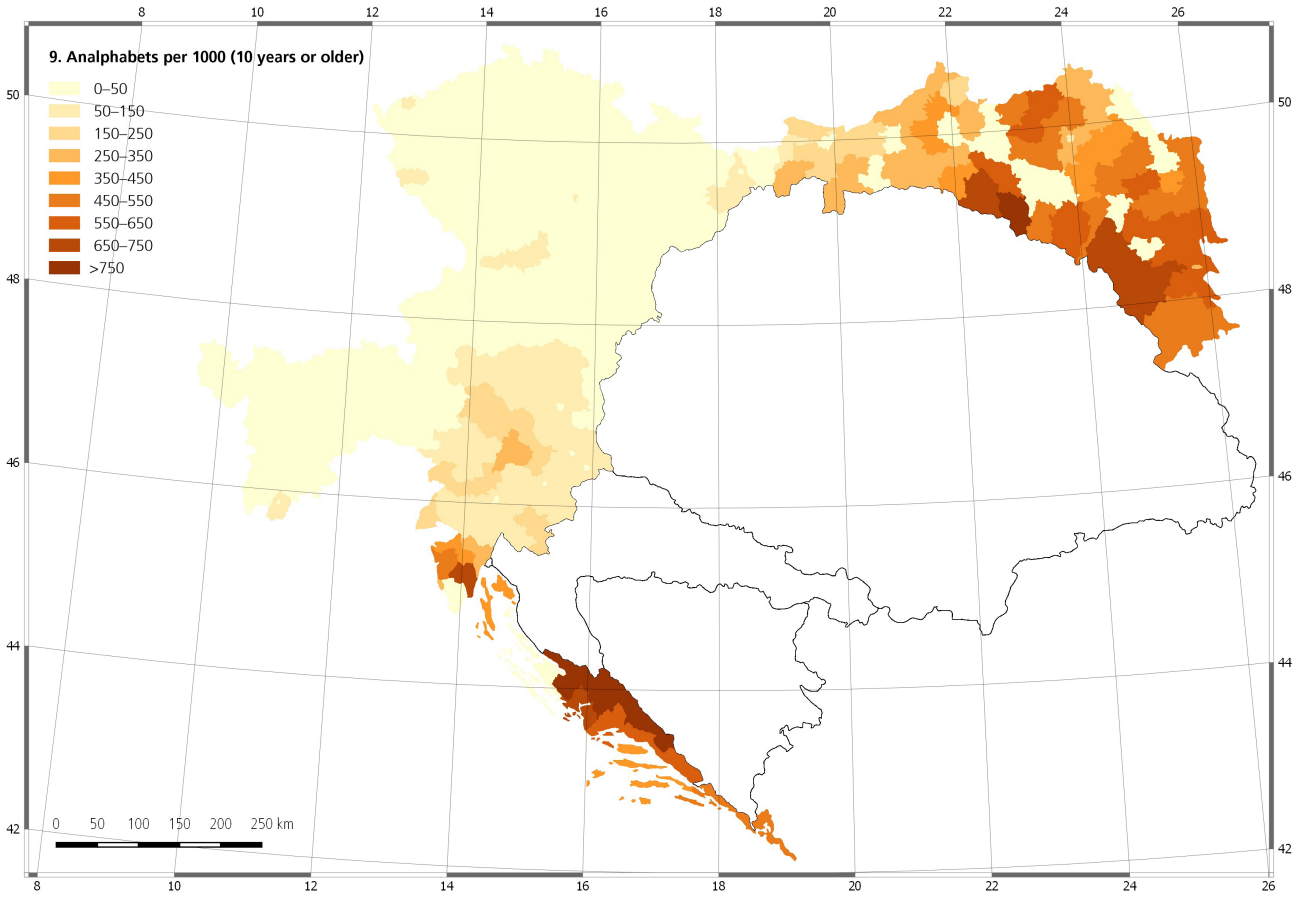
First evidence from Austrian sources suggests a simple answer to the question put at the beginning: Economic growth went hand in hand with rising inequality.

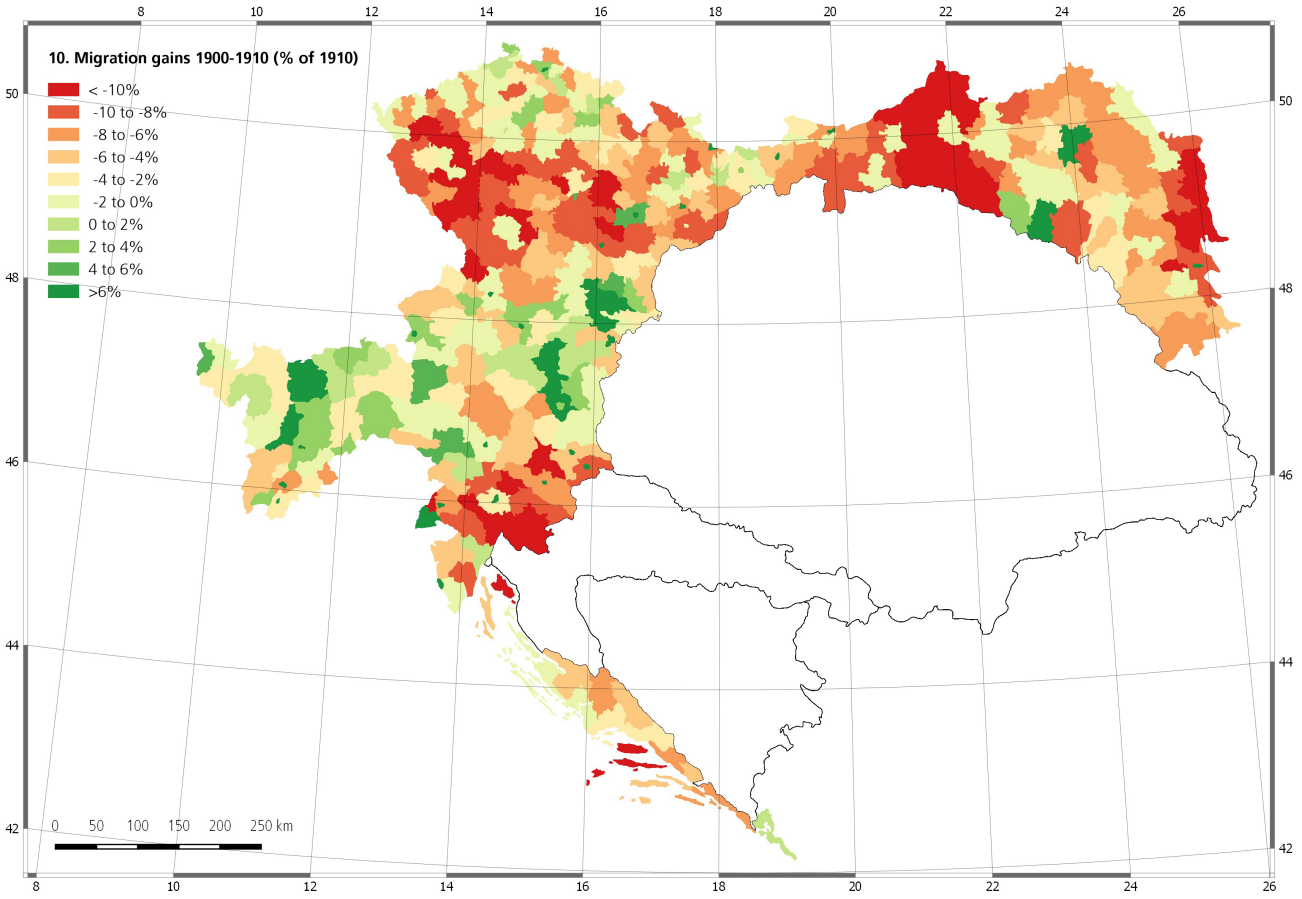
The explanation of the mechanisms behind is not so simple. First, the most important effect of economic growth on inequality was not a direct one. The most important factor was sectoral change. The share of the agricultural sector in the economy decreased, whereby inequality increased. In developing areas parts of the population left agriculture and started to work in industry or the service sector. In doing so, they raised their income (and the income of their district), and they raised the share of the non-agricultural sectors in their regional economy. This means, even if the distribution within the non-agricultural sectors remained unchanged, the overall distribution became more unequal – after all, non-agricultural sectors had a more unequal distribution than the primary sector, and their weight in the economy increased. In this sense, growth was associated with rising inequality indeed.

In part, however, this was offset by processes within the sectors: distribution within the sector did not necessarily remain unchanged. Controlling for sectoral shifts, we find decreasing inequality in the course of income growth. It seems that within-sector inequality decreased when income grew. In other words, with rising income, the lower income classes were able to raise their share. Typical areas of the kind were industrial districts, not necessarily heavily urbanised, but with an already only









moderate share of agriculture, such as areas in North Bohemia, Silesia, Upper Styria, and Vorarlberg, where a strong class of skilled and relatively well-paid workers was able to take its share.

Again, however, this effect did not work uniformly at all income levels. It was stronger at a lower and middle level, petering out at the level of the highest income areas of Imperial Austria. In these areas, the upper classes, whether it be business-people in industry or finance, high-ranking officials, or free professionals, were able to take a disproportionately large share of income.

Clearly, the difference between an agricultural (and backward) Galician district, and an industrial (and advanced) North Bohemian district, is very much a matter of development. But the difference between an Upper Styrian mining district, and the City of Vienna, is not necessarily a matter of development: rural Upper Styria, leaning on mining and heavy industry, had a function different from the industrial, administrative and financial centre of the capital. Therefore, it may well be that the differences observed in Austria in 1911 are not just a matter of history, but also of geography: regions at different levels of income represent different stages of development, but they also represent different geographical situations.

Appendix 1: Income tax statistics

The estimates of the income level and income distribution are based on personal income tax statistics. The personal income tax was newly introduced by law in 1896 and became effective from 1898 on. It replaced a less advanced personal income tax regime introduced in 1849. The new tax was meant to affect all sources of actual income in money and in kind and its equivalent. For instance, people who lived in their own homes had to pay tax on the fictitious rent that property would have yielded in the market. Subsistence income, important in a country with half the population still working in agriculture, was subject to taxation like any other income. Thus, income properly declared in the tax records, gives a good idea of actual material welfare. In addition, aggregated taxed personal income is supposed to be close to national income at factor costs. It does not include undistributed profits (these were subject to corporate tax but not personal income tax),

The income tax was progressive. The basic tax-free allowance amounted to 1,200 crowns; up to this amount no income had to be declared. Incomes of more than 1,200 crowns were taxed not with a certain percentage but with a certain amount that was uniform within each tax bracket, which means that the effective marginal tax rate and the average tax rates were degressive within every tax bracket. For instance, 124 crowns were imposed on all incomes between 6,000 and 6,600 crowns. There were more than sixty tax brackets. From 96,000 crowns on, the tax rose by 200 crowns from one tax bracket to the next, and the width of tax brackets was 4,000 crowns. Thus, looking at the upper limit of tax brackets, the highest marginal tax rate was 5 per cent (there were provisions that it never amounted to more than 100 per cent but it was confiscatory in some cases).

The published tax statistics give the numbers of tax accounts in every tax bracket for the crown lands. On the district level, the numbers are aggregated to just 17 income classes (1,200 to 1,300 crowns, 1,300 to 1,400 crowns, and so on).

The tax units were households, which means that heads of households represented all members of their households (these were normally their relatives living in the household, with certain exceptions who were treated as a separate household). All income of all household members was thus ascribed to one tax account. The overall numbers of persons in taxed households are listed by district in the tax statistics. Therefore the size of the average 'tax household' for incomes above 1,200 crowns is known for every district. However, we do not know the average size of households in every particular tax bracket. Assuming the same household size for all income classes above 1,200 crowns, we can crudely estimate the proportion of the population in every tax bracket.

This assumption is rather arbitrary because households in different tax brackets might well have differed in size, which would alter the proportion of the population in the respective tax brackets.

The same problem appears with respect to the incomes of 1,200 crowns or less. Since these incomes remained tax-free anyway the fiscal authorities did not care about them, and they did not ascertain the amount of income or the number of 'tax households' in this class. In the tax statistics, the whole class is omitted. The income in this lowest class is necessary to know if we want to determine overall income and the distribution of income. Since there are no direct observations to rely upon, we have to take an indirect approach. In the present study, the problem is addressed by assuming a lognormal distribution of income, which enables us to complement the distribution by extrapolation. (See Appendix 2)

In order to do the calculations we have to decide about the relevant income and tax units. Income and tax units may be individual persons, or 'tax households' consisting of any number of persons. The result will determine at which percentage point the distribution is censured.

If individual persons constitute the relevant units the answer is easy: The number of people below an income of 1,200 crowns is known because this is the remainder after subtracting the number of people in taxed households from the overall population. If we treat people below the 1,200 crown threshold individually (and not in household units) we must treat people above the threshold individually as well. Since we dispose only of household incomes (and not individual incomes) we will have to assume an equal income per head within households. Such a proceeding is equivalent to the assumption of a uniform size of households in all ranges of the income distribution including income earners below 1,200 crowns.

On the other hand, if we deal with households (regardless of their size) not individuals as tax units, the outcome is less clear because we know the number of households with incomes of more than 1,200 crowns but not the number of households below this threshold. It is unlikely that lowest income households were as large as higher income households because many unmarried persons like farm labourers living in their workplace earned less than 1,200 crowns. In terms of the personal income tax, these persons constituted a separate 'tax household' although in fact they may have lived in a household with numerous persons: their incomes were not added to their employers' incomes because they were not part of a shared housekeeping.

Although there is no way to determine precisely how large households were, particularly in the lowest range of the distribution, we can determine the effect of various assumptions on the results. The benchmark is an average household size of 1, that is, no income earners under the threshold of 1,200 crowns share their income with other persons. The upper limit is an equal household size for people below and above the 1,200 crown threshold (given the large proportion of unmarried persons in the lowest income range we can exclude the possibility that these households were larger on the average than those of more affluent persons).

A lowest class household size of 1 yields a more unequal distribution between households, which is trivial because the lowest income households consist of just one person and have therefore just one earner and one income whereas an aggregation of the same households results in adding up several of those incomes. In addition, a lowest class household size of 1 yields a higher per capita income: in this scenario, per capita income is just about 15 per cent higher compared with the assumption of an equal household size in all income classes. Since the actual household size in the income range below 1,200 crowns will be somewhere between the two extremes, the exact location of the censure point will exert little influence on the outcome.

In addition, the size of households differs from one region to another, which is evident for households with an income of more than 1,200 crowns and highly probable for those below. The size of households with an income above 1,200 crowns varies in different districts from less than three persons to more than four.

Appendix 2: Distribution estimates

The estimates on regional income and income distribution were made under the preliminary assumption that income was lognormally distributed. The dataset consists of the tax data (for incomes of 1,200 crowns or more) and data from the literature (for incomes of less than 1,200 crowns) (Waizner 1927–28, 114–115).

The assumption of a lognormal distribution relies on empirical findings in other studies and on theoretical considerations about the way how factors determining income interact. Empirically, most studies about income and wealth distribution suggest that a lognormal distribution is there (which is consistent with the conventional wisdom that there are usually many people earning low incomes, and ever fewer people in ever higher income classes, and no one who earns nothing) (see, for instance: Adams 1958; Aitchison/Brown 1954; Aitchison/Brown 1969; Kalecki 1945; Pammer 2003; Roy 1950; Smith 1991; Soltow 1981; Soltow 1982; Wright 1970; Yang 1984). Theoretically, the basic assumption is that determinants of income usually interact multiplicatively not additively. An additive process would produce a normal distribution, while a multiplicative process produces a lognormal one.

If we assume a lognormal distribution whose upper end can be observed, the rest of the distribution can be

estimated by extrapolation. The tax statistics inform us about the proportion of the population earning 1,200, 1,300, 1,400, 1,600, 2,000, 2,400, 3,000, 3,600, 4,400, 5,200, 7,200, 9,200, 12,000, 20,000, 40,000, 100,000, and 200,000 crowns in each district (of course, as the distribution is supposed to be lognormal, all those values are converted into their logarithms).

In a normal distribution the proportion of the population below a given threshold is precisely defined and can be converted into the number of standard deviations between the mean and the respective threshold. Since the proportion of people earning, for instance, 2,400 crowns or less, will differ between districts, the same will be true for the number of standard deviations between the median income and an income of 2,400 crowns. If, for instance, 85 per cent of the population earn 2,400 crowns or less in a given district, this means that in this district the distance between the median income and an income of 2,400 crowns is 1,0364 standard deviations.

Thus, every district has its own relation between the income class limits and the corresponding numbers of standard deviations. This enables us to estimate a regression equation for each district, where the logs of income thresholds are the dependent variable and the number of standard deviations corresponding to the respective threshold, the independent one. The beta-coefficient is nothing else than the standard deviation itself, and the constant term is the median income. Knowing the properties of the distribution, we know, of course, proportions of income earners at all levels including incomes below the basic tax-free allowance. Estimates of median incomes and standard deviations for all districts can be converted in other measures like variation coefficients, Gini coefficients, per capita incomes, and so forth (for these calculations, see Aitchison/Brown 1969).

The accuracy of these estimates is relatively high. Standard errors of beta-coefficients are small, with t-values between 8 and 185 (mostly around 20), which results in confidence intervals for Gini coefficients of ± 0,01 to ± 0,12 (mostly around ± 0,044) at the 5 per cent level of significance. This high accuracy is predetermined by the model design because the model estimates the relation between two monotonically growing variables (the higher the income, the larger is the proportion of the population below this income). In such a setting, it is impossible to produce results that are not statistically significant.

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