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Decomposition of Wealth and Income using Micro Data from Austria

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Editorial

This paper analyses Austrian data on (financial) wealth and income. The main focus lays on the distribution of these indicators. Using a decomposition procedure of the Gini Index first proposed by Lerman and Yitzhaki (1985), it is possible to recover the effect of specific forms of investments of assets and of certain sources of income on the overall distribution (in terms of an elasticity) of wealth and income in Austria. For the first time Austrian wealth and income data are used to decompose the total distribution into various categories. Additionally, there are, due to the lack of available data on household wealth, internationally only very few attempts to compare wealth and income using decomposition methods. The analysis shows that specific forms of assets (mainly more sophisticated ones) as well as income from sources that are concentrated on a small group tend to increase inequality whereas the others have an equalizing effect.

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Decomposition of Wealth and Income using Micro Data from Austria

Peter Lindner*

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Abstract

This paper analyses Austrian data on (financial) wealth and income. The main focus lays on the distribution of these indicators. Using a decomposition procedure of the Gini Index first proposed by Lerman and Yitzhaki (1985), it is possible to recover the effect of specific forms of investments of assets and of certain sources of income on the overall distribution (in terms of an elasticity) of wealth and income in Austria. For the first time Austrian wealth and income data are used to decompose the total distribution into various categories. Additionally, there are, due to the lack of available data on household wealth, internationally only very few attempts to compare wealth and income using decomposition methods. The analysis shows that specific forms of assets (mainly more sophisticated ones) as well as income from sources that are concentrated on a small group tend to increase inequality whereas the others have an equalizing effect.

Keywords: Wealth distribution, income distribution, decomposition by components/factors.
JEL Classifications: D3.

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1 Introduction

The decomposition of distribution measures has a long-standing theoretical as well as empirical background in economic analyses. More or less closely connected approaches for the decomposition of income inequality measures in various forms have been discussed in the literature. Researchers from different backgrounds interested in the set-up of the economy looked at this problem. Documenting the distribution of wealth and income as well as the change of these indicators over time, has also been studied by many authors. The goal of this paper is to out these strains together and investigate the wealth and income distribution in Austria by decomposing them into various contributing components/factors.

Lambert and Aronson (1993), for example, analyse how overall inequality can be attributed to different subgroups in the population[1] and how the resulting coefficients can be appropriately interpreted using the geometrical representation of the Lorenz curve. A special emphasis is put on the within group, between group and overlapping components of the Gini coefficient. So, this approach decomposes inequality according to socio-economic characteristics of the population under consideration.

Decomposition procedures were also applied by labour economists to approach several key questions in the distribution as well as differences in income.[2] These extensively informative studies concentrate on income distribution, but have little to say about wealth distribution. It is also not possible to analyse questions about wealth with this type of decomposition procedures using the income generating function since there is no theoretical foundation for a similar estimation to this income generating process for wealth. Decomposing wealth and compare the results to the ones of income, however, is an interesting investigation. Already the documentation of wealth distribution, its development, and connections to poverty has attracted a huge variety of investigations.[3] For the decomposition exercise conducted here we turn to a line of research that decomposes the Gini Coefficient (henceforth abbreviated by GC), a well known and widely used measure of the distribution, according to various sources. This line of thought has its beginning with the publications of Gastwirth (1971), Gastwirth (1972), and Gastwirth and Glauberman (1976), where the authors looked very closely at the Lorenz-Curve and the

[1] See also Silber (1989) for a theoretical approach along similar lines.

[2] See e.g. Shorrocks (1982), Juhn et al. (1993), Fields (2003), and Yun (2006) for studies using U.S. data; Gunatilaka and Chotikapanich (2009), and Morduch and Sicular (2002) for Sri Lanka and rural China respectively; and Cowell and Fiorio (2009) as well as Frosini (2011) for a theoretical discussion with an international empirical application.

[3] Se e.g. Davies et al. (2009), Jenkins and Jäntti (2005), Peichl et a. (2010), Wolff and Zacharias (2009), and Dell et al. (2005).

calculation of the GC. The ideas were further developed by Dorfmann (1979) and Lerman and Yitzhaki (1985). We take this approach and apply it both to wealth and income in Austria. The sort of question one tries to answer with this method is how does a change of the distribution of a certain type of wealth holding or income affect overall wealth or income distribution, respectively. Another interesting aspect, that is analysed here as well, is how certain ways of holding financial/housing wealth or generating income are correlated with total wealth holdings and income. Furthermore, we can see how important certain investment or income aspects are for total financial/housing wealth and income. And, finally, we will also have a close look at the distribution of the various investment possibilities and income sources. By doing so, we document for the first time in Austria various specific aspects of income and wealth distribution.

The results show that there are huge differences in how financial assets are held. More sophisticated forms of the portfolio choice menu (e.g. bonds or business participations) are largely restricted to certain parts in the the population. Along these lines the changes in different ways financial wealth is held have a significantly different impact on the overall distribution. A similar finding holds for earnings. From several sources of income, that are under consideration, only some forms are received by a large fraction of the sample population (like income from employment), others, however, generate a stream of income for only a small part of the population (e.g. income from rent and lease) and hence there are different consequences for the overall income distribution.

The article is organised as follows. The next section lays out the conceptual and methodological background of the wealth/income concept and the decomposition procedure applied. Then the data that are used in the analysis are introduced, which is followed by the main part of the article that discusses the results. The final section gives concluding remarks and some ideas for further research.

2 Background

2.1 Wealth and Income Concepts

The clear definition of wealth and income is itself a complicated endeavour. There are various issues that have to be accounted for.

On the one hand wealth consists of a wide variety possible forms ranging from holdings in the different forms of financial assets (including e.g. money holdings, savings, investments, stocks, and the like); over real assets like housing, cars or other real valuables; to social and human capital. Also income usually comes in several forms like income from

(self-)employments, rents, or return on investments (Smeeding and Weinberg (2001) investigates the possibility of a uniform definition of income). The distinction of and hence collection of data on the various forms of both income and wealth is a difficult task. This mights explain why there are so few data sources available that include both income and wealth at the level of detail that is needed for the decomposition presented in this paper.[4] In Austria, there is so far no source of data available that includes information on wealth as well as income.[5]

On the other hand the level of aggregation is not clear as income is (at least in the most common forms) received on a personal level and wealth typically is held or rather shared (as is income in a family with a main earner) on a household level. On top of that it is a priory not clear what constitutes a household.[6] Several attempts are in the literature[7] to account for the household structure in order to get some form of equivalence income. The most well know is using the OECD equivalence scale[8] giving the household head a weight of 1, each additional adult member a value of 0.5 and the weight of 0.3 to each children, and calculate the equivalence income of the household. The equivalence scales, however, also have their drawbacks. Sierminska and Smeeding (2005) give a recent summary on the common forms used in the literature, noting that

> "[p]recisely because the person assessing the wealth distribution has no idea about how the owners plan to utilize the wealth that is being measured, equivalence scales are difficult do determine with any precision." (Page 2)

Although equivalence scales are commonly used for the aggregate of the total income at the household level, it is not applied in wealth studies (see e.g. Azpitarte (2008)). Applying no equivalence scale is implicitly assuming perfect returns to scale, which is what we do in this exercise.

In order to keep the analysis as simple, clear, and comparable between wealth and income as possible as well as due to the lack of better data, we concentrate on the decomposition of financial wealth (housing wealth is provided in the appendix) into its various forms of holding and net / disposable income into the different forms it is received in separate

[4] Some notable exceptions include the Survey of Consumer Finance (SCF) (Federal Reserve) for the United States, the Survey of Household Finances (EFF) (Banco de España) for Spain, and the Survey on Household Income and Wealth (SIHW) (Banca D'Italia) for Italy.

[5] This lack of information will hopefully be filled once the data from the Household Finance and Consumption Survey (HFCS) (see e.g. `www.hfcs.at`) become available.

[6] See e.g. Smeeding and Weinberg (2001)

[7] See for example Buhmann et al. (1988), Ebert and Moyes (2003), or Koulovatianos et al. (2005).

[8] See e.g. `http://www.oecd.org/LongAbstract/0,3425,en_2649_33933_35411112_119669_1_1_1,00.html` [accessed on 12th September 2011].

data-sets. Doing so we abstract away from equivalence scales and cannot incorporate (due to data constraints) an overall decomposition of total household wealth including and combining financial and real assets, and of income using one dataset including all necessary information. This analysis is certainly a fruitful endeavour once the data from the HFCS become accessible.

2.2 Methodology

One of the most widely used measure of inequality is the GC. In order to tackle the questions posed in the introduction we look closely at this statistic. As is well known the GC is defined as the area between the Lorenz curve and 45-degree line. There are many different ways to calculate this value describing the unevenness of any empirical distribution function. In a recent survey from Xu (2004) they are described in detail. The most intuitive way to think about it can be written as the following integral of the above described area

$$GC = 1 - 2\int_0^1 L(u)du,$$

where $L(u)$ captures the Lorenz Curve. If we assume that the cumulative distribution function $F(Y)$ of total wealth (or income) Y is piecewise differentiable, zero for all negative values[9] of Y and has mean $\bar{Y}$, the GC can also be written in form of the covariance between Y and its distribution, $F(Y)$, normalized by the arithmetic mean. All the derivations are provided in the appendix (see appendix A.1).[10] So the alternative calculation can be stated as

$$GC = \frac{2}{\bar{Y}} cov[Y, F(Y)].$$

Now, we can think of total wealth or income consisting of several parts, e.g., as in Lerman and Yitzhaki (1985), total (household) income is the sum of the income for the head of the household, the income of other family member, transfers, etc. or one can also think of the total income consisting of income from wages, from letting a flat/house, from interest and dividends payments and so on. In the following empirical exercise we apply this line of thought also to wealth. To be more precise we think of total financial wealth being held in various forms of assets such as bank accounts, savings accounts, stock shares, bonds, life insurance and so on. Also housing wealth can be held in the primary housing unit, secondary housing, building land and so on (see appendix C.1). So, total wealth or income can be hold in or received from different sources such that $Y = \sum_{k=1}^{K} y_k$ where k

[9] That means $F(Y) = 0$ for $Y < 0$

[10] References of the original studies are given in the appendix, and can also be found in Xu (2004).

denotes the source of wealth and income, respectively. Noting the additive separability of the co-variance,[11] one gets

$$GC = \frac{2}{\bar{Y}} \sum_{k=1}^{K} cov[y_k, F(Y)].$$

In appendix A.2 the derivations of the decomposition method are laid out, so that it can be written as

$$GC = \sum_{k=1}^{K} R_k G_k S_k \tag{1}$$

where R_k is the relative Gini correlation between wealth (income) source k and total wealth (income), G_k is the relative Gini component of contributing factor k, and S_k is $k's$ share of the total wealth (income). Thus we can see how the source of wealth (income) is related to the total in R_k; i.e. it explains the correlation between the component k and the overall cumulative distribution. The estimate on S_k tells us how important the specific source is for total wealth (income); i.e. it is the relative share of component k in the total. And G_k gives us the GC of the specific source.

The most interesting feature of this decomposition when it comes to an empirical analysis is that one can calculate the impact, i.e. the percentage change of total income distribution, of a change in the source k. In a sense one can think of the elasticity of the overall distribution of Y with respect to a change in one of its components y_k. For an infinitesimal change in the wealth (income) source k such that it is $\varepsilon_k y_k$ for a small ε_k after the change. This is done by taking the partial derivative (applying the chain rule) and dividing the result by the overall Gini coefficient, which yields

$$\frac{\frac{\partial GC}{\partial \varepsilon_k}}{GC} = \frac{S_k R_k G_k}{GC} - S_k. \tag{2}$$

Using this formula gives us an estimate of how the overall GC changes if a specific way of holding an asset or certain sources of income change. It depends, resulting from the application of the decomposition equation (equation 1), on the GC of source k, the correlation between the component and the overall distribution, and how important factor k is relative to the other parts. Intuitively all three aspects seem clear; e.g. the effect of component k on the overall inequality will depend on the fraction of households having this item, the distribution of of it and the correlation between this factor and

[11] I.e. for any two random variables $X = \sum_{i=1}^{N} x_i$ and Z, one can put the summation out of the calculation of the co-variance to get $cov[X, Z] = cov[\sum_{i=1}^{N} x_i, Z] = \sum_{i=1}^{N} cov[x_i, Z]$.

the overall distribution. We will find that both a change of the wealth and the income distribution is correlated differently to some investments opportunities and sources of income then to others (i.e. the elasticity of the GC of financial wealth with respect to current and savings account as well as life insurance in Austria is negative whilst other ways of holding wealth like shares, bonds and NPTBS have the opposite sign). In what follows, we apply this way of decomposing to Austrian data on financial/housing wealth and income. A similar approach was for example also taken by Azpitarte (2008). We will see that it provides interesting insights.[12] For example, we will also see that income inequality is mostly explained by the distribution of income from work whilst social plans in Austria have the desired reducing effect on inequality.

3 Data Description

The focus in this empirical exercise lies in the structural features of the wealth and income distribution in Austria. We use two separate sources of data, the survey on financial wealth conducted by the Oesterreichische Nationalbank (OeNB) and the EU-SILC survey administered by the National Statistical Offices, for the Austrian data by Statistics Austria, in coordination with EUROSTAT.[13] In the calculation of the descriptive statistics and the measures of inequality appropriate weights are used to account for the survey structure.

3.1 OeNB: Survey of financial Wealth in Austria

The survey on financial wealth[14] from the OeNB (HSFW) was carried out in summer and autumn 2004. In total 2,556 households answered in either a personal or written interview extensive questions on the households balance sheet, detailing financial wealth holdings and some forms of credit; socio-economic characteristics of the household, including size, location, education, age, etc.; and working status. The questions were answered by a household member that was considered being knowledgeable about households' financial matters. The sample is based on multi-stage random sampling procedure in order to reach a representative sample of the whole population in Austria. However, there was

[12] López-Feldmann used this decomposition procedure in several studies, see, for example, López-Feldman et al. (2006) and Taylor et al. (2005), and granted access to the .ado-program in STATA, which is used later in some of the estimations. For the documentation see López-Feldman (2006). Their contribution is gratefully acknowledged.

[13] For the results provided in the Appendix survey data on households' housing wealth from OeNB collected in 2008 and again the EU-SILC data are used.

[14] A good overview on the data that were collected can also be found in Beer et al. (2006).

Table 1: Definition of the HSFW variables

Variable	**Accronym**	**Definition**
Total financial wealth	TFW	Sum off all possible forms in which financial wealth is stored. It is gross financial wealth in the sense that no liabilities are subtracted.
Current Account	CA	Value in the account that is used for transaction purposes. The questionnaire asked for ranges and the data were imputed with the mean of these ranges.
Life Insurance	LI	Sum of premium already invested in life insurances.
Savings Account	SA	Sum of wealth in various forms of savings accounts, building savings, and bonus scheme savings.
Bonds	BO	Sum of wealth invested in various forms of bonds.
Shares	SH	Sum of wealth invested in publicly traded shares.
Investment Certificates	IN	Sum of wealth invested in certificates and funds.
Business Shares	NPTBS	Sum of wealth hold in **not** publicly traded shares of businesses.

Source: OeNB HFWS (2004)

no special oversampling of certain parts of the population (e.g. the wealthy), which would be desirable to have in order to draw clear results about wealth for the part of the population that plays a distinctive role in aggregate developments of financial wealth issues. The data are weighted taking into account geographic as well as socio-economic indicators.[15] Also this survey unfortunately does not cover real assets (apart from not publicly traded business participations which are often defined as real assets) and hence, although being fully aware of the importance of real assets in households total wealth, we have to restrict the analysis due to data constraints to the financial part of households wealth.[16] Furthermore, lacking real assets, especially housing wealth it is not possible to calculate net worth, defined as total gross assets minus total liabilities. Due to the fact that leaving out real assets and still subtracting liabilities would distort the estimates because a big proportion of debt is for financing of housing, we restrict the empirical

[15]Since there are no missing values in the data on financial assets, due to the way of the data collection process, where households were required to provide all necessary information for a successful participation in the survey, no special imputation methods are used to account for item non response.

[16]The appendix (see appendix C.1) gives a comparable exercise using data on real assets. In this survey, however, there is no information on financial assets. A complete picture can only be derived once the data from the HFCS become available where all the necessary information is included.

exercise to the decomposition of gross financial wealth.
For the analysis conducted here we are using the variables on a common set of possible forms in which financial wealth is held at the level of households. For the definition see Table 1. We take a close look at total financial wealth (TFW) consisting of money hold in bank (current) accounts, in savings accounts (including building savings), in bonds, in shares, investments certificates (including various types of funds), not publicly traded business shares (NPTBS), and life insurances.

3.2 Eurostat: EU-SILC

The second source of data is the European Statistics on Income and Living Conditions[17] (EU-SILC), which is a household survey for comparative statistics on income and social exclusion in the European Union.
It has both a cross sectional and longitudinal structure and includes in depth variables on income at the individual and the household level. In this analysis we consider the data for Austria surveyed in 2005,[18] which is close to the time of, and hence comparable to, the above introduced survey on financial wealth from the OeNB (and the survey on housing wealth considered in appendix C.1). The survey is conducted using the computer assisted personal interviewing technique and yields data for a representative sample of Austria including more than 5000 households. The imputations provided in the data set, where Statistics Austria used hot deck procedures to account for item non response, are used in the analysis, so that there are no remaining missing observations. This assumption seems not too strong for most variables since the number of imputed items is (far) below 1%. However, total income and income from capital investment show a high rate of imputed items (about a third of the observations are imputed). We use, again in accordance to the OeNB survey, household level data on income. The total disposable income (DI) (variable code HY020) and total gross income (GI) (variable code HY010) consist of various types of individual and households level income sources. From these a subset is taken and the following further variables generated in order to conduct the empirical analysis. They are an aggregate for social benefits, denoted as family/children related income, which is the sum of both family and children related as well as ohter income against social exclusion; a proxy for income from pension calculated through total household income excluding social benefits minus total household income excluding

[17] See `http://epp.eurostat.ec.europa.eu/portal/page/portal/living_conditions_and_social_protection/introduction/income_social_inclusion_living_conditions` for further informations [accessed on 7th April 2010].
[18] An analysis with the data from 2004 reproduced very similar results.

Table 2: Definition of the EU-SILC variables

Variable	**Accronym**	**Definition**
Total disposable income	TDI	Sum of all personal gross income of all household members **minus** income tax, social insurance contributions, interest payments for mortgage, regular taxes for wealth, and regular inter-household cash transfer.
DI excluding social benefits	IEXSB	TDI **minus** unemployment benefits, sickness benefits, disability benefits, education related allowances, family/children related allowances, housing allowances, and social exclusion related but not elsewhere classified.
NI form rent and lease	NIRL	Income received from renting a property minus its cost (mortgage interest payments, repairs, maintenance, insurance, etc.), the tax and social insurance contribution.
Accommodation allowance	AW	Means tested transfers from the public authority to tenants and owners to meet housing expenses.
NI from private transfers	NIPT	Regular cash received from inter-household transfers, such as alimony or monetary help for students minus tax and social insurance contribution.
NI from capital investment	NICI	Interest, dividends, and other profits from capital investment minus tax and social insurance contribution.
NI from family/children related	NIFC	Sum of net family and children related income (HY050n), and other net income against social exclusion (HY060n).
NI from pension	NIP	Proxy estimated from the household income including pensions but excluding social benefits (HY022) minus household income excluding both, pensions and social benefits (HY023).
NI from work	NIW	Total net income from employment and self-employment summed over all household members(py010n and py050n).
Residual	RES	Total disposable household income minus the sum of all specific forms of income mentioned above.

Source: EU-SILC 065/04: Description of target variables; EUROSTAT

benefits and pensions; the income generated through employment; and the residual, i.e. total household income minus the sum of all specific forms. Net income is abbreviated by NI. We include the variables described in Table 2 in the analysis.

In the appendix in Table 8 we report the socio-economic structure of the households that participated in the survey and that reflects the structure of the population in Austria at the time. Both the absolute number and the appropriately weighted percentage share of the survey sample are reported. Essentially the overall structure of households is very similar in both data sources. It seems worth noting, however, that the households are more often employed, on average somewhat more educated and live more often in households with more household members. This fact at least tends to the direction that the surveys covered a comparable sample and if anything the HSHW included more households with a higher financial capability (due to e.g. higher education and employment rate).

4 Results

4.1 Descriptive Statistics

First, we look at some general overview of the data that are used in the decomposition. Table 3 shows that there are 2556 observations on each of the indicators on how much financial wealth is held by a household in each form of asset.

We can see that the mean is always higher than the median, indicating a distribution

Table 3: Descriptive statistics: Financial wealth

Variable	**Mean**	**Median**	**Variance**	**Min**	**Max**	**% Pop**
Financial Wealth						
Total	54666	23575	152507	0	4487290	99.5%
Current Account	1589	1275	1277	0	4200	91.3%
Saving Account	28226	13200	50682	0	1000000	96.8%
Bonds	3132	0	17908	0	590000	10.6%
Life Insurance	9013	1200	17938	0	312000	53.1%
Investment Certificates	2900	0	17460	0	500000	11.4%
Shares	4069	0	25039	0	1000000	15.7%
Not publicly traded business shares	5737	0	113488	0	4300082	2.6%

Source: OeNB HSFW (2004); *Number of Observations:* 2556

that is skewed to the right of the wealth spectrum. Another interesting point is given by the fact the various forms of capital investment (stocks, bonds, investment certificates, NPTBS) are never hold by any member of the population with the poorest 50% of each holding. Thus the median is given with zero. One can also see that the variation, measured by the standard error, in the variables is relatively high. As an example consider total wealth, where the standard error is almost three times the mean. The minimum value of each variable is zero. Although it is worth noting again that one would rather look at total net wealth, including real assets and the liability side of households, the data do not include this information on real wealth, so that we concentrate here on gross values. This still implies, however, that there are households in Austria that do not have any wealth in each of the described asset categories. These households, however, do not have to be the same households, meaning that, for example, there are some that do not hold shares and others that have no life insurance, but may own shares. The participation rate of households for Current and Savings Account are almost 100% and hence the minimum value implies that there are some households which have an account but no wealth in it.

The last column presents the weighted share of the sample population that holds a certain type of asset. Although almost all people have some form of financial wealth (99.5%),[19] only some possible ways to invest financial capital are used by the majority of the sample population. These are current and savings accounts and also life insurances are quite common, i.e. hold by about 53% of the population. All the other forms of investment are relatively concentrated in a small group. The most extreme case are business shares that are not publicly traded, and that are hold by only 2.6% of the population. We have to keep this fact in mind for the interpretation of the decomposition.

Turning now to the data in income, we can identify a similar pattern, reported in Table 4, in the EU-SILC data as well.

Using the data for 5148 households in Austria, the mean of the various income variables is higher than the median and the variation (measured by the standard error) is rather high; i.e. about twice the mean in the indicators for income from pensions and social benefits, and even relatively higher for the others except total income and income from employment which are less volatile. Note, that in the EU-SILC data it is possible to have a negative disposable income value since there are several expenses subtracted from income.[20] Also note that, for the same reason, the minimum value of income from

[19] Note that this participation rate is calculated on having a positive amount in the specific asset. This fact also explains the participation rate for the current account, which is expected to be closer to full coverage.

[20] These are interest paid on mortgage; regular taxes on wealth; regular intra-household cash transfers.

Table 4: Descriptive statistics: Income sources

Variable	**Mean**	**Median**	**Variance**	**Min**	**Max**	**% Pop**
Disposable / Net income						
Total	32313	27915	22120	-103012	330345	100%
Excl. social benefits	29250	24732	21983	-103012	323490	99%
Rent and Lease	351	0	3461	-12000	121600	4%
Accom. Allowance	57	0	334	0	3600	4%
Private Transfer	274	0	1470	0	28800	6%
Capital Income	294	66	1721	0	58650	78%
Family related	1571	0	2933	0	28771	33%
Pension	7699	0	13211	0	180805	39%
Employment	20846	18000	22072	-103142	270690	70%
Residual	1221	0	4706	-28800	75240	

Source: EU-SILC (2005); *Number of Observations:* 5148

employment and rental of property and land may be negative.[21] There are exactly two negative observation regarding total disposable income. Both of them had a substantial negative income from self-employment which were solely due to extraordinary high tax (and social insurance contribution) payments. These seem the pure strategic tax reduction decisions that do not reflect the real level of income. Thus these two values are considered as unreliable outliers and are not used in the calculations of several inequality measures reported further down.

Also for income we see in the last column in Table 4 that only a minor fraction of the population receives income form rental of land and property as well as from private transfers, and accommodation allowance (about 4%). The very large fraction (almost 80%) who gets some income from capital investment is due to the fact that every person as soon as it has positive bank deposit receives some interest payment. Table 4 shows, however, that the variation in this income variable is very high, i.e about six times its mean. Note also that the fraction of population that benefits from social plans, denoted in the table as family related, is relatively high (about a third of the population). This reflects the generally generous system in Austria, as, for example, children support ('Familienbeihilfe' in German) which every family with a child gets independent of other factors. Further note that the proportion of households receiving income from employment is relatively high, reflecting the fact that at least some household member generate income from employment.

[21] There are several income reducing factors subtracted such as mortgages interest repayments, maintenance costs minor repairs, and other charges.

We can see how each of these wealth and income variables is distributed in the society by looking at the Lorenz-curve. This is done in the next subsection.

4.2 Inequality measures

Now, we take a look at how the distribution of wealth holdings of the Austrian population show up in our data.

The Lorenz-curves of the various possible ways to hold financial assets are given in Fig-

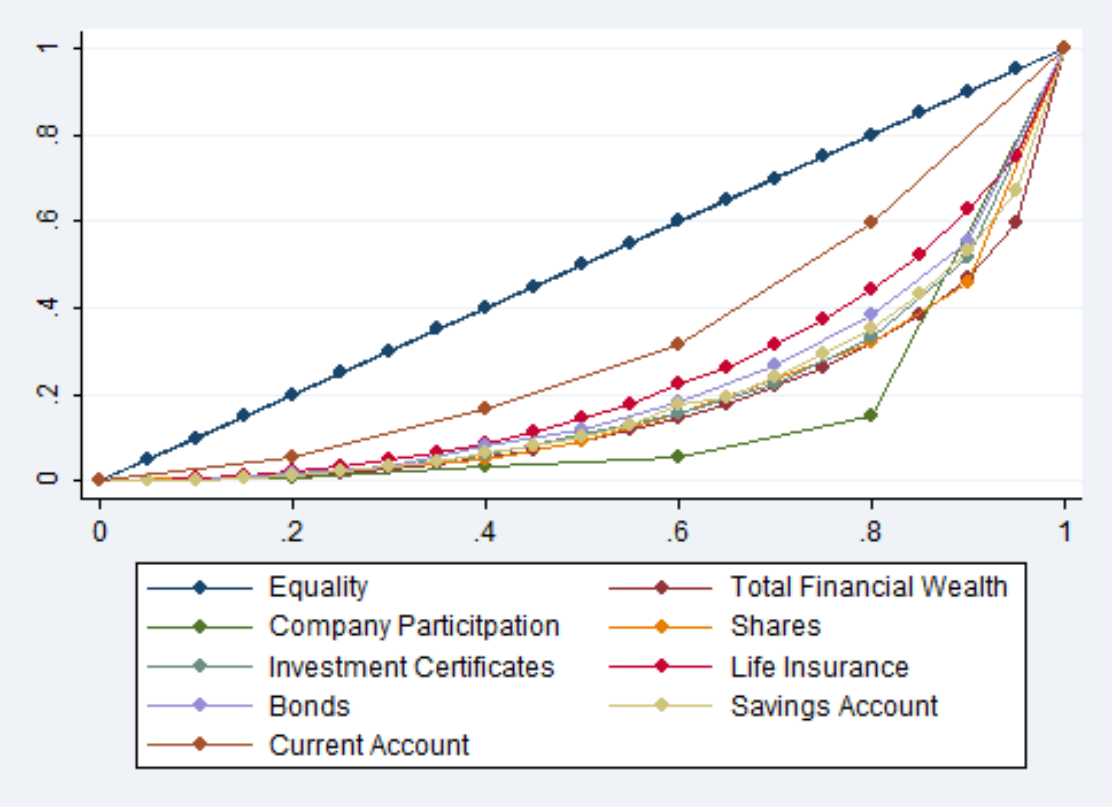

Figure 1: Lorenz-curves for the financial wealth holdings in the OeNB HSFW (2004)

ure 1. It can be seen that, as expected, the two possibilities to hold money in a current or savings account are most equally distributed. This is due to the fact the most households have a bank account and on average higher wealth levels are more often invested in different forms. It can also be seen from the data, see e.g. Table 3, that the participation rate for several portfolio choices is relatively small. Only households with considerable wealth tend to invest in a broad range of investment opportunities including shares, bonds and

other more complex financial instruments. Thus the more wealth in total is invested the more complex and diversified portfolios get.[22] Notice that this representation takes only positive values into account, i.e. it is the within group distribution of the part of the population that holds any of the according financial assets. These curves would look even much more extreme, if we had not excluded the part of the population, who does not hold any of the more complex assets (stocks, bonds, investment certificates, shares, and life insurance), in the calculation of the respective Lorenz curve. We will come back to this issue later comparing measures of inequality.

For the EU-SILC data the Lorenz curves are as one would expect. The distribution is fairly similar across income sources with the exception of income from "rental of property and land" and from "interest and dividends". This is not so surprising since these assets are relatively unequally distributed and thus only a small portion of the population gets any income from these sources.[23] Note that the two groups receiving the two different income sources might be quite distinct from each other. This result is robust to whether net or gross income measures are used, as can be seen in in the appendix in Figure 4. Once again, we did not use observations with value zero in the calculation of the according shares to get the Lorenz curves for the following income sources: total disposable income with and without social benefits; net income from rental of land and property; income from social benefits (family/children related allowances and other benefits against social exclusion); housing allowances; net income from private transfers; net income from pensions; net income from employment; net income from interest and dividend payments.[24]

An even deeper understanding of the underlying distributional characteristics can be found from various measures of inequality. In order to understand the exact features, one has to recall the fraction of the sample population who holds or receives a certain form of asset or income respectively. It can be seen from Tables 3 and 4.

The results are given for both estimations, first, called within inequality, the one excluding the households that do not hold or receive the asset or source of income, respectively, and, second, called overall inequality, the one including these households.

[22] This is in line with various findings in the literature; e.g. Andreasch et al. (2009) or Fessler and Schürz (2008).

[23] For further information on the distribution of holdings of property and land in Austria see e.g. Fessler et al. (2009).

[24] In Appendix B the same holds for gross income from rental of land and property, gross income from social benefits, housing allowances, gross income from private transfers, gross income form employment, and gross income from interest and dividend payments.

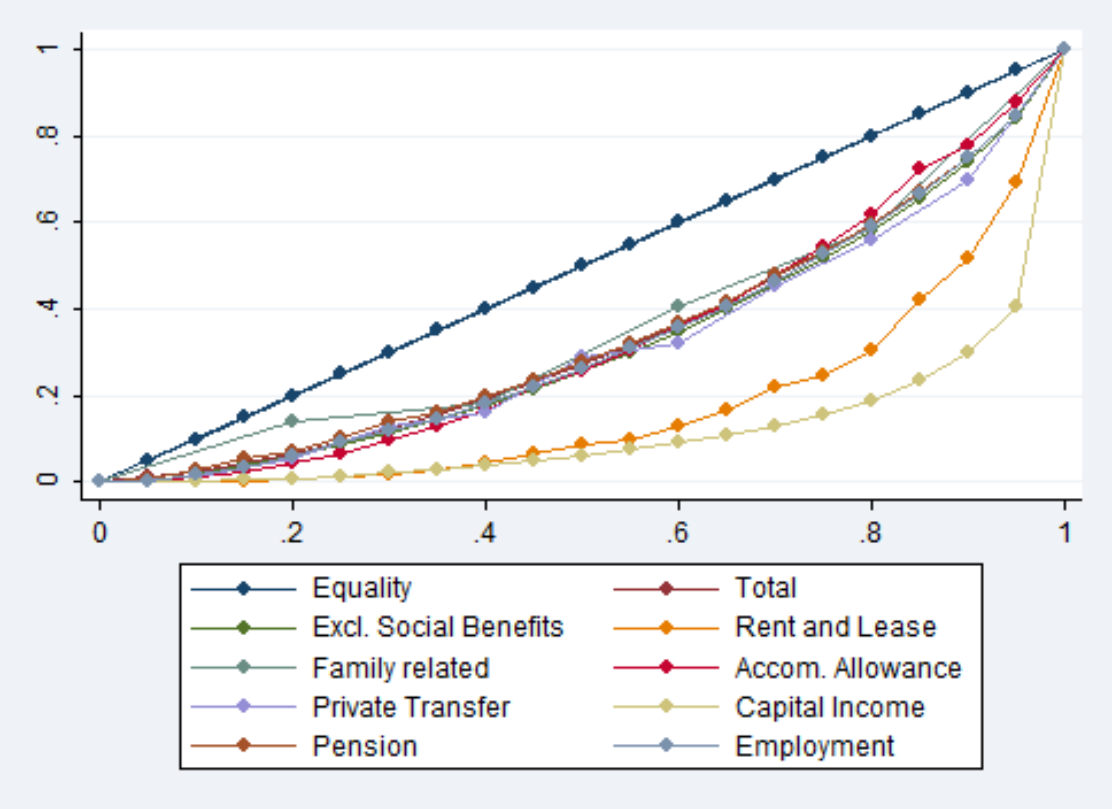

Figure 2: Lorenz-curves disposable/net income sources in EU-SILC (2005)

In Table 5 one can inspect various measures of inequality for all the variables under consideration. We present the well known Gini Coefficient (GC), ranging from 0 to 1 where 0 implies complete equality and inequality is increasing with the value of the GC; a member of the General Entropy Class (GE(2)) where a higher value implies a higher inequality and which is more sensitive to the top; the Atkinson Index[26] (with $\varepsilon = 0.5$ and hence equal weight on both the upper and the lower tail of the distribution); and the 90th to 50th percentile ratio, which simply give the factor by which wealth and income is higher for the top 10% in terms of the part of the population below (and including) the median wealth and income, respectively. First, note that it is not always possible to calculate the value, since for the calculation of the ratio the median has to have a non

[26]All the values denoted with '.' cannot be calculated (e.g. due to the fact, that the fiftieth percentile still holds nothing and thus one would have to divide by zero).

[26]The Atkinson Index ranges from 0 to 1, giving total equality in the sense of every household in the society holding the same amount of wealth or income an index value of 0 whereas total inequality takes the value of unity.

Table 5: Inequality measures

Variable	Overall (including observations with zero)				Within (excluding non-positive observations)			
	GC	GE(2)	AkI	$\frac{p90}{p50}$	GC	GE(2)	AkI	$\frac{p90}{p50}$
Financial Wealth								
Total	0.66	3.89	.	4.5	0.66	3.87	0.37	4.5
Current Account	0.44	0.32	.[25]	3.3	0.39	0.25	0.13	2.9
Saving Account	0.63	1.61	.	4.9	0.61	1.54	0.33	4.8
Bonds	0.96	16.34	.	.	0.62	1.28	0.32	4.5
Life Insurance	0.75	1.97	.	22	0.53	0.82	0.24	3.4
Investment Certificates	0.96	18.12	.	.	0.63	1.63	0.34	5.0
Shares	0.95	18.92	.	.	0.67	2.54	0.37	5.0
Not publicly traded business shares	0.995	195.58	.	.	0.82	4.58	0.59	22.2
Disposable / Net Income								
Total	0.33	0.23	.	2.0	0.33	0.23	0.09	2.0
Excl. Social benefits	0.37	0.28	.	2.2	0.36	0.27	0.11	2.2
Rent and Lease	0.99	48.7	.	.	0.66	1.41	0.38	6.3
Accom. Allowance	0.97	17.0	.	.	0.35	0.20	0.11	2.1
Private Transfer	0.96	14.4	.	.	0.41	0.43	0.14	2.2
Capital Income	0.83	17.2	.	7.1	0.78	13.2	0.53	6.0
Family related	0.78	1.74	.	.	0.35	0.24	0.10	2.3
Pension	0.74	1.47	.	.	0.33	0.26	0.09	2.0
Employment	0.54	0.56	.	2.6	0.35	0.24	0.11	2.1

Statistics reported: Gini Coeficient (GC), measure of the General Entropy Class with $\varepsilon = 2$ (GE(2)), Atkinson Index with $\alpha = 0.5$ (AkI), and the ratio of the 90^{th} to the 50^{th} percentile.

Source: OeNB HFWS (2004) and EU-SILC (2005)

zero value otherwise it is not defined, and the Atkinson index is only defined for non zero incomes. Second, one can see that in general all the measures point in the same direction.

If we compare the left (using the whole sample of the population, i.e. also people that have income or wealth of zero, respectively) and the right (including only strictly positive values) half of the table, it is clear that inequality measured in all various ways decreases. Given the description above, this finding is not further surprising, but, concentrating on the within group inequality now, even the distribution within the group of holders is remarkably high. In line with other investigations[27] we see, for example, that wealth hold in NPTBS is overall highly unequal distributed with a Gini Coefficient of above 0.8 and the top ten percent hold more than 22 times of the wealth hold by the lower 50th percentile. This is obviously the most extreme example in the table, but also all other ways to invest financial wealth apart from the current account and life insurances have a GC of above 0.6 and the top ten percent hold about five times the median amount. The estimates are broadly comparable to other findings in the literature. Sierminska et al. (2006) for example calculate the GC of household net worth for Canada, Finland, Italy, Sweden and the United States raging from 0.6 to 0.89. If one takes into account the distribution of housing wealth, which is included in the definition of net worth, our estime of 0.66 for total financial wealth seems to lie in this range.

It can also be seen from the table that income in general is more equally distributed than wealth. With two slight exceptions in income from rental of land and property, and income from capital investment the GC is rather low at around 0.35. There is no apparent difference between the gross and net income variables.[28] Indicating that the tax burden does not severely change the distribution of income among citizens in Austria.

Close inspection of the table also yields another interesting finding. As expected, however in public debates sometimes doubted, we find that in the EU-SILC data social benefits in Austria reduce inequality. This can be seen from the two variables on total disposable income including (TDI) and excluding social benefits (IEXSB).

Let us turn now in the following section to the main part of this empirical exercise, that is the decomposition of total wealth and income, respectively, according to its sources using the above introduced method.

[27] See e.g. Andreasch et al. (2009) and Fessler and Schürz (2008)

[28] See Appendix B for the estimates of the gross income variables.

4.3 Decomposition of wealth by ways of holdings

In this section of the article we look at the decomposition of wealth based on survey data that were gathered by the OeNB in 2004. Essentially, the distribution of total financial wealth can be decomposed in its various possible types of investment laid out in the data section. This means that that GC reported in the left column in Table 5 for total financial wealth (and total income in the next section) are decomposed with regard to their respective contribution factors. We use bootstrapping with 500 replications to get standard errors and thus confidence intervals for the most interesting estimate; i.e. what a change of the distribution in the particular variable means for the distribution of wealth or income, respectively (last column in the following tables).

Recall from section 2.2 above the methodological definitions / meaning of these empirical results. S_k is k's share of the total wealth, and hence it gives us an indicator for the importance of the particular way to invest financial wealth. R_k is the relative Gini cor-

Table 6: Decomposition of the financial wealth distribution

Variable	S_k	R_k	Share	% Change (Std. Err.)
Current Account	0.027	0.421	0.008	-0.019** (0.001)
Saving Account	0.529	0.938	0.484	-0.045** (0.009)
Bonds	0.066	0.890	0.086	0.020** (0.003)
Life Insurance	0.165	0.703	0.135	-0.030** (0.003)
Invest Certificates	0.060	0.882	0.077	0.018** (0.003)
Shares	0.086	0.896	0.112	0.026** (0.004)
NPTBS	0.067	0.956	0.099	0.031* (0.013)

Significance levels (bootstrapped standard errors): †: 10%, ∗: 5%, ∗∗: 1%

Reported results: Share of wealth in source k (S_k); correlation of source $k-$inequality and cumulative inequality (R_k); share of total inequality that is explained by source k (Share); and how a change in source $k's$ wealth component affects total inequality (% Change)

Source: OeNB HSFW (2004)

relation between wealth source k and cumulative distribution function of total financial wealth. That means, it tells us what is the correlation between a chosen investment k and the overall GC of financial wealth. In the penultimate column, denoted by 'Share',[29] we see the proportion of total wealth inequality that is explained by component k. This implies that the values in column 'Share' sum up to 100% (apart from rounding). It is distinguished from S_k in so far that the former gives us how important a particular way of investment is in terms of the amount of money relative to total wealth and the latter how much the money invested in a certain way contributes to total wealth inequality.

In Table 6 we see the decomposition of total financial wealth in Austria according to several ways of capital investment. In the second column it can be seen that the biggest part of wealth is held in savings accounts (about 53% of total wealth), followed by life insurances (about 17%) and than a group consisting of stocks, shares, investment certificates, and NPTBS (around 7%). In the current account only a small fraction of total wealth (about 3%) is held. This seems to reflect the preference for security, since more secure investments are held more extensively, and a reasonable choice because the savings account and life insurances give better returns than the current account. Apart from the wealth hold in the current account the correlation of the distribution of the various ways to invest and total distributional pattern is very high. This comes from the fact that the GC of the current account holdings is rather low compared to all the other investment opportunities and total distribution.

Comparing the second and the fourth column it can be seen that the contribution of more sophisticated ways of investment (stocks, shares, investment certificates and NPTBS) is relatively higher than is their respective share of wealth. This result is not very surprising since these types of holding are mainly in the hands of households that invest relatively much wealth and hence are the households that drive total distributional issues.

Finally, in the last column we see how a change of the holdings of one way of investment will affect the distribution of total wealth holding everything else being held constant (i.e. ceteris paribus).[30] First, note that all the estimates are significantly different from zero at the 1%-level using the bootstrapping method explained above, except the estimate on the NPTBS which is statistically significant only at the 5%-level. We also see that an increase in the amount of money held in certain investment opportunities tends to increase inequality whilst for others it tends to decrease it. This is very much along the lines of how many people hold a particular type of investment. So would an increase

[29] This measure is exactly the same as for example in López-Feldman et al. (2006) or Taylor et al. (2005) called "share in total income inequality" see e.g. Table 3 on page 29 in López-Feldman et al. (2006).

[30] For the calculation see equation (2).

in the money hold in the current account, the savings account,[31] and in life insurance to be correlated with a decreased inequality, and on the other hand the elasticity with respect to an increase in the remaining types (stocks, shares, NPTBS and certificates) is positive. The size is relatively small, i.e. a 10% increase in the wealth in NPTBS, holding everything else constant, would lead to an increase of overall GC of 0.31%, for example.

Azpitarte (2008) reports in his study about wealth distribution for Spain a similar contribution to wealth inequality of the various sources in which financial wealth is held. Although the author's separation in the specific factors is slightly different then what is analysed here, we see that also in Spain wealth held in the more sophisticated financial instruments tend to increase overall inequality whilst on the other hand wealth hold in bank account (current and saving) has a reverse effect. Furthermore, to get a more complete picture of households total wealth one can look at real property (housing, collectables, cars, etc.) a household owns. For Austria there is so far only one micro-data source on housing wealth, i.e. the OeNB Survey on housing wealth (HSHW 2008). For the results of the decomposition exercise the reader is referred to Appendix A. Again, comparable to the findings for Spain, one can see in Table 12 that the result is driven by the primary housing property which has an equalizing effect. All the other ways seem to have a minor, often statistically insignificant, effect. An overall decomposition with all the various forms of wealth be taken into account can only be done once data from the HFCS become available.

4.4 Decomposition of income according to sources of income

Having analysed the decomposition of wealth, let us now turn to a similar exercise for income. Here we decompose, firstly, disposable income, and later in Appendix B, gross income according to sources of it.

According to Table 7, one can see that the income from employment and pensions are considerable shares of total household income. They amount to about 64% and 23% of total income, respectively. Each other sources of income constitute a significantly lower share to total income.

One can also see that an increase in private transfers, social benefits, and pensions decrease income inequality, whilst an increase income from rent and lease of property

[31] The estimation was also run for current and savings account combined to fit the aggregate data from ESA95 (definitions AF.22 and AF.29). The qualitative result does not change and the point estimate increases for this combined factor to 0.064.

Table 7: Decomposition of net / disposable income distribution

Variable	S_k	R_k	Share	% Change (Std. Err.)
Rent and Lease	0.012	0.686	0.024	0.013** (0.003)
Accom. Allowance	0.002	-0.402	-0.002	-0.004** (0.000)
Private Transfer	0.009	0.021	0.001	-0.008** (0.001)
Capital Income	0.009	0.595	0.014	0.005** (0.001)
Family related	0.056	0.338	0.043	-0.012** (0.002)
Pension	0.229	0.129	0.068	-0.161** (0.009)
Work	0.644	0.800	0.843	0.199** (0.009)
Residual	0.041	0.057	0.009	-0.031** (0.004)

Significance levels (bootstrapped standard errors): †: 10%, ∗: 5%, ∗∗: 1%

Reported results: Share of income in source k (S_k); correlation of source $k-$inequality and cumulative inequality (R_k); share of total inequality that is explained by source k (Share); and how a change in source $k's$ wealth component affects total inequality (% Change)

Source: EU-SILC (2005)

and land, as well as capital investment and income from work increase inequality. These results are quite intuitive, since private transfers are often made to help poorer members of the family or poorer friends, and hence this money has an equalizing effect as well as social benefits and housing allowance. Since property and financial capital is fairly unequally distributed the income from these assets tend to increase overall income inequality as well. For pensions the case is also clear, as it is the case in Austria that (public) pensions are reducing income inequality to a significant, in economic as well as statistical term, effect. This is due to the fact that there is a lower (minimum pension) and an upper limit to public pension schemes and thus income receiver in this group do neither fall into the extremely low nor the extremely high earner part of the population. As expected as well, the main driving force of income inequality comes from the part that is explained through income from work. What seems to be more surprising is that the

effect of an increase in income from work changes overall income inequality by approximately the same magnitude as a change in income from pension but in the reverse order; i.e. a 10% increase received from work increases inequality by roughly 1.99% whereas the same change in pensions decreases inequality by about 1.61%.
As a robustness check the exercise is repeated using data on gross income from EU-SILC. All the estimates for gross income are comparable to the ones for net/disposable income and thus the result seem to be fairly robust.[32] We want to conclude this section with two final remarks. First, as far as there are comparable results in the literature, our findings are similar to these. Lerman and Yitzhaki (1985) find for the U.S. that private transfers tend to decrease inequality, though their estimated effect is larger, and income from rent and lease of land and property has the tendency to increase overall inequality. Also Taylor et al. (2005) and López-Feldman (2006) report an inequality decreasing effect of remittances, a form of private transfers, in Mexico. Second, in the light of the analysis we have to bear in mind that there is a huge difference[33] in the distribution of wealth and income. If one wants to discuss issues of equality of a society, certainly both have to be taken into account.

5 Conclusions

In this paper we analysed wealth holdings and income of the Austrian population. Based on the surveys of financial wealth conducted by the OeNB and on living standards (EU-SILC) from Statistics Austria and Eurostat, we analysed the distribution of financial wealth and income.
Starting from the methodological foundation of decomposition of income first proposed by Lerman and Yitzhaki (1985) we provide the possibility to apply it to data on financial wealth as well as on income in Austria. We find, in line with the existing literature,[34] that certain types of investment possibilities for financial wealth are only held by a very small fraction of the population. The contribution of these types to the total distribution is seen to be significant. A ceteris paribus analysis gives the logically following result that an increase in these types of investment typically tends to increase overall inequality keeping everything else constant. It turns out that the more conservative modes, in which financial wealth is held by almost all members of the sample population, are in this analysis inequality decreasing.

[32] See Appendix C.2 Table 16.
[33] Compare the upper and the lower half of Table 5.
[34] See, for example, in the case of shares Fessler and Schürz (2008), and in the case of not publicly traded business shares Andreasch et al. (2009).

The article also provides an according analysis for the income pattern of households in Austria. We find, both for disposable and gross income, that income from rent and lease of land and property as well as income from capital investment, and income from employment increases inequality whilst income from social benefits, private transfers, and pensions tend to decrease it. In terms of policy relevance, one can get a clear indication on how certain policy decisions would affect overall financial wealth and income distribution. There still remain several issues to be resolved. For example, one could have a closer look at total net worth including both financial, housing wealth together and possibly add the debt burden of households to get the complete picture. Here it would also be interesting to see which aggregate component exerts what kind of effect on total net worth of a household. Other possible way towards greater understanding would be to track the compositional pattern over time or the decomposition of income (possibly with panel data) according to the income generating function.

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A Technical derivations of the applied decomposition method

A.1 Different methods to calculate the Gini Coefficient

As is widely known, the GC is defined as the area between the Lorenz curve and 45-degree line, it is normalized between zero and one, and lower values indicating lower inequality. The Lorenz curve, $L(u)$, defined on the interval between zero and one, i.e. u is the proportion of households and $u \in [0, 1]$, represents the cumulative distribution of an empirical probability measure. In its graphical representation with the proportion of households on the x-axis and the proportion of total wealth or income on the y-axis, gives us the usual result how much of the variable under consideration is hold by what percentage of the population. Assuming piecewise differentiability of the cumulative distribution function $F(Y)$ of an indicator Y (usually income or wealth), that is zero for all negative values has mean $\bar{Y}$, the GC is given by.[35]

$$GC = 1 - 2\int_0^1 L(u)du$$

Dorfmann (1979) is the first who derives this formulation formally and shows that it can be rewritten to

$$GC = 1 - \frac{1}{\bar{Y}}\int_0^{Y*} (1 - F(Y))^2 dY,$$

where $Y*$ is the upper bound of the wealth or income and $F(Y)$ is the cumulative distribution function.

In a slightly different way, we can also derive the GC in the form of the absolute mean difference, Δ, of the variable under consideration. Gastwirth (1972)[36] shows that the GC is the ratio of this measure of dispersion, Δ, and twice the mean of the variable, such that $GC = \frac{\Delta}{2\bar{Y}}$ where the absolute mean difference is given by

$$\Delta = 2\int_0^{Y*} F(Y)(1 - F(Y))dY.$$

Following the outline from Lerman and Yitzhaki (1985), we can use this formula to decompose the GC according to its sources. First, one uses integration by parts with $u = F(Y)(1 - F(Y))$ and $v = Y$ to get

$$\Delta = 2\int_0^{Y*} Y[F(Y) - \frac{1}{2}]f(Y)dY.$$

[35] See for example Gastwirth (1972).

[36] The author in turn relates to the classic work of Kendall and Stuart (1963).

Note that $f(Y)$ is the probability distribution function of Y. Then defining the inverse function $Y(F) = F^{-1}(Y)$ it is possible to rewrite[37] it by transforming the variables to

$$\Delta = 4 \int_0^1 Y(F)[F - \frac{1}{2}]dF.$$

Now, one can use the definition of the covariance and that F is uniformly distributed between zero and one with mean of $F = \frac{1}{2}$ in order to express this integral as the covariance of wealth or income Y and its cumulative distribution $F(Y)$. Thus we get

$$\Delta = 4cov[Y, F(Y)].$$

Putting it back into $GC = \frac{\Delta}{2\bar{Y}}$ yields exactly the expression stated in the text.

A.2 Derivation of the decomposition method

Recollecting from above that $GC = \frac{\Delta}{2\bar{Y}}$ with $\Delta = 4cov[Y, F(Y)]$ we have

$$\begin{aligned} GC = \frac{\Delta}{2\bar{Y}} &= \frac{2}{\bar{Y}} \sum_{k=1}^{K} cov[y_k, F(Y)] \\ &= \sum_{k=1}^{K} (cov[y_k, F(Y)]) \left(\frac{cov[y_k, F(y_k)]}{cov[y_k, F(y_k)]} \right) \left(\frac{\bar{y}_k}{\bar{y}_k} \right) \left(\frac{2}{\bar{Y}} \right) \\ &= \sum_{k=1}^{K} \left(\frac{cov[y_k, F(Y)]}{cov[y_k, F(y_k)]} \right) \left(\frac{2cov[y_k, F(y_k)]}{\bar{y}_k} \right) \left(\frac{\bar{y}_k}{\bar{Y}} \right) \\ &= \sum_{k=1}^{K} R_k G_k S_k. \end{aligned}$$

[37] This result also goes back to Gastwirth (1972).

B Socio-demographic characteristics of the surveys

Table 8: Socio-demographic characteristics

	HSFW		EU-SILC		HSHW	
	# HH	% of Pop.	# HH	% of Pop.	# HH	% of Pop.
Sex						
Female	916	36.5%	2027	40.5%	1100	46.8%
Male	1640	63.5%	3121	59.5%	981	53.2%
Age						
up to 29	157	7.8%	324	7.8%	259	14.0%
30 – 39	418	19.0%	905	18.5%	381	20.3%
40 - 49	602	25.1%	1108	20.6%	491	25.5%
50 - 59	483	16.6%	948	16.2%	307	16.2%
60 - 69	578	17.3%	946	16.1%	239	12.1%
70 and above	318	14.3%	917	20.8%	230	12.0%
Family status						
Single	410	17.4%	819	19.6%	489	25.4%
Married	1582	59.5%	3015	52.9%	1141	50.4%
Divorced	309	12.1%	582	11.8%	276	14.7%
Widowed	255	11.0%	724	15.6%	175	8.4%
Education						
Primary	308	13.6%	1215	24.3%	356	17.2%
Secondary	1864	74.0%	3255	61.6%	1510	72.2%
Tertiary	384	14.4%	678	14.1%	215	10.6%
Employment status						
Employed	1428	60.5%	2670	51.5%	1306	63.2%
Unemployed	56	1.5%	173	3.8%	55	2.8%
Pension	922	31.2%	1951	38.1%	553	26.4%
Other	150	6.4%	354	6.6%	167	7.7%
Household size						
1 Member	772	32.3%	1529	36.7%	599	35.1%
2 Members	844	28.6%	2501	43.4%	728	28.6%
3 Members	406	15.3%	718	12.5%	310	14.9%
4 or more	534	23.8%	400	7.3%	444	21.3%

Statistics reported: Absolute number of households (# HH) in the according survey, and weighted frequency representing the proportion of population (Very few "no Answer" in EU-SILC are not reported).

Source: OeNB HFWS (2004), EU-SILC (2005), and OeNB HSHW (2008)

C Decomposition of housing wealth and gross income

As in the paper above first the used variables are introduced. The descriptive statistics including various measures about the distribution are followed by the results from the decomposition analysis.

C.1 Housing wealth

The second major way in which households accumulate wealth is in housing wealth. Unfortunately, due to lack of data on both, financial and housing wealth, in one comprehending source, it is not possible at this point in time to decompose inequality of both financial and housing wealth at the same time. This will be possible once the data from the European Household Finance and consumption Survey are out, which is expected in 2013. One can, however, have a closer look only at wealth held in housing using the Housing Wealth survey from the OeNB conducted with computer assisted personal interview method in 2008 (HSHW 2008). For the calculations we used the imputed data.[38] For the calculations of the descriptive statistics appropriate estimation techniques for multiply imputed data were used applying also household weights. For the structural part, however, standard formulas are sufficient for correct results, since we are concerned with the structural equation. In the latter part the imputed data was used.
Housing wealth can be separated into various forms (see Table 9). In this exercise we use housing wealth held in the primary residence (where the household lives most of the time), secondary housing wealth (including holiday homes), further housing wealth (i.e. further private property owned), building ground, property used for agricultural purposes (short: agricultural), and other housing wealth (including hotels, offices, etc.).

The socio-demographic characteristics of the HSHW are reported together with the respective statistics of the other surveys. They look very similar to the HFSW survey. Descriptive statistics and distributional information are reported in Tables 10 and 11 as well as Figure 3. There are various interesting aspects of the descriptive statistics of housing wealth. For example, each and every form of housing wealth is hold by less then 50% of the population in Austria. This, however, is not the focus of the paper and the interested reader is referred to these already well documented facts.[39]

As we can see in Table 12, only two components seem to influence overall inequality in a statistically significant way (at the 1%-significance level). From these a increase in

[38] The data were imputed by the method called Multiple Imputations by Chained Equations. Further details on the method can be found in Albacete (2010).

[39] See e.g. Fessler et al. (2009).

Table 9: Definition of variables on housing wealth

Variable	Accronym	Definition
Total Housing Wealth	THW	Sum of value of the following various real housing assets.
Primary Housing	PR	Current value of housing unit that is occupied as main residence by the owner.
Secondary Housing	SE	Current value of the house or apartment that is described as the second unit; i.e. for an owner of primary housing it is the second housing unit that is stated and for a renter of primary housing it is the first reported housing unit.
Further Housing	FH	Sum of current values of all further houses and apartments (third or more for an owner of PR and second or more for a renter of PR).
Building Ground	BG	Sum of current value of all building grounds.
Agricultural	AG	Sum of current value of further housing wealth (over and above the primary housing unit) that is used for agricultural purposes.
Other	OT	Sum of current value of further housing wealth (over and above the primary housing unit) that is used for various other means (e.g. hotel, office, etc.).

Source: OeNB HSHW (2008)

Table 10: Descriptive statistics: Housing wealth

Variable	Mean	Median	Variance	Min	Max	% Pop
Total	247949	100000	16279	0	10440118	59%
Primary	152397	0	7881	0	4903659	50%
Secondary	38964	0	6945	0	8752059	11%
Further	10363	0	5314	0	9115563	2%
Building Ground	30436	0	9567	0	10440118	7%
Agricultural	12312	0	3914	0	5123126	6%
Other	4414	0	1633	0	3586417	2%

Source: OeNB HSHW 2008; *Number of Observations:* 2081

Figure 3: Lorenz-curves for various forms of real assets in OeNB HSHW (2008)

Table 11: Inequality measures: Housing wealth

Variable	Overall (including observations with zero)				Within (excluding non-positive observations)			
	GC	GE(2)	AkI	$\frac{p90}{p50}$	GC	GE(2)	AkI	$\frac{p90}{p50}$
Housing Wealth								
Total	0.73	2.4	.	.	0.46	0.82	0.19	2.4
Primary	0.75	2.6	.	.	0.43	0.85	0.16	2.0
Secondary	0.97	19.6	.	.	0.57	1.06	0.28	3.2
Further Housing	0.99	84.0	.	.	0.69	1.03	0.50	44.8
Building Ground	0.98	69.9	.	.	0.69	3.51	0.41	7.8
Agricultural	0.99	81.4	.	.	0.80	4.00	0.55	11.8
Other	0.99	105.4	.	.	0.74	1.81	0.50	11.4

Statistics reported: Gini Coeficient (GC), measure of the General Entropy Class with $\varepsilon = 2$ (GE(2)), Atkinson Index with $\alpha = 0.5$ (AkI), and the ratio of the 90^{th} to the 50^{th} percentile.

Source: OeNB HSHW 2008

Table 12: Decomposition of housing wealth distribution

Variable	S_k	R_k	Share	% Change (Std. Err.)
Primary	0.783	0.946	0.756	-0.027** (0.007)
Secondary	0.107	0.813	0.116	0.010* (0.005)
Further Housing	0.012	0.942	0.016	0.004** (0.001)
Building Ground	0.036	0.767	0.038	0.002 (0.004)
Agricultural	0.054	0.887	0.066	0.012* (0.006)
Other	0.008	0.695	0.007	-0.000 (0.001)

Significance levels (bootstrapped standard errors): †: 10%, ∗: 5%, ∗∗: 1%

Reported results: Share of wealth in source k (S_k); correlation of source $k-$inequality and cumulative inequality (R_k); share of total inequality that is explained by source k (Share); and how a change in source $k's$ wealth component affects total inequality (% Change)

Source: OeNB HSHW (2008)

housing wealth held in the primary housing unit tends to decrease inequality whereas the effect is reversed for 'Further Housing'. This is due to the fact that only a small fraction of wealth households own additional to the primary and secondary housing wealth further property. All the other components are only marginally or not at all significant and thus are not interpreted here.

C.2 Gross income

As a robustness check all the calculations for the income decomposition where done with gross income data as well. Tables 13 to 16 and Figure 4 report the results. Note that for gross income a separation of pensions is slightly differently since there is no possibility to disentangle it from total gross income in the household file and thus had to be taken from the personal data file. Socio-demographic statics are identical to the one reported in the main body (see Table 8). These estimates can also be seen as a check whether any results discussed in the paper where derived from negative minimum values in some of the income variables. This seems not to be the case.

The estimates[40] of the change in all sources of income are significant, but relatively small. So, for example, would a 10% increase in the income from rent and lease of property and land increase total income, measured with the GC, of 0.11%. All the estimates for gross income are comparable to the ones for net/disposable income.

[40] See Table 16.

Table 13: Definition of the EU-SILC variables

Variable	Accronym	Definition
Total gross income	TGI	Sum of all personal gross income of all household members
GI from rent and lease	GIRL	Income received from renting a property minus its cost (mortgage interest payments, repairs, maintenance, insurance, etc.)
Accommodation allowance	AW	Same as above
GI from private transfers	GIPT	Regular cash received from inter-household transfers, such as alimony or monetary help for students
GI from capital investment	GICI	Interest, dividends, and other profits from capital investment
GI from family/children related	GIFC	Sum of gross family and children related income (HY050g), and other gross income against social exclusion (HY060g)
GI from pension	NIP	Household gross income from private and public pension plans (py080g and py100g summed over all household members)
GI from work	NIW	Total gross income from employment and self-employment summed over all household members(py010g+ py050g)
Residual	RES	Total gross household income minus the sum of all specific forms of income mentioned above.

Source: EU-SILC 065/04: Description of target variables; EUROSTAT

Table 14: Descriptive statistics: Gross income sources

Variable	Mean	Median	Variance	Min	Max	% Pop
Gross Income						
Total	43600	36425	32873	1	501935	100%
Rent and Lease	493	0	4975	0	175456	4.0%
Accom. Allowance	57	0	334	0	3600	4.0%
Private Transfer	274	0	1470	0	28800	6.3%
Capital Income	367	82	2151	0	73313	77.5%
Family related	1571	0	2933	0	28771	33.3%
Pension	9524	0	18215	0	300191	37.3%
Employment	29567	24920	32331	0	420869	70.3%
Residual	1745	0	5527	-31200	115146	

Source: EU-SILC (2005); *Number of Observations:* 5148

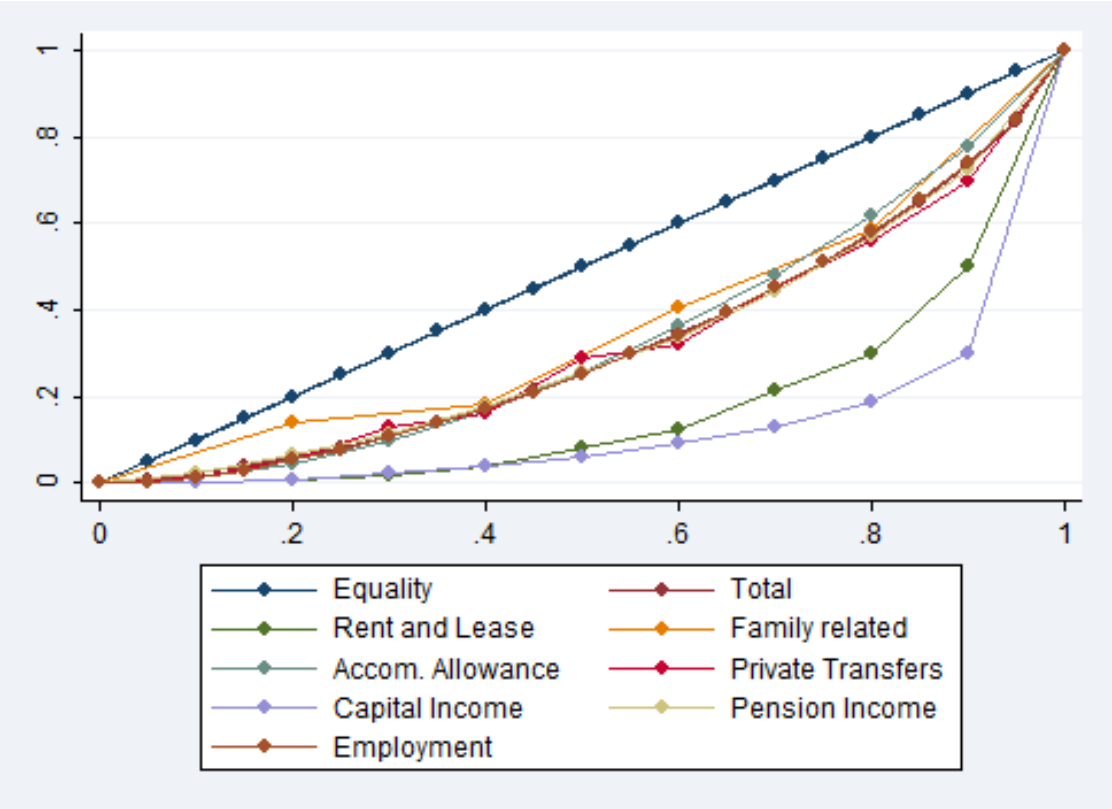

Figure 4: Lorenz-curves gross income sources in EU-SILC (2205)

Table 15: Inequality measures: Gross income

Variable	Overall (including observations with zero)				Within (excluding non-positive observations)			
	GC	GE(2)	AkI	$\frac{p90}{p50}$	GC	GE(2)	AkI	$\frac{p90}{p50}$
Gross Income								
Total	*	*	*	*	0.36	0.28	0.11	2.2
Rent and Lease	0.99	50.9	.	.	0.67	1.56	0.39	5.8
Accom. Allowance	0.97	17.0	.	.	0.35	0.20	0.11	2.1
Private Transfer	0.96	14.4	.	.	0.41	0.43	0.14	2.2
Capital Income	0.83	17.2	.	7.1	0.78	13.2	0.53	6.0
Family related	0.79	1.74	.	.	0.35	0.24	0.10	2.3
Pension	0.76	1.83	.	.	0.37	0.37	0.11	2.1
Employment	0.55	0.60	.	2.7	0.37	0.27	0.12	2.2

Statistics reported: Gini Coeficient (GC), measure of the General Entropy Class with $\varepsilon = 2$ (GE(2)), Atkinson Index with $\alpha = 0.5$ (AkI), and the ratio of the 90^{th} to the 50^{th} percentile.

All the values denoted with '*' have no observation with zero value in this variable, thus only the estimates for the right part of the table are given.

Source: EU-SILC (2005)

Table 16: Decomposition of gross income distribution

Variable	S_k	R_k	Share	% Change (Std. Err.)
Rent and Lease	0.012	0.690	0.023	0.011** (0.003)
Accom. Allowance	0.001	-0.490	-0.002	-0.003** (0.000)
Private Transfer	0.007	-0.072	-0.001	-0.008** (0.001)
Capital Income	0.008	0.592	0.012	0.003** (0.001)
Family related	0.042	0.278	0.025	-0.017** (0.001)
Pension	0.210	0.143	0.065	-0.144** (0.008)
Employment	0.679	0.840	0.877	0.199** (0.009)
Residual	0.042	0.013	0.001	-0.041** (0.004)

Significance levels (bootstrapped standard errors): †: 10%, ∗: 5%, ∗∗: 1%

Reported results: Share of income in source k (S_k); correlation of source $k-$inequality and cumulative inequality (R_k); share of total inequality that is explained by source k (Share); and how a change in source $k's$ wealth component affects total inequality (% Change)

Source: EU-SILC (2005)

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- members of academic and research institutions (preferably post-doc), and with
- central bank researchers[1]

who work in the fields of macroeconomics, international economics or financial economics and/or with a regional focus on Central, Eastern and Southeastern Europe.

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Applications (in English) should include

- a curriculum vitae,
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- an indication of the period envisaged for the research stay, and
- information on previous scientific work.

Applications for 2012/13 should be e-mailed to
eva.gehringer-wasserbauer@oenb.at
by May 1, 2012.
Applicants will be notified of the jury's decision by mid-June. The next round of applications will close on November 1, 2012.

[1] Other than those eligible for the External Work Experience program established within the ESCB.