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ECONOMIC INEQUALITY AND SOCIAL MOBILITY: CHALLENGES OF THE PAST AND THE PRESENT

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General Introduction

General Introduction

The discussion about wealth inequality and social mobility is of great interest, in the past two years more than ever.

The Wealth-x Billionaire Census 2021 estimates that the number of billionaires in 2020 rose by 13.4% worldwide with respect to 2019, which corresponds to an increase of 5.7% in the total wealth owned. It is worth to note that the billionaires correspond to only 0.1% of the total world population of individuals with at least 5 million dollars of net worth and they own 16% of the global wealth owned by this group. According to Oxfam (2022), we had a new billionaire every 26 hours during the first two years of the Covid-19 pandemic. Increasing the awareness of this phenomenon will help institutions to take decisions that are more conscious with respect to the tax and distributive systems. Oxfam International's Executive Director Gabriela Bucherthat said, "If these ten men were to lose 99.999 percent of their wealth tomorrow, they would still be richer than 99 percent of all the people on this planet" (Oxfam, 2022).

These percentages and numbers tell how unfair our economies are. However, the problem of taxing the rich is not so simple. The discussion often focused on the concept of meritocracy. The Marxist theory on inequality and class conflict argues that economic inequality can be justified by meritocracy since it is the result of the effort that people put in their work and the results of the working structure (Stolzman and Gamberg, 1973; Milner Jr, 1987; Koh, 2020; McCoy and Major, 2007). However, part of inequality is explained by the fact that differences widen from one generation to the next due to the returns on the "investments". Education and opportunity are a form of investments and children that are born in a rich family do not deserve them more than the ones born in a poor family. This is more relevant when social mobility is low and institutions do not compensate for disparities at birth. In this case, economic positions at birth will determine the economic success of the children (Koh, 2020). For the children born in poor families it will be very difficult to upturn the original advantage given to the rich children that would be able to attend better schools and to live experiences that will define their character and life approach.

To answer this question we need to look at inequality trends to understand how inequality evolved over time and to compare nowadays estimates with past levels of inequality, both within and between countries. This thesis tries to shed light on the topic by looking at wealth inequality for the period 1820-2010 at the global level. It is important to know the past to give a picture of what we already know and to create new knowledge.

Chapter 1, *Wealth inequality in the long run* (published as G. Alfani and S. Schifano, "Wealth inequality in the long run", in J.L. Van Zanden et al., eds., How Was Life? Volume II, OECD, 2021, pp. 103-23) provides an overview of long-term changes in wealth inequality

based on the Gini index and the wealth share of the richest 10%.[1] The chapter relies on current databases such as the *World Inequality Database (WID)* but expands the time series for a range of countries (back to 1820 in the case of France, Italy, Sweden, the United Kingdom and the United States) and by producing new estimates.

Our data confirm the general picture of a creeping increase in inequality during the 19th century, followed by declines from the onset of World War I (1914) until the 1960s and, in many (but not all) countries, a new tendency towards higher inequality since the 1970s. The correlation of wealth inequality with per capita GDP is found to be quite weak and not always positive, implying that higher wealth inequality cannot be considered a simple side effect of economic growth.

Working on this chapter, made me realise that wealth inequality in Luxembourg was not really investigated in the past. I then found that there were amazing sources never used for this purpose and I decided to study them and to understand if they could contribute to my research question. European archives are full of hidden knowledge that waits to be discovered. This applies also to Luxembourg. Land ownership in Luxembourg was recorded from 1766. The land registries are available for the 19th and 20th centuries and with time and resources, it is possible to conduct inequality and intergenerational studies for the whole country. However, a PhD schedule is limited in time and resources, and I decided to start from the town of Dudelange. This municipality is placed in the south of Luxembourg and a book on the families that lived there from 1645 allowed to create exacts matches between families that lived between 1766 and 1872.

Chapter 2, *The distribution of land in Luxembourg (1766-1872): family-level wealth persistence in the midst of institutional change* analyses family-level wealth inequality and social mobility in Dudelange (Luxembourg) between 1766 and 1872.[2] This period saw the end of feudal social relations with the integration of Luxembourg into the French revolutionary regime (1795-1815). Archival data and information on more than 15,000 descendants over five generations were used to connect the declarants of the Maria-Theresa

[1] The authors wish to thank Peter Lindert, Livio Di Matteo, Salvatore Morelli and Giacomo Gabbuti for supplying us with some data on wealth inequality. This chapter received support from the European Research Council under the European Union's Horizon 2020 Framework Program/ERC Grant agreement No. 725687, SMITE-Social Mobility and Inequality across Italy and Europe, 1300-1800, as well as from the Luxembourg National Research Fund (FNR) (AFR Individual - 12553347).

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land survey with their descendants in the land registries of 1842 and 1872. The main key variable used in the analysis and extracted from the archival sources is the value of the net revenues of the land. The net revenues were assigned according to the surface and the category of land declared. The drop in the Gini coefficient for the ownership of land between 1766 and 1842 reflects an institutional change, the abolishment of the feudal system. The social mobility analysis conducted on the 337 linked descendants and ancestors shows that one standard deviation increase in the average rank position of the ancestors in 1842 leads to a 0.33 standard deviation increase in the rank position of the descendant in 1872.

As the data collection process on the Maria Theresa cadastre continued, Luxembourg City coud also be analysed. Chapter 3, *Land distribution in pre-industrial Luxembourg: a comparison of urban and rural areas*,[3] uses the land distribution derived from the Maria Theresa cadastre in Luxembourg from 1766 to compare inequality levels between Luxembourg City and Dudelange, a rural municipality in the South of the country. I collected 1,045 individual declarations for the city of Luxembourg and 266 observations for the municipality of Dudelange. The inequality analysis is based on the net revenues reported in the declarations and associated to the land owned or used by the declarants. The Gini coefficients for the two areas show a big difference in inequality. Dudelange, with a Gini coefficient of 0.85, seems to be much more unequal than Luxembourg City that registers a Gini coefficient on land distribution of 0.53. The paper analyses the differences in the two areas looking at the net revenues of the different categories of land reported in the declarations.

My interest for economic inequality is not limited to historical data. The Covid-19 pandemic gave me the opportunity to indirectly investigate how economic differences, combined with the pandemic and the stringency measures used to limit its spread, affected people' well-being. In my analysis on five European countries, I included variables such as the number of people living in the same house, the number of rooms available for each person and the presence of a garden. The characteristics of the house in a time when many people worked from home could influence mental and physical health and reflect the economic status of the people that live in there.

Chapter 4 , *Well-being and working from home during COVID-19* (published as Schifano, S., Clark, A.E., Greiff, S., Vögele, C. and D'Ambrosio, C. (2021), "Well-being and working from home during COVID-19", Information Technology & People, published

[3] I would like to thank Guido Alfani, Conchita, D'Ambrosio and Philippe Van Kerm for the support and help in presenting this work in progress. I acknowledge financial support from the Fonds National de la Recherche Luxembourg (FNR) (Grant 12553347 – AFR Individual).

ahead-of-print DOI: 10.1108/ITP-01-2021-0033)[4] tracks the well-being of individuals across five European countries during the course of the coronavirus disease 2019 (COVID-19) pandemic and relate their well-being to working from home. We also consider the role of pandemic-policy stringency in affecting well-being in Europe.

We have four waves of novel harmonised longitudinal data in France, Italy, Germany, Spain and Sweden, covering the period May–November 2020. Well-being is measured in five dimensions: life satisfaction, a worthwhile life, loneliness, depression and anxiety. A retrospective diary indicates whether the individual was working in each month since February 2020 and if so whether at home or not at home. Policy stringency is matched in per country at the daily level. We consider both cross- section and panel regressions and the mediating and moderating effects of control variables, including household variables and income.

Well-being among workers is lower for those who work from home, and those who are not working have the lowest well-being of all. The panel results are more mitigated, with switching into working at home yielding a small drop in anxiety. The panel and cross-section difference could reflect adaptation or the selection of certain types of individuals into working at home. Policy stringency is always negatively correlated with well-being. We find no mediation effects. The well-being penalty from working at home is larger for the older, the better- educated, those with young children and those with more crowded housing.

The harmonised cross-country panel data on individuals' experiences during COVID-19 are novel. We relate working from home and policy stringency to multiple well-being measures. We emphasise the effect of working from home on not only the level of well-being but also its distribution.

The results of the four chapters included in the thesis confirm that wealth inequality needs more and harmonised data, especially to cover developing and underdeveloped countries. Even for developed countries, there is a lack of data for pre-industrial time except for specific countries such as Italy, France, Great Britain and the United States. These exceptions result from the work of scholar teams that devoted their research time to collect and analyse data in the long run. The results that originate from the second chapter of this thesis tell that inequality in Luxembourg in the pre-industrial era was in line with the rest of Europe. In addition, our analysis suggests that social mobility was low, and not affected by a switch from the feudalism to the Napoleonic regime. This result contributes to the

[4] The authors would like to thank two anonymous referees and seminar participants at the University of Luxembourg for helpful comments. Financial support from the André Losch Fondation, Art2Cure, Cargolux, the Fonds National de la Recherche Luxembourg (Grant 14840950 – COME-HERE and Grant 12553347 – AFR Individual), and the French Agence National de la Recherche (Grant DYNAPANDEMIC). Andrew E. Clark acknowledges financial support from the EUR grant ANR-17-EURE- 0001.

discussion on how to reduce inequality, and how policies can be more effective for this. The third chapter shows how the same source, the Maria Theresa cadastre, used to compute inequality in two different places, one rural and one urban, gives very different results. Another contribution to the above discussion is the last chapter of this thesis. It shows that people's well-being working at home during the Covid-19 pandemic were more affected by living in crowded houses. Houses are more crowded when families cannot afford to live in a bigger house and so in this chapter, we aimed to show that wealth inequality indirectly affects our well-being. The four chapters have in common the understanding of the evolution of inequality over time and its consequences on future generations and on personal well-being.

Before presenting the four chapters of this dissertation, I will introduce the concepts of inequality and intergenerational mobility.

Wealth inequality

The increasing interest on economic inequality of the last decades partly depends on Thomas Piketty, with the book *Capital in the Twenty-First Century*. Piketty made possible to increase public interest toward this topic. Citizens should be interested in economic inequality since it can affect, directly or indirectly, their lives. A society is unequal when resources and opportunities are not evenly distributed among the individuals that are part of it. In an extremely unequal society, if we have 100 inhabitants and the wealth of that society is 100, only one person would own 100 and the remaining people 0. Most probably, if we ask people if they are fine with this, the answer would be no. At least, for the 99 individuals that own nothing. McCall (2013) reports that Americans are not satisfied with the current level of inequality. Still, inequality today is so high and tacitly accepted. We vote our politicians according to their education policy plan, or to the tax reform that they want to implement, but policies affect redistribution and inequality. In the past centuries, taxation was among the main debated topics in the policy agenda, in particular taxation of the rich. Already in 1500, Francesco Gucciardini debated the effects of democracies on taxation and on inequality (Scheve and Stasavage, 2016). Over the past centuries, politicians discussed about the meaning of equality of treatment, trying to understand if this means that everyone should equally contribute to the society or that people should contribute proportionally to their economic position.

Looking at the increasing rate of inequality over time in many countries, we can conclude that past governments did not tax the rich high enough. This is counterintuitive since governments, in most cases, represent the majority of the population that we know is not the rich. Even if the rich people are a minority, they have the power to influence the political

interest through lobbying and using their money to finance the election campaigns (Hacker and Pierson, 2010; Bonica et al., 2013).

Some rich people also use tax evasion to become richer, and this results in the underestimation of inequality (Alstadsæter et al., 2019). Hence, if we take into account all the opportunities that rich individuals have to control the political system and to contribute less than what they should to the society, it is difficult to think that high tax rates for wealthy people are in contrast to a meritocratic system.

The connection between democracies, political power, money and inequality is central for our economies and should increase awareness of the importance that these elements have in our lives. One way to do so is to study the past and try to link it with current data.

Wealth data are particularly poor in quality and quantity for the pre-industrial time in Europe and for some countries is even difficult to find data for the nineteenth century. To overcome this problem, we need to put an effort in collecting as much data as possible and to harmonise them (Alfani and Schifano, 2021). Indeed, the data that researchers use come from different sources such as probates, individual declarations, tax on properties, tax on stocks. These sources measure different components of wealth and at different time in the life of individuals. For this reason, a unique definition of wealth is difficult to agree upon. Zucman (2019) discusses a comprehensive definition that includes all marketable wealth but that excludes important components of wealth such as durable goods, valuables or social security wealth, human capital wealth. The multiple definitions of wealth reflect the multiple data sources that we have, and that we need to combine, to have a more comprehensive measure of wealth (Zucman, 2019). For past societies, the land registry or cadastre give one of the most common sources of wealth data. One of the oldest cadastres used is the cadastre of the Florentine State of 1427 (Alfani and Ammannati, 2017; Milanovic et al., 2011). In pre-industrial societies, land is used as proxy for wealth, considering that it was the main source of material wealth (Shenk et al., 2010; Lindert, 1986). Van Zanden (1995) tries to summarise the literature on wealth inequality related to the early modern period of Western Europe and he realised that most of the studies focused on small areas or cities while studies at the country level were missing. From 1995 to todays, the research on the topic improved in quantity and quality of data and in terms of geographic coverage, however we do need more to have a global picture of inequality and its trends.

Social mobility

Social mobility tells how the class of origin and the class of destination of individuals are related. Social mobility is absent when these two classes are the same. Sociologists and economists studied social mobility from different perspectives, with sociologists focussing

on occupation while economists use mostly income or wealth (Van Leeuwen e Maas, 2010). We can distinguish between absolute or relative social mobility (Breen and Müller, 2020). The absolute measure of social mobility counts the number of people whose destination class is different from the class of origin and differentiates between people that moved upward or downward in the social class scheme. The relative measure of social mobility measures how the class of origin influences the class of destination and it tries to measure the strength of this link.

Two different statistical approaches have focused on the study of relative social mobility rates. A more traditional approach measures social mobility looking at the social class of two following generations, such as fathers and sons (van Leeuwen et al., 2016), while a more innovative approach uses elite surnames to group people and follow the average wealth shared by each surname group over very distant dates (Clark, 2014). The two approaches reflect the different data sources that are available to study social mobility, especially for past societies and over the long run. Researchers have used different sources of data such as marital, military, civil, fiscal and land registries, but also autobiographies and journal articles (Alfani, 2015; Dribe et al. 2015).

Social mobility became part of the policy agenda in the last decades. Understanding the actual rates of social mobility and of historical trends is important to explain if and how parents' resources have an impact on children's wealth and social status once they reach adulthood. Social mobility is key to understand income inequality because it really reflects equality of opportunity, or fairness. Solon (1999) explains this concept using as example two societies that share the same Gini coefficient. In each society, we can look at parents and sons position in the distributions of earnings. In society one, parents and sons share the same percentile, so that the parents' position define the sons' position in the earnings distribution. In society two, the relative position in the earnings distribution of the sons does not depend on the one of the parents. This example suggests that although society two has the same Gini as society one, the inequality that results from the earnings distribution of society two is the outcome of a more meritocratic society where anyone can move from one social class to another.

This allows institutions to understand if public policies, such as education or health care, are effective in giving the same opportunities to everyone.

Education is considered a tool to promote social inclusion and to reduce class differences from a social and economic point of view, and the association between education and social mobility is one of the most commonly studied. However, results do not seem to agree on whether progress of education and social mobility move toward the same direction (Beller and Hout, 2006; Breen and Müller, 2020; Bernardi, 2016; Barone and Ruggera, 2018; Sturgis and Buscha, 2015; Torche, 2016). In modern and complex societies, education is one of the

elements that determine children's social and economic future. Experiences are fundamental to create attitudes and behavioural skills, or social wealth, in each individual. Early childhood exposure to different activities, social context and tools is fundamental to define how children development and differences in parents' resources translate into different investments on children (Duncan and Murnane, 2011).

Education should not be considered only as the sum of years studied, the formative experience matters as much as the years of education. Some examples that come first to my mind are summer schools to learn a foreign language and trips around the world that children can do with the parents. How many children have the opportunity to be constantly exposed to new languages and cultures? Opportunities depend on the financial resources of parents and the governments should make an effort to guarantee that children and people in general have equally access to the same opportunities. The logical reasoning will bring to the conclusion that the more you have the more you can do, thus inequality and social mobility need to be part of the same political agenda.

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Chapter 1. Wealth inequality in the long run

Wealth inequality in the long run

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1.1 Introduction

In recent years studies on historical developments in economic inequality have flourished. Much of this new research has focused on income inequality during the 19th and 20th centuries, continuing a trend that had been triggered by Simon Kuznets's seminal article (Kuznets, 1955). This greater attention to distribution is surely connected to the tendency towards the increase in income inequality in past decades, as well as to the Great Recession that started in 2007, whose effects are still felt today – among them a much-heightened perception of inequality as a social and political issue. One factor characterising this renewed interest in inequality is that it has not been limited to income, as was almost invariably the case in the past, but has involved wealth, which in recent decades has shown a tendency towards becoming ever more concentrated (Atkinson, 1980; Di Matteo, 2018; Lindert and Williamson, 2016; Piketty, Postel-Vinay and Rosenthal, 2014; Piketty, 2014; Roine and Waldenström, 2015). An even greater attention to wealth inequality has been paid by studies focusing on preindustrial times (as a rule of thumb, pre-1800), which – for a long period – had remained uncharted territory for inequality studies (Alfani, 2015; Alfani, 2017; Alfani and Ammannati, 2017; Alfani and Di Tullio, 2019; Bengtsson et al., 2018; Canbakal, Filiztekin and Pamuk, 2018; Nicolini and Ramos Palencia, 2016). Indeed, for some areas of the world (especially Europe) we now probably know more about wealth inequality in preindustrial times than during the 19th or even most of the 20th century.

Overall, recent findings about long-run inequality trends, of both income and wealth, have significantly changed how we look not only at historical distributive dynamics, but also at current inequality levels and tendencies. For example, they have led many scholars to explicitly reject Kuznets's hypothesis about the existence of an innate tendency for economic inequality to decline after the achievement of a certain level of development (Lindert, 2000),

as well as to question all sorts of mono-causal explanations of changes in inequality (Alfani and Ryckbosch, 2016; Alfani and Di Tullio, 2019; Lindert and Williamson, 2016). In this chapter, some of the insights from these studies will be used to better understand the nature of the inequality trends we describe.

One important reason why tendencies in wealth inequality have become crucial to current studies on distributional dynamics is the awareness that a high concentration of material and financial assets could hinder the way in which modern societies are supposed to function. No one has been more influential in making this point than Thomas Piketty (Piketty, 2014; 2015). In Piketty's view, as long as the rate of return on capital is higher than the growth rate of national income, and as long as wealth is highly inheritable, inequality (of both income and wealth) will continue to increase. But this might prove incompatible with the principles of social justice and equal access to public institutions, which are the basis of contemporary democracies. More generally, there is a growing concern that excessively high wealth inequality may compromise the openness of societies and have negative consequences for long-term social and economic development, for example by making upward mobility more difficult (OECD, 2015).

This chapter presents the available information about wealth inequality in the last two centuries. Unfortunately, for most areas of the world this information continues to be much less systematic than what is available for income inequality. Subsequently, we describe the general trends of wealth inequality, and we provide a brief account of some of the current debates on the drivers of changes in inequality in the long run of history.

1.2 Description of the concepts used

The analyses presented in this chapter refer to the distribution of household net wealth. We measure inequality via two standard indicators: the Gini index and the wealth share of the richest 10%. Both choices require further discussion.

At the outset, we have to acknowledge that there is currently no universal consensus about what we should consider when measuring "wealth". Indeed, if we wanted to measure the distribution of all economic resources, we should take into account human capital (Davies and Shorrocks, 2000), or the sum of what are sometimes referred to as "embodied" and "relational" wealth (embodied wealth includes knowledge and skills as well as physical characteristics like strength) (Borgerhoff Mulder et al., 2009). Even if we restricted the

analysis to non-human capital, there would still be some doubt about which components of wealth we should include. It might seem straightforward to define wealth as "net worth", i.e. the monetary value of assets (both real property and financial claims) minus the value of liabilities. But this leads to questions about the inclusion of intangible assets that could not easily be sold, for example, pension rights or entitlements to future government transfers. In practice, applied research on wealth usually focuses on net "marketable wealth" (Davies and Shorrocks, 2000, p. 60). A final point to consider is that in the history of economic thought, two different ideas have confronted each other, one considering wealth as a set of tangible possessions (the notion of net wealth is related to this view), the other focusing not on tangibles per se, but on the pleasure or "utility" that they generate (Heilbroner, 2008). A different way of raising not-entirely-dissimilar concerns comes from anthropology, which has suggested that wealth and affluence are not universal concepts, and that the possession of assets has different meanings and consequences in different societies (Sahlins, 1974).

This being said, the most frequently used concept is that of net (marketable) wealth, which also corresponds to by far the largest part of the currently available information. This is the kind of information provided by the *World Inequality Database (WID)*, for example. Consequently, the data presented here have to be understood as referring to net wealth (although for earlier epochs and for some areas we often have more limited information, hence some adjustments were required). This definition of wealth is also in line with OECD recommendations in this field (OECD, 2013). Note that our measures refer, ideally, to wealth at the household level, without adjustments for household size, again reflecting data availability and common practice. However, for some countries and periods we rely on individual-level distributions (adults) due to the absence of information about household distributions. Based on the available literature – see the discussion in (Roine and Waldenström, 2015, p. 513) – we expect that measures of wealth inequality at the individual level differ only slightly from those calculated at the household level.

Regarding the inequality measures, the Gini index of concentration is an obvious choice, not only because of its vast application in the social sciences, but also because a significant amount of the information we have available is expressed as a Gini value. The index value varies between 0 (perfect equality, i.e. all households or individuals have the same wealth) and 1 (perfect inequality, i.e. one household or individual owns all the wealth, the others have none). However, the Gini index is often multiplied by 100 for more effective

presentation, as we do here. Note that this index can in principle be applied in exactly the same way to wealth and to income – hence we refer to Chapter 11 from (van Zanden et al., 2014), dedicated to income inequality, for further discussion of the index's properties. When applied to wealth, the Gini index tends to be higher than when applied to income, due to the empirical tendency for wealth to be more concentrated than income, see (Davies and Shorrocks, 2000, p. 60).

A well-known limitation of the Gini index is that the same value can describe very different distributions. One practical way of solving this problem is to couple the Gini coefficient with percentiles, which can capture changes in important parts of the overall distribution. In this chapter, we do this by including information on the wealth share of the richest part of the population. But there are other important reasons for considering this additional indicator. One is practical: for a significant number of years and countries, we have information only about the share of the richest 10%. Hence, using information about the top of the distribution allows to improve coverage across time and across countries. It has also been argued that the wealth share of the richest should be used because it is easier to understand even without specific training – which is clearly a desirable feature, given the socially sensitive nature of many current debates on inequality and the interest in the topic found across ample strata of civil society. This choice is further justified by the fact that there is a clear empirical tendency for changes in the wealth share of the rich to go hand-in-hand with changes in general inequality as measured by the Gini index (in other words, the Gini index increases/declines as the wealth share of the rich increases/declines). This empirical tendency has been confirmed by studies of both contemporary and historical societies (Alfani, 2015; Alfani, 2017; Atkinson, Piketty and Saez, 2011; Alvaredo et al., 2013; Roine and Waldenström, 2015). Finally, it has been argued that in studies of wealth inequality the top shares are to be preferred to the Gini because wealth (unlike income) can assume negative values for indebted households at the bottom of the distribution – indeed, in the presence of negative wealth, the Gini value could theoretically exceed 1 (or 100 in our preferred format) (Balestra and Tonkin, 2018). This, however, does not happen across our database, either because the original sources used do not allow for negative wealth (this would be the case of most property tax records and estate data sources), or because the research teams producing the data we rely upon set the minimum value of net household wealth at zero. This is the case for the *World Inequality Database* (Alvaredo, F.; A. Atkinson and L. Chancel,

2016), in particular Annex Table A1, which is the main source of the estimates included in this chapter. This consideration enhances the case for coupling the Gini index with top shares or other indicators with similar properties.

The existence of a strong empirical correlation between the share of the richest and the Gini index presents the additional advantage of offering a simple and relatively reliable way of estimating one from the other when complete information is unavailable – which unfortunately is very often the case, as discussed in the next section. We made use of this procedure, with some adaptation, as the preferred way to complete gaps in the database of Gini indices or of the share of the top 10%.[5] This method is preferable to other options, like interpolation, because it makes use of at least some information about the actual distribution in a given country and year, although we had to resort to interpolation when neither the Gini nor the share of the top 10% were available. The estimated relationship between the Gini and the share of the richest 10% is the following.[6]

$$Gini = 0.30 + 0.72 * Top10$$

The main objective of this chapter is to provide a long-term perspective on wealth inequality in individual countries. However, we also provide some hints about the global distribution of household wealth (i.e. that obtained by considering all the households in the world as living in the same country). This task is performed with a method analogous to that employed in Chapter 11 of (van Zanden et al., 2014), which provides additional details. Applying this method requires some assumptions. In particular, we rely upon available estimates of the average net wealth at the country level, and assume log-normality to estimate wealth distributions starting from the Gini coefficient and the net private wealth for each country and year. Global wealth distributions are then obtained by aggregating country level distributions for each year. Unfortunately, we could produce global estimates only for the more recent years, given the sparse nature of the available information about wealth inequality (even including new estimates and "guess-estimates"), as detailed in the next section. We do however provide estimates of overall wealth inequality since 1850 across a

[5] Note that across our database, the Pearson coefficient between the Gini index and the share of the richest 10% is 0.94, suggesting a very strong correlation. The Pearson coefficient has been calculated on the 258 country-years for which both Gini and the share of the top 10% were available.

[6] With an R^2 of 0.8756, an adjusted R^2- of 0.8751 and a t-statistics of 42.61.

small group of Western countries (France, Sweden, the United Kingdom and the United States).

1.3 Historical sources

The information currently available about the distribution of wealth is much sparser than that relating to income. In order to build as comprehensive a database as possible, we needed to rely upon disparate sources as well as to produce some new estimates.

Most of the available historical evidence about wealth concentration comes from wealth and estate taxation statistics. Tax sources also allow building the longest time series (Roine and Waldenström, 2015). However, they also have a number of limitations. A particularly important one is that often they include only the richest part of the population, which is why many applied studies have relied upon the wealth share of the richest to summarise inequality levels and trends. But this coverage problem does not always occur. For example, the Italian estimi (property tax records used until the turn of the 19th century) included at least 90-95% of the overall population (Alfani, 2015; Alfani and Di Tullio, 2019). Similar sources exist for other parts of Europe (for example southern France, north-eastern Spain and parts of Germany). Unfortunately, this kind of information is not widely available for later periods due to changes in the fiscal systems. In this chapter, these sources have been used only to estimate wealth inequality in Italy in the first part of the 19th century.

A general concern with all fiscal sources is the level of tax evasion and avoidance. Although it is usually very difficult to quantify this, it should be noted that at least some components of wealth – like real estate – are relatively difficult to hide, or to misevaluate dramatically. This being said, the opportunity for wealth tax evasion and avoidance probably tended to increase during the two centuries covered by this chapter, for example because in the current global economy it has become easier to hide movable wealth by means of tax havens or otherwise (Roine and Waldenström, 2015).

Alternative sources feeding the data used in this chapter include estate data (which usually do not cover the entire population, but result from researchers' attempts at building representative samples) as well as probate inventories (data from the judicial process through which a will is accepted as the legal testament of the deceased). The latter are relatively popular in historical research, due to the vast archival availability of probates since early epochs. A useful feature of probates is that they exist for non-European areas, too, like the

Ottoman lands in Anatolia and the Levant (Coşgel and Ergene, 2012; Canbakal, Filiztekin and Pamuk, 2018). However, due to the vast amount of archival research needed to produce national samples of probates, so far it has been possible to produce comprehensive and reliable wealth distributions based on them only for a few countries and years. Moreover, and most importantly, they do present specific challenges related to sampling – as, again, they often reflect the richest part of the population far better than the poorest, and require assumptions about mortality rates by age, sex and socio-economic status to move from the distribution of wealth of those dying in a given period to the hypothetical distributions characterising living cohorts in earlier periods (Bengtsson et al., 2018; Lindert, 1986; Roine and Waldenström, 2015).

The main databases we drew information from provide us with standardised measures that usually incorporate attempts at correcting the limitations in the original sources described above. In particular, we relied heavily upon the *World Inequality Database (WID)* (WID.world), from which comes most of the information we have for the period 1900-2000 (recent releases of the database have greatly increased the coverage of wealth inequality, although much more information is available about income). For 2010, we have also collected information from the *Global Wealth Databooks (GWD)*, published by Credit Suisse's Research Institute (Credit Suisse). The Databooks include estimates for a number of countries ranging from 20 to 30 according to the year, based on a combination of national accounts and household survey data supplemented by a variety of estimation methods. For this year and for a large subset of OECD countries, high-quality data from the *OECD Wealth Distribution Database (WDD)* (OECD), based on a combination of household surveys and (for some countries) administrative data, are also available. We preferred relying upon the *GWD* for later years due to the much larger number of countries covered as well the higher (albeit far from perfect) consistency with the estimation methods used by the *WID*. However, we also used the *WDD* as a means of external validation of our findings. For earlier periods, we relied upon a greater variety of sources, reflecting the specificities of the archival and statistical information produced locally as well as the degree of advancement of historical research on inequality and related topics.

Only for very few countries covered by this chapter is information about wealth inequality available as far back as 1820. Especially for Africa and Asia, the estimates tend to begin only in the second half of the 20th century (the earliest estimate we have for these

areas refers to Japan in 1870). Estimates extending back to 1820 are available only for five countries in Western Europe and the Western Offshoots: France, the United Kingdom, Italy, Sweden and the United States. The sources and information used in this chapter for these five countries are detailed below.

France is the country whose wealth distribution during the 19th century has been researched most thoroughly. This is due especially to the research conducted by (Piketty, Postel-Vinay and Rosenthal, 2006; Piketty, Postel-Vinay and Rosenthal, 2014; Piketty, 2014). Indeed, of all the countries covered by this chapter, France is the only one for which complete series of wealth Gini indices and top shares are readily available, without the need for additional estimates, for the entire period 1820-2010. We used the standardised series recently made available by the *WID*.

For the United Kingdom, we made use of estimates of the share of the richest 10% produced by (Lindert, 1986) for selected years during the late 18th and the 19th century, with some additional estimates used to fill in the gaps. Lindert's estimates are based on data from probates, coupled with various other sources to account properly for some specific components of wealth, like real estate. From 1900, the *WID* provides fairly systematic data about the wealth share of the richest 10%. Information about UK Gini index is much scarcer, and it is only from the 1970s that a series of Gini indices is available, from (Alvaredo, Atkinson and Morelli, 2018). This led us to produce a large number of new estimates by means of the correlation procedure described in the earlier section.

For Italy, wealth inequality measures for 1820 have been produced using information from studies of long-term inequality trends in preindustrial times (based on fiscal sources and particularly on property tax records) in a variety of Italian pre-unification states – for example (Alfani, 2015; Alfani, 2017; Alfani and Di Tullio, 2019; Alfani and Ryckbosch, 2016). Information for later periods is scattered (Schneider, Pottenger and King, 2016; Brandolini et al., 2004; Davies et al., 2010; Credit Suisse, 2017; Gabbuti and Morelli, 2019); as the *WID*, does not provide this information for Italy, hence many new and rather tentative estimates have been produced.

For Sweden during the 19th century, Bengtsson et al. (2018) produced estimates of both the Gini index and the wealth share of the richest 10% for selected years by using data from probate inventories. For the 20th century, the same was done by Roine and Waldenström

(2015) regarding the share of the richest 10%, while Schneider, Pottenger and King (2016) provided Gini estimates for 2000. Also, in this case, many additional estimates were required to fill in the gaps.

Finally, for the United States, very tentative estimates of top wealth shares during the 19th century have been produced by interpolation between an observation for 1774 based on data provided by Lindert (2000), one for 1870 provided by Sutch (2016) and one for 1890 by Roine and Waldenström (2015); Schneider, Pottenger and King (2016) provide a Gini index for 1870. For the 20th and early 21st centuries, the data we use for the share of the richest 10% and for the Gini indices mostly come from the *WID*. New tentative estimates have been produced to fill in the gaps.

Table 1.1 and Table 1.2 provide an overview of the kind of information used in this chapter, specifying the original data source and the estimation method used. As far as the share of the top 10% is concerned, the *WID* provided 21% of the data used in our analysis, while the publicly available database by Roine and Waldenström (2015) furnished another 13% of the data. Regarding the Gini indexes, 33% of the observations are new estimates obtained by correlation with the share of the top 10% (as discussed earlier). The *WID* and Schneider, Pottenger and King (2016) together supplied 18% of the other data.

For both the Gini indices and the share of the top 10%, 34% of observations had to be produced by simple interpolation, although sometimes between very close dates (for example, the estimate for Italy in 1990 is obtained by interpolating the observations for 1989 and 1991).

Unfortunately, as is quite clear, good-quality estimates of wealth inequality are only sparsely available, hence to provide at least an impression of long-term trends we had to rely heavily on new and often very tentative estimates. Also note that for some areas and periods more than one estimate is available, hence we had to make informed decisions about which one to rely upon. Beyond the general guidelines described in this section, we aimed to ensure consistency in the reconstructed series, to avoid reporting clearly artificial trends, and to offer a picture that is overall consistent with the most recent literature on single countries or areas.

Table 1.1 Estimates of wealth inequality used in this chapter by source and benchmarked year, 1820-2010, Gini coefficients

Number of countries covered

	All	World Inequality Database	Schneider, Pottenger and King (2016)	New estimate (obtained by correlation with share of top 10%)	New estimate (obtained by interpolation)	Other sources
1820	5	1		1	3	
1830	5	1			4	
1840	5	1			4	
1850	5	1			3	1
1860	5	1			4	
1870	6	1	1	1	2	
1880	6	1			5	1
1890	7	1	1	2	3	
1900	7	1	1	2	2	1
1910	11	1	1	3	5	1
1920	12	1		5	6	
1930	12	1		5	6	
1940	12	1		4	7	
1950	12	1		7	4	
1960	13	2		6	5	
1970	17	2	1	6	3	5
1980	18	3		4	6	5
1990	21	4	1	4	5	7
2000	25	4	3	3	2	13
2010	36	4	1	27	2	2
Total	240	33	10	80	81	36

Table 1.2 Estimates of the wealth share of the richest 10% used in this chapter by source and benchmark year, 1820-2010

Number of countries covered

	All	World Inequality Database	Credit Suisse Global Wealth Databooks	New estimate (obtained by correlation with Gini coefficient)	New estimate (obtained by interpolation)	Roine and Waldenström (2015)	Other literature
1820	5	1			3		1
1830	5	1			4		
1840	5	1			4		
1850	5	1			3		1
1860	5	1			4		
1870	6	1			2		2
1880	6	1		1	5		
1890	7	1			3	1	2
1900	7	2			2		3
1910	11	3		1	5		2
1920	12	3			6	3	
1930	12	3			6	3	
1940	12	3			7	1	1
1950	12	3			4	3	2
1960	13	3			5	3	2
1970	17	3		4	3	4	3
1980	18	4		2	6	2	4
1990	21	5		5	5	4	2
2000	25	5		5	2	4	9
2010	36	5	23		2	2	4
Total	240	50	23	18	81	30	38

1.4 Data quality

In Table 1.3 and Table 1.4 we provide an assessment of the quality of the data used in this chapter. So far, the study of wealth inequality has not produced a unique database containing comparable data in terms of both unit of analysis and methodologies used to gather them.

Table 1.3 Quality of estimates of the Gini coefficient of wealth inequality by region and benchmark year, 1820-2010

	Western Europe	Eastern Europe	Western Offshoots	Latin America and Caribbean	Middle East and North Africa	Sub-Saharan Africa	East Asia	South and Southeast Asia
1820	3		4					
1870	3		4		3			
1910	3		4				4	
1960	3		4				4	
1990	3	4	2	3			3	2
2010	3	3	2	3	2	4	3	3

Note: 1: High quality; 2: Moderate quality; 3: Low quality; 4: Tentative estimates. The table reports rounded mean values per world region/benchmarked year.

Table 1.4 Quality of estimates of the wealth share of the reachest 10% of the population by region and benchmark year, 1820-2010

	Western Europe	Eastern Europe	Western Offshoots	Latin America and Caribbean	Middle East and North Africa	Sub-Saharan Africa	East Asia	South and Southeast Asia
1820	3		4					
1870	3		4		3			
1910	3		4				4	
1960	2		4				4	
1990	2	4	2	3			3	2
2010	2	3	2	3	2	4	3	3

Note: 1: High quality; 2: Moderate quality; 3: Low quality; 4: Tentative estimates. The table reports rounded mean values per world region/benchmarked year.

Studies of wealth inequality in the past have relied upon national sources that provide different information about wealth distributions. Most of them are based on wealth tax statistics, estate records, probates, and for the last decades, household surveys. Moreover, given the presence of numerous gaps between the readily available measures, we had to produce many new estimates. This is why, according to the parameters defined in Chapter 1 of (van Zanden et al., 2014), in most instances data quality has to be classified as “low” or “moderate”. Note that the situation is better regarding measures of the share of the richest

10% compared to Gini indexes. To a large degree this is due to the *World Inequality Database (WID)*, which is the most comprehensive database in this field of enquiry. For many countries and years, the *WID* provides us with good estimates of the wealth share of the richest percentiles. Other sources have been used for specific countries, as detailed previously, as well as for the 19th century, which is not usually covered by the *WID* (France is the notable exception).

Collecting estimates of the Gini coefficients for the period under study was more difficult. Indeed, earlier research has focused mostly on the top percentiles, also because it is much easier to gather data on the right-hand side of the wealth distribution. However, there is strong empirical evidence that the wealth share of the richest 10% and the Gini index are strongly correlated. Indeed, for the sub-set of countries and years for which we had information about both, the Pearson correlation coefficient is 0.94. This allowed us to present estimates of the Gini coefficient starting from values of the top 10% whenever we lacked a direct measure of the former. Less often we predicted the top share from the Gini coefficient. This is a simple estimation method which, in the absence of any useful additional information, seems preferable to more complex procedures. A more detailed description of our methods is provided in the section "Description of the Concepts Used". Furthermore, we have systematically assigned a lower data quality to predicted measures than to original measures.

1.5 Main highlights of historical trends in wealth inequality

This section provides an overview of long-term tendencies in wealth inequality, focusing on developments within countries and underlying commonalities and differences across world regions. It also provides a tentative picture of global wealth inequality, generally restricted to the most recent periods given the limited availability of information about wealth distribution in many areas of the world until the final decades of the 20th century.

1.5.1 Developments in individual countries

At 1820, we have information about wealth inequality for only five of the countries included in Table 1.5 and Table 1.6, and all of them are in the West: France, the United Kingdom, Italy and Sweden in Western Europe, plus the United States in the Western Offshoots. In this year, Gini indices range from 88 to 90 in Europe, while the United States was significantly more "egalitarian" with a Gini of 76. The wealth share of the richest 10% marks

an even greater distance, being in the 81-85% range in Europe, and 62% in the United States. This difference in wealth inequality between Western European countries and the United States in the 19th century is well documented in historical research (Lindert and Williamson, 2016). The gap between Europe and the United States tended to narrow during the 19th century, without disappearing entirely. By 1900, with a Gini of 84, the United States was still slightly more egalitarian than any European country with available data, although only marginally so compared to Italy where the Gini was 83. For that year, we also have information about Canada which, with a Gini of 89, was basically in line with European countries. The only non-Western country for which we have data in 1900, Japan, is significantly more egalitarian, with a Gini coefficient of 53 and a wealth share of the richest 10% of 36%, well below the 75-93% range characterising Western Europe and the Western Offshoots as a whole.

Importantly, during the 19th century we find an overall tendency for wealth inequality to increase. This is clearer in the United Kingdom, Sweden and the United States compared to France and Italy, whose trends are quite flat. This finding could be taken to fit the narrative of the "Kuznets curve" – which, although originally related to income, can reasonably be applied to wealth as well, see pp. 215-219 in Lindert (1991) – with growing inequality seen as the consequence of the Industrial Revolution. However, recent research focused on longer time periods casts doubt on this, as this phase of increasing inequality seems to be the continuation of a multi-secular phase of wealth inequality growth that started around the 15th century, that is, after a phase of declining inequality (of both wealth and income) triggered by the Black Death plague of 1347-1352 (Alfani, 2017; Alfani, 2019; Alfani and Di Tullio, 2019; Alfani and Ryckbosch, 2016).

Wealth inequality continued to grow during the first decade of the 20th century. In Western Europe and its Offshoots, this tendency was halted by World Wars I and II and by the troubled times in between. The multi-faceted impact of war and large-scale societal and economic disruption has been variously presented as the direct cause of the inequality decline characterising the period from 1914 to 1945 (Piketty, 2014; Scheidel, 2017). Indeed, in each country for which we have information about wealth inequality in both 1910 and 1950, we find a decline over the period. For example in Australia, whose first available observation dates to 1910, the Gini coefficient declines sharply, from 86 to 63, and the share of the richest 10% falls from 75% to 64%. The tendency for a decline in wealth inequality continued for

about two decades after 1950, probably (at least in advanced countries) also as a consequence of fiscal redistribution and the associated development of the welfare state: think about, for example, the spread of public programmes supporting home ownership (Atkinson, Piketty and Saez, 2011; Alvaredo et al., 2013; Piketty, 2014). From the late 1970s – the beginning of a phase of fiscal reform leading to lower progressiveness in income taxation and lower inheritance taxes, as well as of deregulation in the financial sector (Alfani, 2019; Piketty, 2015) – we find in most countries signs of a resumption in the tendency for wealth inequality to grow, which continues to this day. At least to some degree, this could also be related to demographic tendencies in the West. Particularly relevant are increases in life expectancy: as wealth is positively correlated with age, due to higher cumulated savings, an aging population tends to be characterised by a more dispersed, hence more unequal, wealth distribution – for a discussion of this general problem, which is also relevant for income, see Paglin (1975). According to some studies, population aging is a contributing factor of wealth inequality growth, for example in Germany (Ihle and Siebert-Meyerhoff, 2017), although this effect can be expected to wane and finally disappear as Western populations grow even older.

From 1970 onwards, we can compare inequality levels between more world areas. At that date, the Gini index in Western Europe ranged from 65 to 77; in the Western Offshoots from 52 to 84 (72-84 if we restrict the observation to North America); in Latin America and the Caribbean from 61 to 86; and in Asia, 52, where the only estimate available refers to Japan. However for China in 1980 our estimate of the Gini index is 54, suggesting that overall East Asia was relatively egalitarian (differences in political regimes between China and Japan do not seem to be associated with significantly different inequality levels).

The coverage of our database improves further in subsequent decades. In 2000, the range of Gini levels was 57-89 in Western Europe; 75 in the Russian Federation, which is the only Eastern European country for which we have information; 62-83 in North America and Australia (the latter being, again, the most egalitarian of the group); 74-78 in Latin America and the Caribbean; 72 in Turkey; 55-59 in East Asia (Japan and China respectively); and 67-76 in South and Southeast Asia.

Table 1.5 Gini coefficient of wealth inequality in selected countries, 1820-2010

	Western Europe							Eastern Europe		Western Offshoots			Latin America and Caribbean			Middle East and North Africa		Sub-Saharan Africa			East Asia		South and Southeast Asia		
	GBR	NLD	FRA	DEU	ITA	ESP	SWE	POL	RUS	AUS	CAN	USA	MEX	BRA	ARG	EGY	TUR	KEN	NGA	ZAF	CHN	JPN	IND	IDN	THA
1820	[90]		88		89		[90]					[76]													
1830	[90]		87		[88]		[89]					[78]													
1840	[90]		86		[88]		[88]					[79]													
1850	[90]		90		[87]		87					[80]													
1860	[90]		88		[87]		[90]					[82]													
1870	90		87		[86]		[93]					83										53			
1880	[92]		87		[86]		[92]					[83]										[53]			
1890	[94]		88		86		[92]				91	[82]										[53]			
1900	97		89		83		91				89	[84]										[53]			
1910	96		89		81		[94]			86	[87]	[87]										[53]			
1920	94		88		[79]		[96]			[80]	[84]	[86]										[52]			
1930	92		87		[77]		[95]			[74]	[82]	[91]										[52]			
1940	91		82		[74]		[90]			[69]	[79]	[86]										[52]			
1950	88		82		[71]		[86]			[63]	77	[79]										[52]			
1960	81		80		[68]		[79]			58	70	84										[52]			
1970	77		70	75	[65]		[72]			52	72	84	61	84	86							[52]			
1980	65		66	70	[62]		69			66	69	81	[66]	85	84						54	52			
1990	64	78	65	62	58		72		67	64	69	79	[70]	85	83						54	56	66		
2000	71	79	70	67	61	57	89		75	62	69	83	75	78	74		72				59	55	67	76	71
2010	69	81	70	73	63	67	73	58	78	61	71	88		82						82	73	65	80	78	78

Note: For an assessment of data quality, see Table 1.3 and Table 1.4. The complete database, including information about the sources used for each country/year, can be downloaded from http://didattica.unibocconi.eu/Alfani_database.

Values in brackets [ ] indicate very tentative data.

StatLink 2 https://stat.link/swhjlm

By 2010, the United States stands out as the least egalitarian country among those included in Table 1.5 and Table 1.6 , with a Gini coefficient of 88 and a wealth share of the richest 10% of 73%. An interesting feature of American history is that, starting from being the most egalitarian of Western societies in the 19th century, it has become exceptionally unequal.

Table 1.6 Wealth share of the richest 10% of the population in selected countries, 1820-2010

	Western Europe							Eastern Europe		Western Offshoots			Latin America and Caribbean			Middle East and North Africa		Sub-Saharan Africa			East Asia		South and Southeast Asia		
	GBR	NLD	FRA	DEU	ITA	ESP	SWE	POL	RUS	AUS	CAN	USA	MEX	BRA	ARG	EGY	TUR	KEN	NGA	ZAF	CHN	JPN	IND	IDN	THA
1820	[83]		85		81		83					[62]													
1830	[84]		82		[80]		[81]					[63]													
1840	[84]		80		[79]		[80]					[63]													
1850	[84]		87		[78]		79					[64]													
1860	[84]		83		[76]		83					[65]													
1870	84		81		[75]		87					65										36			
1880	[86]		83		[74]		87					69										[36]			
1890	[89]		83		73		87				84	72										[36]			
1900	93		84		76		86				82	75										[36]			
1910	92		85		82		88			75	[79]	78										[35]			
1920	88		82		[76]		92			[72]	[75]	78										[35]			
1930	86		80		[71]		89			[70]	[72]	85										[35]			
1940	84		72		[66]		83			[67]	[68]	77										[35]			
1950	80		72		[61]		77			[64]	65	68										[35]			
1960	71		71		[55]		68			[61]	55	70										[35]			
1970	64		58	62	[50]		58			58	56	71	46	73	76							[35]			
1980	52		52	49	[45]		55			50	56	65	[51]	75	74						41	35			
1990	46	64	50	41	39		59		53	49	56	64	[57]	75	72						41	40	52		
2000	51	58	57	44	49	42	60		65	45	56	69	62	67	61		59				48	39	53	65	58
2010	54	62	56	59	46	51	59	37	66	45	57	73		72						72	63	48	69	67	67

Note: For an assessment of data quality, see Table 1.3 and Table 1.4. The complete database, including information about the sources used for each country/year, can be downloaded from: http://didattica.unibocconi.eu/Alfani_database.

Values in brackets [ ] indicate very tentative data.

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This change mainly reflected developments in the interwar period and in the 20-30 years following World War II, when the United States were characterised by a lower decline in inequality than that found in many European countries or Canada. It is also interesting to compare the case of the United States to that of France, which followed much the opposite

path, turning from being one of the most unequal Western European countries in the first half of the 19th century to being one of the most egalitarian Western countries today – or at least, one where the inequality increase during the last 40 or 50 years has been exceptionally modest (by 2010, with a Gini of 70, France was as unequal as in 1970. The share of the richest 10% even declined marginally, from 58% to 56%).

1.5.2 Regional comparisons

The country-level data reported above allow for some regional comparisons, as shown in Table 1.7 (for all world regions except sub-Saharan Africa and the Middle East and North Africa). The measures shown in the table do not reflect differences in net wealth between countries nor country population sizes, but are simple averages of Gini coefficients. Table 1.7, which we restricted to 1950-2010 to avoid presenting measures based on few country observations, shows the final phase of decline in within-country wealth inequality in Western Europe and in the Western Offshoots, from the 1950s to the 1970s. This decline, which is usually associated with the development of the welfare state (see discussion above), has been followed in the last 40-50 years by stagnation and then an upward creep (which was more clearly visible in the country-level data presented in Table 1.5 and Table 1.6).

A period of declining inequality seems to have been followed by one of rising inequality also in East Asia, where average inequality today is very close to that of Western Europe. East Asia and Western Europe are the only two world regions that, in 2010, were below the world average of 72. The Gini index for the Latin America and Caribbean region matches the average perfectly, while that for the Western Offshoots (at 74) is just above it. South and Southeast Asia leads the ranking, with a Gini index of 82 (although excluding Singapore drops this to 79). This picture does not change much if we look at 2000 (when database coverage is highest) instead of 2010, with the exception of the Latin America and Caribbean region, which jumps to the top of the ranking. The very high wealth inequality in the Latin America and Caribbean area in 2000 mirrors its exceptionally high income inequality (Milanovic, 2005; Prados de la Escosura, 2007).

1.5.3 A first glance at the global wealth distribution

We can provide a global perspective on wealth distribution, by observing the inequality levels corresponding to all the world's households taken together, i.e. as if the whole world were considered as a single country, similarly to what is done for income inequality in

Chapter 11 of van Zanden et al. (2014).[7] Unfortunately, this is not easy to achieve for wealth, given that we do not have complete information for any year, either about inequality levels or about per capita net wealth per country. Consequently, we focus on 2000, which is the year with the largest country coverage. Some additional assumptions were made to obtain estimates of the global wealth distribution in 2000; in particular, we use the information about inequality for South Africa in 2010 to represent the whole of sub-Saharan Africa in 2000, which clearly does not reflect perfectly the overall situation of the area.

Table 1.7 Wealth inequality across world regions, 1950-2010

Gini coefficients, unweighted averages

	Western Europe	Western Offshoots	Latin America and Caribbean	East Asia	South and Southeast Asia	World
1950	84	73		52		79
1960	80	70		52		75
1970	76	69	77	52		74
1980	72	72	78	53		71
1990	70	71	79	55	66	70
2000	72	71	76	57	71	71
2010	71	74	72	69	82	72

Note: For an assessment of data quality, see Table 1.3 and Table 1.4. This table includes all the countries for which we have information about wealth inequality, so this covers a larger group compared to Table 1.5 (hence some slight differences in the value of "World" averages between this table and Table 1.8).

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Our estimate of the global wealth distribution in 2000 is shown in Figure 1.1, panel A. As can be seen, this global distribution is log-normal (i.e. it assumes a normal shape when the x axis is expressed in a logarithmic scale), with the mode placed at a per capita net wealth of about USD 8 700 (measured as US dollars PPP 2017). The corresponding Gini level is 82, and the share of the richest 10% is 73%. Our estimate is quite a bit lower than the Gini of 93 (with a share of the top 10% of 89%) estimated for the same year by Davies, Lluberas and Shorrocks (2017) (see in particular pp. 754-5), due to differences in the countries

[7] Also see the section "Description of the Concepts Used" about methods.

covered and in the methods used. In particular, while we apply to wealth the method used for income in Chapter 11 of van Zanden et al (2014) in order to maximise the internal comparability of measures, Davies and Shorrocks (2000) follow a different approach that adjusts the right tail of the distribution based on the "rich lists" published by Forbes and others.

Unlike what was shown for the income distribution in van Zanden et al (2014), our wealth distribution for 2000 is unimodal. As the coverage of our database is quite imperfect, we cannot identify any time trend. Although in Table 1.8 we include measures of "Global Inequality" for the period 1960-2010, changes in the Gini index are also affected by changes in the country coverage of our database.

For the period 1870-1950, however, we have information about both the Gini index and average net wealth for four Western countries (France, Sweden, the United Kingdom and the United States). If we restrict the analysis to this group, we can indeed detect a time trend for 1870-2010. Figure 1.1, panel B, shows that, in all years, the shape of the distribution is log-normal. The mode of the distribution shifts to the right through time (with the sole exception of the troubled period between 1910 and 1930), reflecting increases in average net wealth, as well as a general spreading out of wealth across the overall population of these countries. This is reflected by an estimated Gini index that declines from 88 in 1870, to 82 in 1950, and 76 in 1990.[8] Lower wealth inequality in the second half of the 20th century goes hand in hand with convergence in net wealth across the four countries (see below). However, the tendency towards lower wealth inequality within this group of rich Western countries comes to a halt and reverses in the last thirty years or so: after the minimum reached around 1990, the Gini index increases to 80 by 2000 and to 84 by 2010.[9]

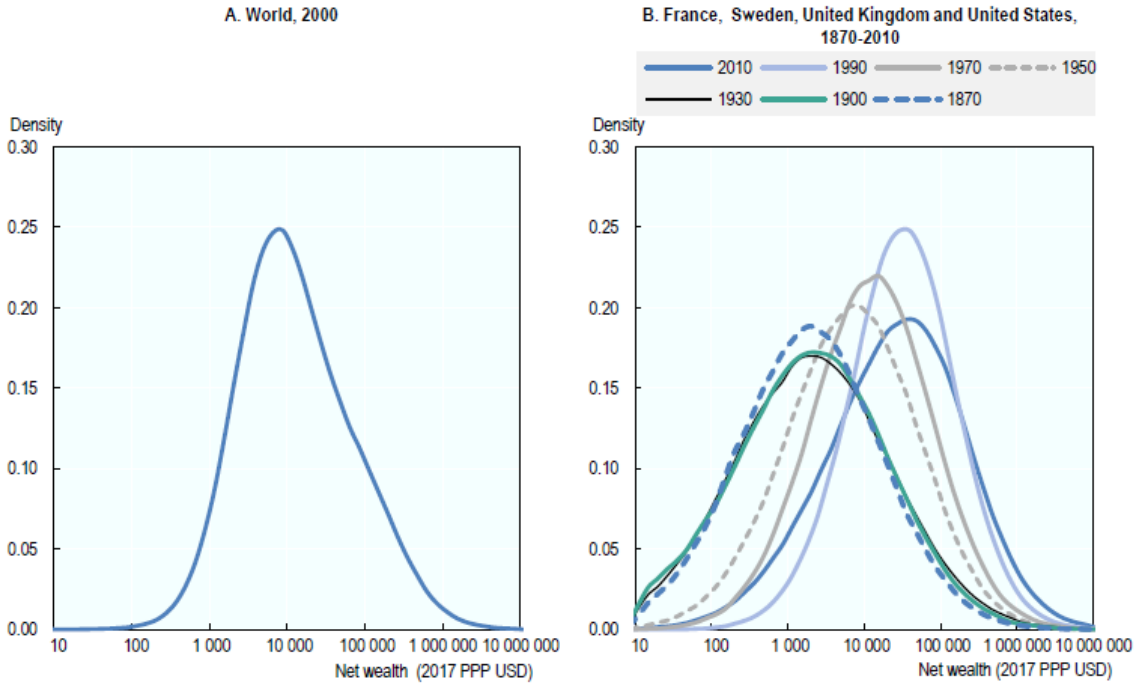
Convergence in average net wealth between countries can be analysed referring to the concept of "international inequality", which is particularly apt at detecting processes of convergence/divergence between nations (Milanovic, 2005). Note that the concepts of "global" and "international" inequality differ because of the methods, not because of the territorial coverage, which in Table 1.8 is kept constant across measures. In the unweighted

[8] From 1870 to 1990, the share of the richest 10% declines from 83% to 65%.

[9] From 2000 to 2010, the share of the richest 10% grows from 70% to 75%.

version, international wealth inequality is calculated on the average net wealth of each country, without regard for relative population size and without taking into account within-country inequality. As shown in Table 1.8, international wealth inequality among the four Western countries declines steadily from 1870 to 2010, until it reaches almost perfect "equality". The same trend is found when looking at the population-weighted version of the index. If we apply the same measure to all countries for which we have information we get more erratic results which, again, simply reflects sharp changes in the coverage of the database across time – hence we report "world" measures from 1960 only, which are more reliable due to better territorial coverage.

Figure 1.1 Global wealth distributions



Note: For an assessment of data quality, see Table 1.2, Table 1.3 and Table 1.4.
Source: Clio-Infra, www.clio-infra.eu.

StatLink 2 https://stat.link/7h190r

The same problem with coverage applies to one final measure: the simple average of Gini levels. While in Table 1.8 the countries considered for each year are kept constant across measures, the simple average of Gini levels could cover a larger number of countries compared to our concept of global inequality, as it does not require information about net wealth. The "World Gini" calculated on all the countries for which we have the relevant information is shown in Table 1.7.

Table 1.8 Average Gini, international inequality and global inequality, 1820-2010

	Average Gini (population weighted)		Average Gini (population unweighted)		International inequality (weighted)		International inequality (unweighted)		Global inequality	
	World	FRA, SWE, GBR, USA	World	FRA, SWE, GBR, USA	World	FRA, SWE, GBR, USA	World	FRA, SWE, GBR, USA	World	FRA, SWE, GBR, USA
1820		87		86						
1850		88		87						
1870		87		88		22		29		88
1890		87		89		15		24		89
1910		90		91		12		20		91
1930		91		91		10		18		91
1950		82		84		17		25		82
1960	74	83	73	81	13	13	17	18	83	84
1970	73	80	71	76	15	10	13	14	75	81
1980	60	76	68	70	61	10	20	17	86	77
1990	60	74	68	70	63	8	29	15	84	76
2000	64	79	70	78	55	8	22	16	82	80
2010	74	83	72	75	37	1	18	5	80	84

Note: For an assessment of data quality, see Table 1.3 and Table 1.4. Table 1.8 includes all the countries for which we also had information about net wealth. Consequently, the table covers a smaller group compared to Table 1.7, leading to some slight differences in the value of the "World" average between this table and Table 1.8.

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1.6 Correlation with GDP per capita

Figure 1.2 gives a general picture of the relationship between GDP per capita and wealth inequality over time and across countries. From 1820 to 1840, wealth inequality is only very weakly correlated with GDP per capita. From 1850 onwards, the correlation becomes stronger and it is positive: richer countries have a higher wealth inequality than poorer ones. Nevertheless, after World War I the relationship stops increasing and, although remaining positive until 2010. By then it is even weaker than in the first half of the 19th century.

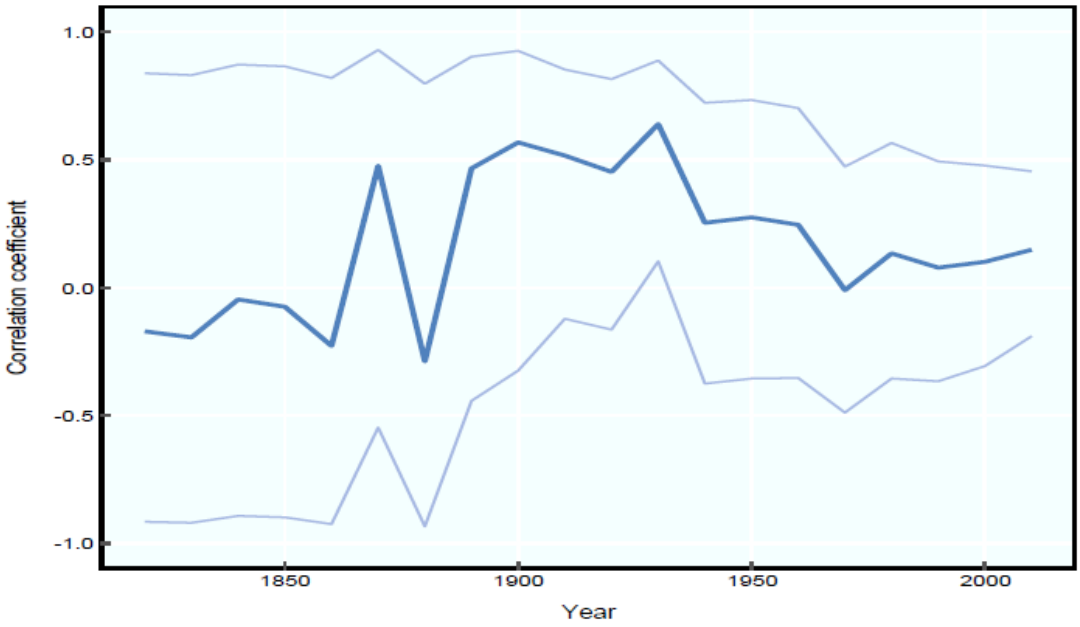
Figure 1.3 shows the correlation between GDP per capita and the Gini index of wealth inequality for all countries. The three graphs correspond to three different periods. The first

panel includes observations for the period before 1930, the second panel describes the correlation from 1950 to 1970, and the third refers to the period from 1980 to 2010.

For the first period, the correlation between GDP per capita and wealth inequality is positive for those countries with a GDP per capita less than USD 8 000; the correlation turns negative for countries with GDP per capita above that level. During the 1950s and 1970s, the relationship is slightly negative and turns positive only for the highest-income countries. However, there are very few observations in the bottom and top GDP region. For the last period, the relationship is positive until USD 9 000, it turns negative until USD 24 000, and then it becomes positive again. Due to the already-discussed limitations in the available information, the number of countries differs across period, which might affect our results.

Figure 1.2 Correlation between Gini coefficient of wealth inequality and GDP per capita, 1820-2010

Pearson correlation coefficient



Note: The thick and thin lines correspond to the Person correlation coefficient and the 95% confidence interval, respectively. For an assessment of data quality, see Table 1.3 and Table 1.4.

StatLink 2 https://stat.link/8oprm6

The overall conclusion is that there is no obvious and automatic correlation between GDP per capita and the change in wealth inequality in the period 1820-2010 – which confirms what has been argued for the pre-industrial period (1500-1800), when trends in wealth (and income) inequality have been reported to be largely unrelated to GDP (Alfani,

2015; Alfani, 2019; Alfani and Ryckbosch, 2016). Overall, our findings confirm the view that simple "Kuznetsian" explanations are not sufficient to explain long-term inequality trends (Alfani, 2019; Lindert, 2000; Vecchi and Amendola, 2017). Instead, we need to explore a broader range of causal factors beyond GDP change, embrace complexity in explanations, and pay great attention to context. An example of this approach is the recent masterful study of inequality in the United States from 1700 until today by Lindert and Williamson (2016).

1.7 Priorities for Future Research

The current availability of data about wealth inequality – in both contemporary and past societies – is far from satisfying. Even in comparison with data we have regarding income inequality, which is also surely not adequate for current research needs, wealth fares significantly worse. For many areas of the world, there is no information from before the last few decades, and for many countries we have no information even for recent years. To some degree, this reflects the nature of many national fiscal systems, which today weigh much more on income than on wealth – hence generating an inferior amount of useful information about the latter.[10] But to this we have to add that research long neglected wealth in favour of income due to ideas about the long-run drivers of inequality growth that were probably misguided (chiefly, the view that wealth inequality is of only minor importance in determining total income inequality in the long run), as clearly exposed by many recent studies (Alfani, 2019; Lindert and Williamson, 2016; Piketty, 2014; Piketty, 2015; Roine and Waldenström, 2015).

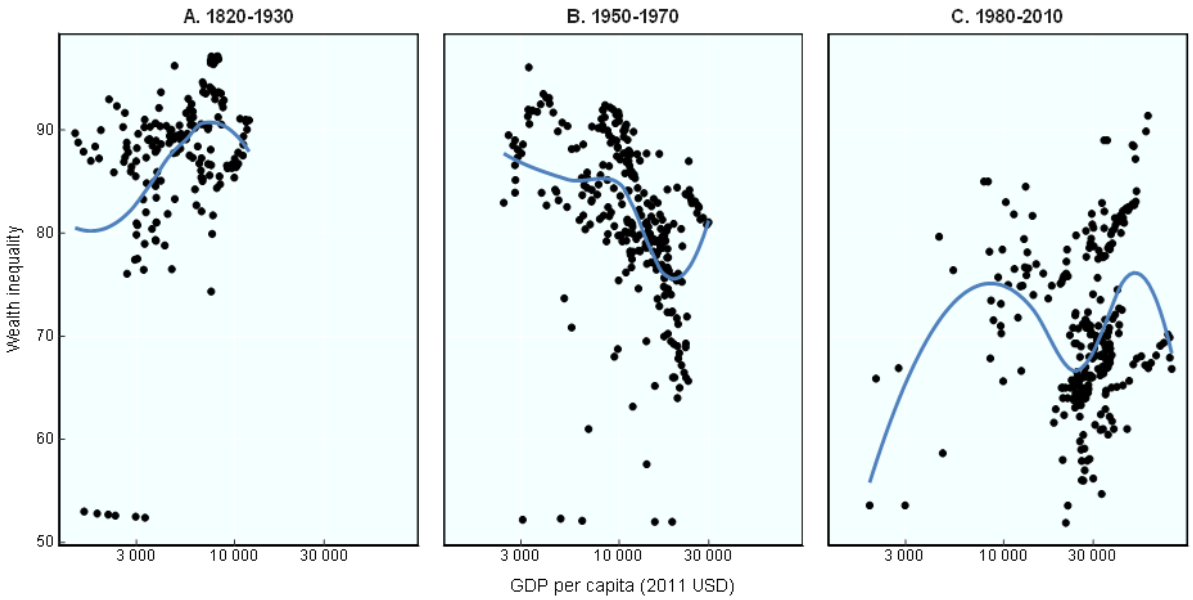
In the current world, characterised by growing inequality of both income and wealth, questions about the causes, and about the very nature and the potential consequences, of distributional change have acquired high societal relevance. But to answer such questions, we need more and better data. This need is further strengthened by the fact that recent research highlights how levels and trends of economic inequality cannot be "deduced" from trends in other variables, like GDP per capita, but must be measured as directly as possible. In particular, recent historical evidence provides strong support for the view that inequality

[10] This is also why, paradoxically, for a growing number of countries, especially but not limited to Europe, we now know more about wealth inequality before 1820 than after such date: as income taxes replaced older taxes based on real estate and other wealth components.

growth cannot be simply considered a side effect of increasing prosperity (Alfani, 2019). In the foreseeable future, it seems probable that the area of the world for which the availability of data on the distribution of wealth will grow at the quickest pace is Europe, partly due to the relative abundance of useful historical sources and, even more, thanks to the many research groups that have risen to the challenge. This is undoubtedly a positive development, but the other side of the coin is that more will need to be done to better integrate other world areas – particularly Africa and Asia – into the broader picture.

Figure 1.3 Correlation between the Gini coefficient of wealth inequality and GDP per capita in three time periods, 1820-2010

Semi-logarithmic scale



Note: Gini coefficient and GDP per capita at 2011 PPPs. The grey area around the correlation coefficient (shown as the blu line) corresponds to the confidence interval. Black dots corresponds to country estimates. For an assessment of data quality, see Table 1.3 and Table 1.4. This figure is based on all available annual information, not just the data included in Table 1.5. General patterns do not change when limiting the analysis to the countries in Table 1.5.

StatLink 2 https://stat.link/c16mhj

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Chapter 2. The distribution of land in Luxembourg (1766-1872): family-level wealth persistence in the midst of institutional change

The distribution of land in Luxembourg (1766-1872): family-level wealth persistence in the midst of institutional change

With Antoine Paccoud (*LISER, LSE*)

2.1 Introduction

In recent years, the study of wealth inequality has grown and has increasingly focused on the mechanisms through which wealth is transmitted, and what this means for social mobility (Adermon et al., 2018; Barone and Mocetti, 2021; Corak, 2004; Clark, 2014; Piketty, 2014, 2015; Pfeffer and Killewald, 2018). In a society in which inequalities are increasing, the problem of social mobility remains important for the policy agenda. When income and wealth inequalities increase, it is difficult to move upwards on the social mobility ladder; thus, assuring high rates of social mobility can help to boost social and economic equality (Goldthorpe and Jackson, 2007).

The World Inequality Database (WID)[1] and the Luxembourg Wealth Study Database (LWS)[2] collect and harmonize data on wealth inequality for the nineteenth and twentieth centuries, when data started to be available in a systematic way. For pre-industrial times, wealth data are very fragmented and it is difficult to have harmonized sources to study how wealth inequality has evolved over time in different countries (Alfani and Schifano, 2021). In most cases, archival sources have been lost, or if available, are not well-preserved (Alfani et al., 2020). Studies are limited to societies that developed complex and well-organized fiscal administration systems (Alfani, 2015, 2017; Alfani and Ammannati, 2017; Alfani and Di Tullio, 2019; Bengtsson et al., 2018; Brea-Martínez and Pujadas-Mora, 2019; Canbakal, Filiztekin and Pamuk, 2018; Nicolini and Ramos Palencia, 2016). In Europe, some countries and periods have been extensively analysed thanks to the availability of historical data. One of the most important examples is the Florentine State, the study of which has improved our

[1] https://wid.world/

[2] https://www.lisdatacenter.org/our-data/lws-database/

understanding of wealth inequality and social mobility in the long term (Alfani and Ammannati, 2017; Barone and Mocetti, 2021; Padgett, 2010).

Scarcity of data is not the only problem that researchers face in the study of historical wealth inequality levels. The lack of harmonization of data across time and place has resulted in different methods and measures to study economic inequality, thereby hindering comparability. For wealth inequality in pre-industrial times, the choice of the inequality measures to use depends on the available data. These problems apply also to the study of intergenerational mobility. Deutscher and Mazumder (2021) compared different estimators for intergenerational income mobility and listed their properties.

To study how wealth is transmitted over time across generations, we need to link ancestors and descendants; this adds more difficult steps in the data collection process. In recent years, studies of pre-industrial social mobility have increased. Santiago-Caballero (2018) used marital registries to show that Valencia, between 1840 and 1870, became a polarized society and that growing up in a wealthy family increased the probability of maintaining and increasing that status. Clark and Cummins (2014) used the wealth owned at death of people sharing rare surnames to show that wealth was persistent both in the short and long term in England between 1858 and 2012. Van Leeuwen et al. (2015) analysed social mobility in France between 1720 and 1986. They used direct links between fathers and sons to create social mobility tables and observed an increase in social mobility during the period under study. In addition to vertical intergenerational mobility, Pujadas-Mora and Brea-Martínez (2020) looked at horizontal social mobility, that is, class mobility between siblings. They used the surnames and the occupations listed in Barcelona marital registries between 1451 and 1905, and show that during the eighteenth and nineteenth centuries, parents had less influence in the socioeconomic class of the sons as compared with the sixteenth and seventeenth centuries, while the influence of siblings increased. The authors explain these results by the move from an impartible to a partible inheritance system.

The digitalization of historical records and the consequent increase in the availability of data to study inequality and social mobility in the past could help us to understand how inequality levels and the family-level transmission of wealth are affected by large-scale institutional changes. There have been some investigations into the impact of societal transformations on inequality levels. Piketty (2014) highlighted the inequality reducing effect of the world wars and the increase of wealth taxation on wealth inequality levels in the first

half of the twentieth century. The inequality-reducing impact of violent shocks throughout history is well-established in the literature (Scheidel, 2017; Alfani, 2010; Alfani et al., 2022), as is the impact that different inheritance system have on economic inequality (Alfani, 2021). However, less is known about the effect of the transition from feudalism to full property rights. This particular type of change directly concerns the way in which land and property is owned, and can thus be assumed to matter for land and wealth inequality.

The purpose of the current paper is accordingly to study both the evolution of land inequality and intergenerational mobility in Luxembourg between 1766 and 1872 in the context of large-scale institutional changes (transition from feudalism to full property rights, domination by different empires). In examining pre-industrial society, land is a good proxy for wealth inequality (Lindert, 1986) and the use of fiscal sources to estimate land values is well-established in the literature (Barbot et al., 2018). Luxembourg is a small country in the middle of Europe, and is nowadays one of the three European capitals hosting the Court of Justice and the Court of First Instance, the Court of Auditors and the European Investment Bank. It has undergone both an industrial and a financial revolution since the end of the nineteenth century, and today has the highest per capita Gross Domestic Product (GDP) of any European country (Eurostat).[3] The Grand Duchy of Luxembourg has been incorporated into different empires over the past centuries, partly due to its strategic position. These empires changed the historical, economic and social settings of the country, and this has presumably had consequences for economic inequality and the level of social mobility. However, throughout these changes, Luxembourg has continuously exempted transfers in direct line from any inheritance tax. We investigate the process of wealth accumulation and intergenerational transmission of wealth in Luxembourg in pre-industrial times using Dudelange, a small municipality in the South of the country, as a case study. Dudelange represents one of the first European areas in which we can analyse both inequality and intergenerational mobility.

We use archival sources to create three datasets, and a book reporting all the families that lived in Dudelange from 1645 (Pauly, 2014) to measure land inequality for the three time points studied and to follow ancestors and descendants between 1766 and 1872. We show that the drop in the Gini coefficient that we observe between 1766 and 1842 reflects the change in the sources used, which are themselves a reflection of the institutional change that occurred

[3] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=GDP_per_capita,_consumption_per_capita_and_price_level_indices

between those years. We use demographic information as well as direct links between ancestors and descendants to study intergenerational social mobility. In the context of a large change in the socio-legal organization of property ownership and of rule by different empires, family dynamics around inheritance and the number of siblings seem to operate whatever the socio-legal regime of property and the fiscal regime. This applies to the middle of the distribution, even though the abolishment of the feudalism seems to play a favourable role in slightly increasing social mobility.

Our results contribute to investigations into the relationship between institutional change, inequality and social mobility. These results can also enrich the political debate on possible policies to increase social mobility in our societies. In the next sections, we present the history of the Grand Duchy of Luxembourg during the period under study and we explain the sources and the databases used. We then introduce our empirical approach and the results of the analysis. The last section concludes.

2.2 Historical context in Luxembourg and Dudelange, 1766–1872

From 1715 to 1795, Luxembourg was under Austro-Hungarian domination. During that period, the country experienced a period of peace and reforms. The Austro-Hungarian Monarchy implemented the land survey in 1766 to introduce fiscal equity and to collect money from landowners and their tenants. During the eighteenth and nineteenth centuries, the concept of economic inequality between human beings appeared for the first time in written records (Alfani and Frigeni, 2016), and inspired the reforms rolled out by Maria Theresa. The uniqueness of the Maria-Theresa land survey is that for the first time in Luxembourg the nobility and the Church also had to pay taxes. It also represents the first attempt to create a more egalitarian society in the country and to abolish some feudal privileges (Moreau de Gerbehaye, 1994, p. 95). The Maria-Theresa land survey thus offers a unique source to investigate the full distribution of land in Luxembourg in 1766.

The feudal system and the associated privileges were abolished in 1795, with the integration of Luxembourg into the French revolutionary regime. From 1795 up to 1815, Luxembourg was part of the French regime, also known as the Napoleonic regime from 1799 onwards. The *Code Civil*, introduced in 1804, focused on the regulation of the family and on property legislation. The titles attributed by the old system were no longer valid, the individual was placed at the centre of society and personal freedoms were guaranteed. To limit the

influence of the Church, the civil code introduced divorce and the secularism of the state was proclaimed (Trausch, 2017).

In 1815, the congress of Vienna resulted in the creation of the Grand Duchy of Luxembourg, and William I, the King of the Netherlands, obtained the control of the Duchy until 1839. Under Dutch domination, the economy of the Grand Duchy suffered because of the introduction of new taxes and customs tariffs that limited commercial activities. Between 1815 and 1839, Luxembourg was mainly a rural country, oppressed by the Dutch fiscal and commercial policies. From 1839 onwards, the country progressively gained its independence, which was confirmed by the Treaty of London in 1867. The period under consideration (1766–1872) thus saw the country move from Austro-Hungarian, to French, then to Dutch control and finally to full independence.

In this paper, we focus our attention on the municipality of Dudelange. This town is in the south of Luxembourg, at the border with France. During the period under study, Dudelange was a rural settlement. At the end of the nineteenth century the town developed into an important regional centre of steel production, with large population increases linked to domestic and international migration. In 1821, Dudelange had 1398 inhabitants, in 1872 the number was 1691 (Kohn, 1894) while today it stands at 21,513. Dudelange was the 29th most populous municipality in 1821, and the 41st most populous in 1871. By 1910, it was the fourth most populous town in Luxembourg, after Luxembourg City, Esch-sur-Alzette and Differdange. To give a picture of the average size of cities in the country, Luxembourg City today has 124,500 inhabitants and Esch-Sur-Alzette 36,200.[4] Luxembourg today is characterized by a high level of concentration in the ownership of land, with 0.5 per cent of its residents owning half of all residential land (Paccoud et al., 2021a). Dudelange is no exception to this, as landowners still represent a very important segment of the top of the property wealth distribution and have controlled the production of housing in recent decades (Paccoud, 2020; Paccoud et al., 2021b). However, little is known about the historical roots of the country's concentrated landownership structure.

At the end of the eighteenth century, the Boland and the Chanclos families were the owners of the seigneurie of Dudelange (the feudal estate). During 1792 and 1793, the French Revolution reached Luxembourg and the Baron de Boland organized an armed force to resist

[4]https://statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=12860&IF_Language=fra&MainTheme=2&FldrName=1

the French incursions into the country. He was defeated and fled to the safety of his family in Weinau, Germany. When order was restored in Dudelange, the Baron de Boland was able to return to the seigneurie. The war had generated significant debts and de Boland had to first take on mortgages, and then sell his part of the Dudelange seigneurie to repay them. The majority of the land he owned in Dudelange was sold to the Metz-Gerard family. At the beginning of the nineteenth century, the descendants of the Chanclos family also sold their half of the seigneurie to the Metz family. The Metz family was able to acquire all the land of the original Dudelange seigneurie, but sold it through a public tender and the land was acquired by the Bertier family. The Bertier family owned the domain of Dudelange until the end of the nineteenth century and contributed this land for the creation of the steel company in Dudelange in return for a significant proportion of the company's shares.

2.3 Data

The first data point used in the analysis comes from the 1766 Maria Theresa land survey for the municipality of Dudelange. This land survey is a collection of individual declarations, in which the owners and users of land had to declare the amount and type of land that they owned or cultivated. In each declaration from 1766, we have the name and the surname of the declarant, their place of residence and their profession. In addition, these declarations state the surface area and the type of land, and its productive potential net of the feudal burdens that were to be paid to the owner of the land or to the Church. The different categories of land are: arable land, gardens, forests, vineyards, meadows, enclosures, ponds, pastures, wasteland and buildings. The tables also include a section for the *droits et prestations*; that is, the feudal transfers that the owners of the land received from the tenants.

The declarations report net revenues, which represent 4 per cent of the productive potential of the land. These are reported in écu, escalins, sols and deniers. Specifically, 1 écu corresponds to 8 escalins, 1 escalin to 7 sols and one sol is made up of 12 deniers (Hudemann-Simon, 1985). In our analysis, net revenues are expressed in the bigger unit (écu). Declarants could choose to use the French or German language version of the declaration table. The declarations were collected in the municipality where the land or the building was situated, and in the Maria Theresa land survey, a person had to complete a declaration in each municipality in which they owned or rented land. The 1766 land survey for Dudelange contains 273 declarations, among which two thirds are filled in by Dudelange residents, with the remainder residing in

Luxembourg or in another country. This means that our unit of analysis is the land in Dudelange and its distribution among different families over time.

The figures in the Maria Theresa land survey are self-measurements rather than having been calculated by a state officer. Historians estimate that a quarter of the land surface[5] is not included in the declarations. However, this is thought to be linked to an imprecise knowledge of the surface area of the land, rather than to any intent to cheat. External and internal commissioners checked the declarations to ensure people did not report less land to pay less in taxes, and the declarations were public so that everyone could check the amount of land reported by each declarant. Anyone who correctly reported someone having falsified the amount of land declared would obtain half of the net revenues of the 'hidden' land for ten years, with the other half passing to the state.[6] For these reasons, we believe that the data used in the analysis are of sufficient quality.

We used the declarants' personal information to link them to the individuals listed in the book *Chronique familiale de la Ville de Dudelange* (Pauly, 2014). Pauly collected information on each family that lived in Dudelange from 1645 to the 1950s, on the basis of birth, marriage and death records. Each family is assigned a unique code. For each head of a family, the name, surname, profession, dates of birth and death (when available), and the name and surname of the parents are reported. Pauly also collected the same information for the spouse or spouses of the head of the family. Usually the head of the family is the male, unless a woman had a child outside of marriage. In the latter case, the woman could be listed twice: once as *liaison avec inconnu* and the other time within the family of the husband. If a woman married twice, she was listed in both husbands' families, and thus was given two family codes. For each family listed in the book, we also have a list of the children with their dates of birth, and when available, their death dates. If one of the children started a family in Dudelange, we also have the code associated with his or her future family.

Having identified the 1766 declarants within Pauly (2014), we use the family codes to collect five generations of their descendants (around 15,000 individuals). The collection of this

[5] Thewes (2008), "Le cadastre de Marie-Thérèse au duché de Luxembourg: mythe et historiographie." In Hémecht, *Actes des deuxièmes assises de l'historiographie luxembourgeoise*, p. 350. Digitized by the National Library of Luxembourg, https://persist.lu/ark:70795/kxm90msvd/pages/96/articles/DTL1244.

[6] Luxembourg, Archives Nationals, B-0103 Cadastre de 1766 - Lois et instructions sur le nouveau cadastre, 1227-1238 (Dossier), *Placcard concernant le rapport et l'estimation générale de tous les biens fonds de nos Pays, Duché de Luxembourg et Compté de Chiny, du 12 Mars 1766*, Art. 4.

data is required to exactly match the 1766 declarants with their descendants in 1842 and 1872. In addition, this method allows us to create matches based on the lineages of both the fathers and mothers. It is worth noting that the *Chronique familiale* does not contain information on the 1766 declarants who lived outside of Dudelange. It also only includes information on the descendants of resident declarants that lived in Dudelange. The social mobility analysis we conduct is thus limited to families with members who lived in Dudelange across the three time periods.

The land registers of 1842 and 1872 list all the property owners and the extent of their land holdings at that date. For each property owner, they contain the name, surname, profession and place of residence, as well as the land area owned and the net revenues associated with it. The land area is expressed in hectares, ares and centiares, while the associated net revenues are reported in florins and centimes. The land registries of 1842 and 1872 report 543 and 651 property owners, respectively.

We linked 180 out of the 273 declarants of the 1766 land survey with a family unit reported in Pauly (2014). We also linked 408 out of 543 property owners to a family unit for 1842, and 532 out of 651 declarants for 1872. We used Pauly (2014) not only to create the links between ancestors and descendants, but also to compute how many children and siblings each declarant had. In addition, for the 1872 property owners, we were able to count the number of ancestors who appear in the 1766 and 1842 datasets. This provides information on the extent to which land in 1766 and 1842 was divided among descendants and to understand how many of the ancestors already had land in Dudelange.

2.4 Land inequality

We started our analysis by looking at the distribution of land in 1766, 1842 and 1872. The municipality of Dudelange includes Dudelange, Burange and Budesberg. Figure 2.1 corresponds to the cadastral plan of how land was partitioned, and Figure 2.2 shows the inverse hyperbolic sine transformation[7] of the three distributions. We used this transformation instead of a logarithm transformation, because 55 out of 273 of the 1766 declarants reported net revenues equal to 0. This is because in 1766, under feudalism, users of land had to pay feudal taxes to the land owners. Some of these users faced feudal taxes that were higher than the

[7] It takes the form of IHS(x) = log(x + sqrt(x^2 + 1))

revenues they generated from the land, and their revenue was thus artificially set at 0 in the Maria Theresa land survey. In contrast to the logarithm transformation, the inverse hyperbolic sine transformation allows us to consider these 0 values in the analysis and to compare the three distributions. We can graphically compare these distributions using their Lorenz curves. If the Lorenz curve of distribution A lies below the Lorenz curve of distribution B and the two curves do not cross, we can conclude that distribution A is less egalitarian than distribution B.

Figure 2.2 suggests that there was an increase in the average net land revenues over time. Using the entire distributions, we computed the Lorenz curve and the Gini index[8] for the original distribution of net revenues from land. Figure 2.3 shows that the Lorenz curves for the 1766, 1842 and 1872 distributions do not cross. As to be expected from the evolution of the Lorenz curves, we find that the value of the Gini coefficient decreased over time: for 1766, the Gini coefficient is 0.85, while it is 0.70 for 1842 and 0.69 for 1872.

The drop in the level of inequality between 1766 and 1842 reflects the socio-legal change that took place in the intervening period, as the full ownership rights of the civil code replaced the tenured relations of feudalism. Indeed, the loss of feudal privileges translated into a decrease of net revenues for the top of the distribution and an increase in the net revenues for the bottom. At the top, this change is visible in the relation between land surface owned and the revenues that were extracted from it. While the feudal lords in 1766, Boland and Chanclos, and the largest property owner in 1842, Berthier, owned more or less the same area of land in Dudelange, Berthier had a much smaller share of total revenue in 1842 than the feudal lords had in 1766 (12.3 per cent compared with 44.3 per cent of all land revenues). This derives from the fact that in 1766, the feudal lords received revenues from both the land they owned directly and from their feudal subjects for the land they worked, while in 1842 all property owners had full ownership of their land, thus limiting revenue to that accrued from the land they actually owned. At the bottom, the same disappearance of the feudal burdens weighing on property owners meant that there were no longer records with null revenues in 1842 and 1872 (all revenues were positive). This consequently increased the net revenues reported by the bottom 60% of the declarants in these time-points as compared to 1766, as can be seen in the Lorenz curves. In our view, this socio-legal change in relation to property thus accounts for the

[8] The Gini index is calculated according to the following formula: $G = \sum_{i=1}^{n} \sum_{j=1}^{n} \frac{|x_i - x_j|}{2\bar{y}n^2}$, where n is the number of declarants, $\bar{y}$ is the arithmetic mean of the total value of net land revenues and y_i is the net land revenues of declarant i. The Gini coefficient can take values between 0 (perfect equality) and 1 (perfect inequality).

majority of the drop in inequality between the 1766 and the 1842–1872 time points. The Gini coefficients we calculated are very sensitive to this change. The presence of Lorenz domination over the years, allows us to generalize our findings of a decrease in inequality as measured by the Gini coefficient to all relative inequality indices, such as the Theil coefficient, for example.

In Table 2.1, we look in detail at the distribution of net land revenues in 1766, 1842 and 1872. Even though the Gini coefficients for 1842 and 1872 are very similar, the table suggests that there was a drop of 7 percentage points in the net revenues from land owned by the top 1 per cent between the two years. This reflects a redistribution within the top, since the loss in the top 1 per cent of the distribution went to the ninth and the rest of the tenth deciles.

2.5 Intergenerational land mobility: Methods

To assess how land was transmitted between generations, we computed the percentile, rank and quartile positions of each individual for each of the time points, based on the entire list of individuals with land wealth at that time point. This means that percentiles, rank positions and quartiles are computed on the whole distribution, including people who are not in in the database of descendants created from Pauly (2014). The analysis that follows focuses on individuals who can be linked through the three data points and whose rank position can be compared and interpreted in terms of social mobility.

Our empirical strategy to compute intergenerational land mobility in Dudelange between 1766 and 1872 is based on the following equation:

$$Net\ Rank72_i = \beta_0 + \beta_1 Female_i + \beta_2 Old_i + \beta_3 Ancestor66_i + \beta_4 Ancestors42_i + \epsilon_i$$

where $Net\ Rank72_i$ is the rank based on the net revenues for the land of individual i in 1872, $Female_i$ takes value 1 if the individual i in 1872 was female, Old_i takes value 1 if the individual i in 1872 was more than 50 years of age.[9] $Ancestor_i$ is a vector for the average ancestors' rank adjusted for generational distance in 1766 and 1842, the average number of children older than 13 adjusted for generational distance in 1766 and 1842, and the number of ancestors in the previous timepoints. In the analysis, we only include the ancestors, and for a property owner in 1872 we never take into account the net revenues declared in 1842. To link

[9] The median is 49 and the mean is 48.9.

ancestors and descendants, our sample is restricted to individuals who can be found in Pauly (2014). Since the two richest families in 1766—the Chanclos and the Boland—were not resident in Dudelange, and are thus not in Pauly (2014), we do not include them in the analysis. As a consequence of this limitation, we focus our analysis on the middle of the distribution.[10] In addition, individuals with land wealth in 1872 who had at least one ancestor in both 1842 and 1766 are entered into the analysis. This choice was fundamental to analyse intergenerational land mobility based on direct links between ancestors and descendants. In Table 2.2, we present the summary statistics of our final sample, based on 337 individuals linked in all the three data points. Half of the declarants in 1872 are older than 50, and we used this age to consider a person who was old enough to have accumulated wealth. Only 10 per cent of the declarants in 1872 in our sample are female. The mean rank position in 1766 is notably low, because the generational distance between ancestors in 1766 and descendants in 1872 is always greater than 1.

Before computing the average net revenues and the average number of children of the ancestors, we weighted the net revenues and the number of children of the ancestors by their generational distance. The percentage of wealth that is transmitted is proportional to the generational distance between ancestors and descendants, because the land owned by a grandfather will be shared among his children and then among the grandchildren, while the land owned by a father will be shared only among his children. Since we can have more than one ancestor in 1842 and 1766 for one property owner in 1872, we want to give more importance to the information about the closer ancestors. To be sure that the weighting procedure did not influence the result, we also ran our main regression using unweighted net revenues (see the Appendix Table A2.1). The relevant results were unchanged.

To overcome the problem of distributions in different monetary units and of the influence of inflation, we decided to use a rank-rank analysis. This approach is also a convenient method, in light of the fact that 20 per cent of our declarants in 1766 declared net revenues of 0.[11] We standardized our continuous variables, both dependent and independent, since their distributions are very different (see summary statistics, Table 2.2).

[10] Confirmed by the results that we obtained when we ran our analysis by quartiles of the distribution (Table 2.5).

[11] In Table A2.2 in the appendix, we also show the results for the inverse hyperbolic sine transformation model.

2.6 Intergenerational land mobility: Results

Table 2.3 shows the results of our rank-rank analysis of the net land revenues in 1872 on the average net land revenues of the ancestors, adjusted for generational distance. In column 1, we regress the rank position of the property owner in 1872 on two dummy variables: being older than 50 at the time of the measurement and being female. Being older than 50 increases the rank position by 55 per cent of a standard deviation; that is, equivalent to a rise of 95.92 ranks (0.55*174.4) in the 1872 rank distribution. On the other hand, being female reduces the rank position by 0.76 of the standard deviation of the rank position of the 1872 property owners. These females were widows or married women who owned land independently from their husband, usually land transmitted from the woman's family to assure her of some protection; the negative coefficient confirms this.

In columns 2 and 3, we measure intergenerational mobility between 1872 and, respectively, 1766 and 1842. This allows us to investigate how intergenerational mobility evolved over time. The coefficients for being female and being older than 50 do not change across the model specifications. This means that the effect of those two variables on the rank position does not depend on the rank positions of the ancestors. In column 2, we add only the information related to the ancestors in 1766. One standard deviation increase in the rank position of the ancestors in 1766 is associated with an increase in the rank position of the property owner in 1872 by 0.15 of its standard deviation.

The number of ancestors in 1766 is positive and significant, indicating that the larger the number of ancestors who owned land in 1766, the higher the rank position of the property owner in 1872. If the number of ancestors is higher, it is more likely that both spouses came from Dudelange and their ancestors owned land, so it was easier for them to accumulate or maintain land than it was for a couple in which only one of the spouses had ancestors who owned land in Dudelange.

Column 3 shows that one standard deviation increase of the average rank position of the ancestors in 1842 increases the rank position of the property owner in 1872 by 0.36 standard deviations. This means that by increasing the rank position of the ancestors in 1842 by 105, the rank position of the property owner in 1872 will increase by 62. The number of ancestors in 1842 is also positive and significant, indicating that the larger the number of ancestors who owned land in 1842, the higher the rank of the property owner in 1872. We can also observe that the coefficient for the number of children of the ancestors in 1842 is negative and

significant. In our sample, 70 per cent of the ancestors in 1842 were parents of the owners in 1872, and for those, the children of the ancestors in 1842 were the siblings of the owners in 1872. This means that the greater the number of siblings the declarants had in 1872, the more the land could be fragmented among them. We also tested whether the effect of the number of siblings is mediated by the inheritance system (see below).

In column 4, we include information on the ancestors for both 1766 and 1842. Here, the effect of the ancestors in 1766 is significant only at 10 per cent, and one standard deviation increase in the average rank position of the ancestors in 1766 leads to 17 ranks higher for the property owner in 1872. This specification confirms that the wealth of the closer ancestors has a greater impact on the wealth of the descendants than the land owned by more-distant ancestors.

Column 4 confirms the results obtained for the average number of children of the ancestors in 1842, but not for the number of ancestors present in the 1842 land registry. Figure 2.4 shows that using a single year in the regression or using both does not change our coefficients significantly, and that the effect of the average rank position of the ancestors in 1766 is independent from the effect of the ancestors' average rank in 1842.

Thanks to the demographic information that we collected from Pauly (2014), we also know if the declarants in 1872 are the first born or not, and if they had older siblings who died before turning 13 (so that they became first born 'de facto').

In Table 2.4, we present the results when we include a dummy for being the first child or the first child 'de facto'. There is a large body of literature studying the inheritance system and its relation to family structure and population growth (Berkner and Mendels, 1978; Chu, 1991; Piketty, 2000). The first-born child had an advantage in pre-industrial society because of the primogeniture rule, which aimed to preserve family holdings from fragmentation by bequeathing the full inheritance to the first-born child. In Luxembourg, at least among the nobility, the inheritance system was regulated by specific norms that are based on the *Coutume du Luxembourg* (Hudemann-Simon, 1985) and the primogeniture was called *droit d'aînesse*. Although inheritance was regulated, it was very common not to respect the *droit d'aînesse* and to share the family wealth among all the heirs. The *droit d'aînesse* was formally abolished with the French Revolution, but there is wide agreement that it was never fully applied before this time in Luxembourg, with families often splitting the inheritance among all the children, even if not in equal parts (Hudemann-Simon, 1985; Wealer, 2010). Table 2.4 shows us that being

first born only offered an advantage if the child was genealogically the first one, hence if he or she did not have older siblings who had died at an early age. These results show the intriguing fact that in Luxembourg, primogeniture gave an advantage only if the child was chronologically the first born, while if the actual first born died (which according to our data was not a rare event), being first born 'de facto' did not give any advantage. This phenomenon may be explained by the higher percentage of children who died at an early age, including first born children, and the scarce use of the *droit d'aînesse*; however, we believe that reaching any final conclusions concerning this result requires further study.

We ran a heterogeneity analysis to see if our estimates result from the top, the bottom or the middle of the distribution. Table 2.5 shows us that in our sample we have an overrepresentation of the top 50 per cent of the distribution in 1872, and that our results depend on this 50 per cent. The results for the bottom quartile of the distribution indicate that the average rank position of the ancestors in 1766 has a negative effect on the rank position of the 1872 property owners. Bearing in mind that we only have 55 individuals in the bottom quartile who are part of our sample, this result seems to us to derive from the fact that in a rural area such as Dudelange in the eighteenth and nineteenth century, families in the bottom quartile of the land distribution were living very close to the subsistence level. It is thus possible that in this quartile, land fragmentation at the point of inheritance was more widespread than in the other quartiles because land was a vital source of income, and thus had to be distributed between children if they were to survive. Table 2.5 also shows that the extent to which ancestors influence the socio-economic life of descendants is greater at the top of the distribution.

We also tried to compare our estimation results with social mobility tables for the periods 1766–1842 and 1842–1872. In our regression, the variables are standardized and we regress the rank position in year t on the average rank in t-1 (adjusted for the generational distance), the number of ancestors in t-1 and the number of children in t-1 (also adjusted for the generational distance). The social mobility tables only take into account the rank position, without adjusting for the generational distance. The two regressions were carried out independently, because we want to look at the links between the two years and to obtain results that are comparable with our social mobility tables.

If we look at Table 2.6 and Table 2.7, we find that social mobility between 1766 and 1842 was almost the same as during the 1842–1872 period. This trend is confirmed by our estimation results. One standard deviation increase in the average rank position of the ancestors in 1766

leads to a 0.27 standard deviation increase in the rank position in 1842, and one standard deviation increase in the average rank position of the ancestors in 1842 leads to a 0.41 standard deviation increase in the rank position in 1872 (Table 2.8).[12] These results suggest that social mobility remained reasonably stable once the new political order had been established and had persisted over time. After the end of feudalism, the top of the property wealth distribution was only slightly open to newcomers over time.

2.7 Conclusions

In this paper, we used the Maria Theresa land survey of 1766 and the complete land registries of 1842 and 1872 to study the land wealth distribution and its transmission between generations during the transition from a feudal to a full property rights society in Dudelange, Luxembourg. Linked with detailed genealogical data, this data allowed us to build exact links between ancestors and descendants for the three time points under study, and to understand how the land distribution in Dudelange evolved in response to institutional changes.

This prompted us to look more closely at the transmission of wealth within families that according to our sample selections represent the 'middle' of the distribution: that is, below the very top landowners and above the landless. In this segment of the population, we find a strong persistence of land-based wealth in families over time. With the limitation that we only considered declarants in 1766 that lived in Dudelange, our results suggest that the wealth of the closer ancestors influences the wealth of their descendants more than the land owned by more-distant ancestors. According to our results, being the first child was an advantage in terms of land inheritance only if no other siblings born before had died. This is also justified and confirmed by the fact that we find a greater fragmentation of land the larger the number of children of closer ancestors.

In the context of a large change in the socio-legal organization of property ownership and of rule by different empires, family dynamics around inheritance and the number of siblings seem to operate whatever the socio-legal regime of property. This applies most clearly to the wealthiest 50 per cent of the distribution, while the influence of the very top landowners, excluded from the intergenerational analysis, was reduced by the abolishment of feudalism. The persistence of family dynamics, most clearly seen in the second half of the distribution,

[12] The sample used for the regression between descendants in 1842 and ancestors in 1766 is larger, because we also included the links that do not have further descendants in 1872.

can be linked to the fact that there were no inheritance taxes on transfers in direct line throughout the period. This points to the fact that in the absence of inheritance taxation, family-level transmission mechanisms limit social mobility and strongly advantage those with ancestors owning property wealth, even when there are significant changes in the organization of property relations. Our results suggest that policymakers should target family transmission mechanisms, such as inheritance, in addition to taxation on property ownership if the aim is to reduce wealth inequality.

This paper is the first output of a broader research project to study the long-run evolution of wealth inequality in Luxembourg. The country's rapid industrialization at the end of the nineteenth century provides another type of shock that needs to be investigated from the perspective of the distribution of land and property wealth. This has potential not only to further the debate on how wealth in Europe was transmitted over time, but also to understand how wealth inequality levels are linked to economic growth.

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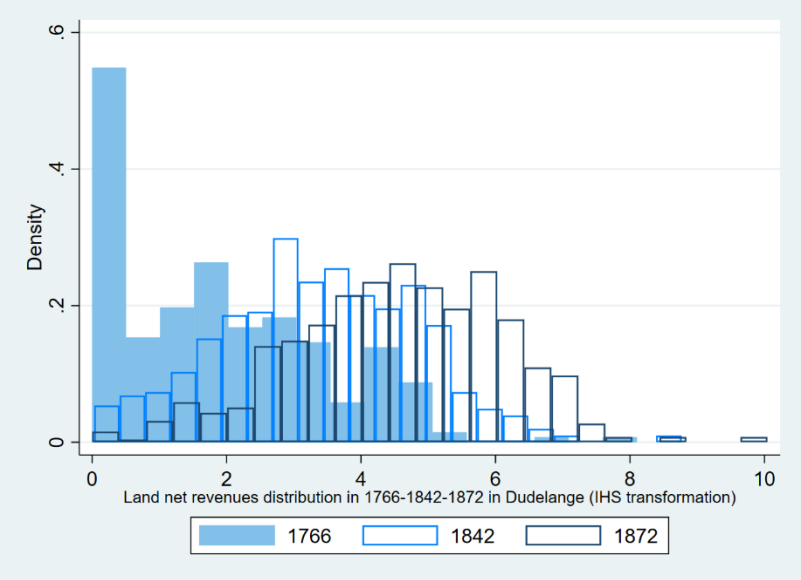
Tables and figures

Figure 2.1 Cadastral map for the city of Dudelange, nineteenth century



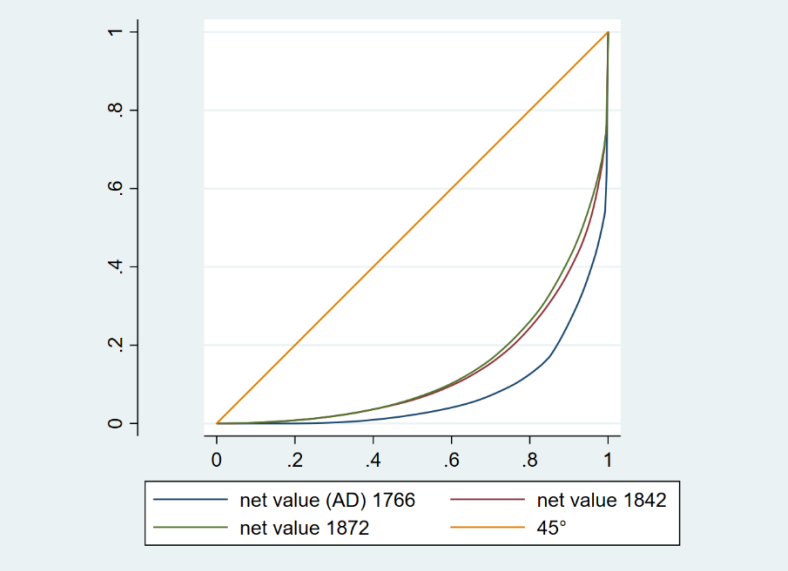
Source: ANLux, Cadastral map of section B of Dudelange (not inventoried), 1824.

Figure 2.2 Inverse hyperbolic sine transformation of the net revenues, 1766–1842–1872



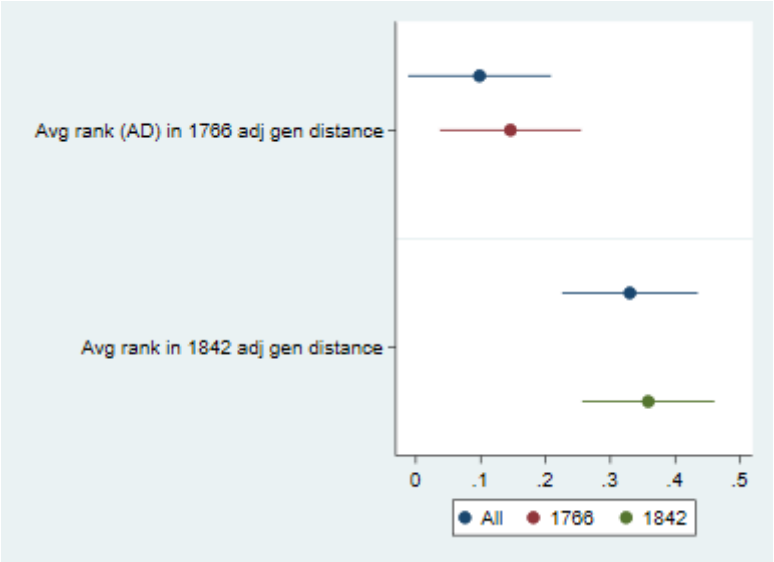
Source: The authors used the distribution of land in 1766, 1842 and 1872 generated from the Marie Thérèse Cadastre of 1766 and the land registries of 1842 and 1872 to create this graph

Figure 2.3 Lorenz curves for the distribution of net revenues from land 1766, 1842 and 1872



Source: The authors used the distribution of land in 1766, 1842 and 1872 generated from the Marie Thérèse Cadastre of 1766 and the land registries of 1842 and 1872 to compute the Lorenz curves.

Figure 2.4 Estimated coefficients



Source: The authors analysed the distribution of land in 1766, 1842 and 1872 generated from the Marie Thérèse Cadastre of 1766 and the land registries of 1842 and 1872. The graph shows the coefficients of the average wealth of ancestors and they compare these coefficients when the regression is done using only the ancestors in 1766, only the ancestors in 1842 and both.

Table 2.1 Distribution of land net revenues Dudelange 1766-1842-1872

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Top 5%	Top 1%	N
1766	0	0	0.22	0.67	1.22	1.87	3.08	5.45	13.00	74.48	62.67	48.10	266
1842	0.23	0.70	1.22	1.91	2.68	4.18	6.35	10.13	16.08	56.53	43.63	29.31	533
1872	0.23	0.65	1.19	1.92	2.94	4.35	6.76	10.66	17.50	53.80	40.10	22.84	633

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.
Note(s): Representation of the share of net revenues owned by each decile (D1 to D10) and by the top 5 percent and top 1 percent of the distribution, N is the number of observations.

Table 2.2 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Rank 1872	337	369.8	174.4	10.00	634.00
Older than 50 in 1872	337	0.5	0.5	0	1
Being Female in 1872	337	0.1	0.3	0	1
Average rank ancestors 1766 (adj.)	337	54.6	26.4	6.6	142.3
Number of ancestors in 1766	337	3.3	1.97	1	9
Average number of children ancestors 1766 (adj.)	337	2.54	0.97	0.3	8.17
Average rank ancestors 1842 (adj.)	337	318.3	105.7	15.5	527
Number of ancestors in 1842	337	2.1	1.3	1	6

Average number of children ancestors 1842 (adj.)	337	4.8	1.9	1	10

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.

Table 2.3 Regression results: Rank analysis, generational adjustment and standardization

	(1)	(2)	(3)	(4)
Older than 50 in 1872	0.555***	0.534***	0.457***	0.437***
	(0.102)	(0.102)	(0.104)	(0.104)
Being Female in 1872	-0.759***	-0.772***	-0.747***	-0.756***
	(0.167)	(0.165)	(0.157)	(0.157)
Avg. rank (AD) in 1766 adj. gen. distance		0.146***		0.098*
		(0.055)		(0.056)
Number of ancestors in 1766		0.109**		0.055
		(0.050)		(0.058)
Avg. children>13 in 1766 adj. gen. distance		0.056		0.073
		(0.055)		(0.053)
Avg. rank in 1842 adj. gen. distance			0.359***	0.330***
			(0.052)	(0.053)
Number of ancestors in 1842			0.111**	0.074
			(0.051)	(0.062)
Avg children>13 in 1842 adj. gen. distance			-0.086*	-0.121**
			(0.050)	(0.052)
Observations	337	337	337	337

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.
Note(s): Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Dependent and independent continuous variables are standardized.

Table 2.4 Regression results: Rank position in 1872 - ancestors' rank position. First born

	(1)	(2)	(3)
Older than 50 in 1872	0.437***	0.441***	0.439***
	(0.104)	(0.103)	(0.104)
Being Female in 1872	-0.756***	-0.758***	-0.755***
	(0.157)	(0.156)	(0.157)
Avg rank (AD) in 1766 adj. gen. distance	0.098*	0.088	0.095*
	(0.056)	(0.056)	(0.056)
Number of ancestors in 1766	0.055	0.054	0.053
	(0.058)	(0.057)	(0.058)
Avg children>13 in 1766 adj. gen. distance	0.073	0.082	0.072
	(0.053)	(0.052)	(0.053)
Avg rank in 1842 adj. gen. distance	0.330***	0.332***	0.329***
	(0.053)	(0.053)	(0.053)
Number of ancestors in 1842	0.074	0.074	0.080
	(0.062)	(0.061)	(0.062)
Avg children>13 in 1842 adj. gen. distance	-0.121**	-0.102*	-0.111**
	(0.052)	(0.052)	(0.053)
First born 1872		0.271***	
		(0.102)	
First born 'de facto' 1872			0.084
			(0.098)
Observations	337	337	337

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.
Note(s): Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Dependent and independent continuous variables are standardized.

Table 2.5 Regression results: Analysis by quartile of the distribution

	All	1st	2nd	3rd	4th	P0-50	P51-100
Older than 50 in 1872	0.437***	0.036	-0.092	0.015	0.171***	0.069	0.208***
	(0.104)	(0.088)	(0.066)	(0.057)	(0.054)	(0.104)	(0.067)
Being Female in 1872	-0.754***	-0.023	0.053	-0.257***		0.088	-0.631***
	(0.157)	(0.082)	(0.082)	(0.093)		(0.114)	(0.148)
Avg percentile (AD) in 1766 adj. gen. distance	0.093*	-0.149***	-0.039	0.006	0.013	-0.142**	0.099***
	(0.055)	(0.050)	(0.036)	(0.028)	(0.032)	(0.055)	(0.036)
Number of ancestors in 1766	0.055	0.066	0.052	-0.067*	-0.052*	0.071	-0.019
	(0.058)	(0.043)	(0.038)	(0.039)	(0.027)	(0.055)	(0.037)
Avg children>13 in 1766 adj. gen. distance	0.077	0.071	0.004	0.016	-0.016	0.073	-0.025
	(0.052)	(0.052)	(0.044)	(0.022)	(0.031)	(0.065)	(0.031)
Avg percentile in 1842 adj. gen. distance	0.332***	0.004	-0.001	0.026	0.094***	-0.015	0.201***
	(0.053)	(0.043)	(0.038)	(0.035)	(0.028)	(0.057)	(0.035)
Number of ancestors in 1842	0.075	-0.037	0.010	0.096**	0.089***	-0.057	0.187***
	(0.062)	(0.041)	(0.034)	(0.040)	(0.033)	(0.051)	(0.043)
Avg children>13 in 1842 adj. gen. distance	-0.120**	0.077	0.032	-0.024	-0.063**	0.111**	-0.069**
	(0.052)	(0.053)	(0.036)	(0.028)	(0.027)	(0.055)	(0.033)
Observations	337	55	68	104	110	123	214

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.
Note(s): Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Dependent and independent continuous variables are standardized.

Table 2.6 Social mobility table 1766–1842

Quartile in:	1842				
1766	1	2	3	4	Total
1	36	25	20	7	88
2	18	22	26	21	87
3	20	19	28	21	88
4	14	21	13	38	86
Total	88	87	87	87	349

Upward mobility	34.4%
Downward mobility	30.1%
No mobility	35.5%
Total mobility	**64.5%**

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.
Note: Social mobility table includes the number of observation in each class combination.

Table 2.7 Social mobility table 1842–1872

Quartile in:	1872						
1842	1	2	3	4	Total		
1	29	34	16	6	85	Upward mobility	34.4%
2	25	18	27	14	84	Downward mobility	30.9%
3	19	25	25	19	88	No mobility	34.7%
4	12	7	16	45	80		
Total	85	84	84	84	337	**Total mobility**	**65.3%**

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.
Note: Social mobility table includes the number of observation in each class combination.

Table 2.8 Rank-Rank regression between 1842 descendants with 1766 ancestors, and 1872 descendants with 1842 ancestors

	Rank 1842	Rank 1872
Avg rank 1766	0.27	
s.d. avg. rank 1766	69.73	
s.d. rank 1842	305.97	
Avg rank 1842		0.41
s.d. rank 1842		105.6
s.d. avg. rank 1872		174.42
N	349	337
Controls	Yes	Yes

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.
Note: Dependent and independent continuous variables are standardized.

Appendix

Appendix Table A2.1 Rank position in 1872 explained by ancestors' rank position without generational adjustment

	(1)	(2)	(3)	(4)
Older than 50 in 1872	0.555***	0.597***	0.528***	0.532***
	(0.102)	(0.101)	(0.102)	(0.101)
Being Female in 1872	-0.759***	-0.766***	-0.741***	-0.728***
	(0.167)	(0.164)	(0.157)	(0.157)
Average rank (AD) in 1766 wrt 1872		0.165***		0.099*
		(0.050)		(0.054)
Number of ancestors in 1766		0.097*		0.087
		(0.050)		(0.058)
Average children>13 for 17662		0.099**		0.105**
		(0.050)		(0.048)
Avg rank (AD) in 1842 wrt 1872			0.334***	0.298***
			(0.048)	(0.050)
Number of ancestors in 1842			0.028	-0.040
			(0.051)	(0.062)
Avg children>13 for 1842 wrt 1872			-0.043	-0.075
			(0.049)	(0.052)
Observations	337	337	337	337

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.
Note(s): Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Dependent and independent continuous variables are standardized.

Appendix Table A2.2 1872 net revenues explained by ancestors' net revenues: HIS transformation

	(1)	(2)	(3)	(4)
Older than 50	0.580***	0.579***	0.510***	0.492***
	(0.102)	(0.100)	(0.099)	(0.099)
Female	-0.727***	-0.758***	-0.700***	-0.703***
	(0.166)	(0.162)	(0.151)	(0.152)
IHS trans. values of avg_ad_totgen66		0.215***		0.078
		(0.052)		(0.056)
Number of ancestors in 1766		0.050		0.064
		(0.050)		(0.055)
Avg children>13 in 1766 adj. gen. distance		0.054		0.090*
		(0.052)		(0.048)
IHS trans. values of avg_totgen42			0.413***	0.379***
			(0.047)	(0.052)
Number of ancestors in 1842			-0.039	-0.084
			(0.049)	(0.058)
Avg children>13 in 1842 adj. gen. distance			-0.083*	-0.110**
			(0.048)	(0.049)

Observations	337	337	337	337

Source: Authors' analysis based on the land distribution of 1766, 1842, 1872.
Note(s): Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Dependent and independent continuous variables are standardized. The inverse hyperbolic sine transformation (HIS) is applied to the distribution.

Chapter

3. Land distribution in pre-industrial Luxembourg: a comparison of urban and rural areas

Land distribution in pre-industrial Luxembourg: a comparison of urban and rural areas

3.1 Introduction

Wealth inequality refers to the unequal distribution of wealth among individuals. Whether unequal means unfair is still debated and the discussion is part of the political agenda now more than ever. In the last years, the Covid-19 pandemic exacerbated economic disparities and the distance between the poorest and the richest increased (Oxfam, 2022).

These data are alarming, and in the implementation of inequality reducing reforms, governments are not independent from the richest. The richest people in the world have enough money to lobby and to influence government interests such that they are in line with theirs and it is difficult to assure that institutions really do what is best for everyone. In this increasing inequality scenario, it is important to increase awareness among scholars and public audience, to be sure that despite the economic and social differences that exist between voters and elected politicians, all economic categories are represented in political institutions. Studying long-term inequality patterns is fundamental to understand current inequality trends.

In the last decades, researchers contributed to data collection and production of inequality measures on pre-industrial societies (Alfani et al., 2020). Some European countries have received the attention from many scholars thanks to well-preserved archival sources that allowed the study of wealth inequality in one or more communities and for one or more years or decades. For the pre-industrial era, the places studied the most were Italy, Spain and Low Countries (Alfani and Ammannati, 2017; Alfani, Di Tullio and Fochesato, 2020; Alfani and Ryckbosch, 2016; Nicolini and Ramos-Palencia, 2021; Ryckbosch, 2016). In recent years, also Germany, Sweden and Finland became part of the research agenda on wealth inequality (Alfani, Gierok and Schaff, 2020; Bengtsson et al., 2017).

Although the effort of the last decades, there are many countries that did not attract the attention from scholars. One of the main problem in doing research in this field, is the scarcity of data that additionally to be scarce, are also not harmonised. Research in collecting long-term series of data for the past societies increased in the last decades and it is important to collect as much data as possible to be able to have a global picture of wealth inequality in the long run. This problem has been debated among scholars starting from the second half of the twentieth century (Milanovic et al., 2011, Alfani and Schifano, 2021).

This paper tries to add new knowledge on the topic throughout the analysis of wealth inequality in Luxembourg in 1766. The data used are new and collected from the archival

source "Le cadastre de Marie Thérèse".[23] The information included in the land registry allow analysing inequality level in the urban area of Luxembourg City and the rural municipality of Dudelange. The paper aims at understanding how areas with different socio-economic characteristics, but exposed to the same institutions, react in terms of inequality. The data allow understanding whether the bottom of the distribution drove inequality in pre-industrial societies as conjectured by Milanovic et al. (2007). This research should be considered as the starting point of a bigger project that wants to give a picture of inequality in the whole Luxembourg in 1766. The project also aims at comparing inequality among places that were exposed to the same institutions as part of the same empire and for which the *Marie Thérèse cadastre* is available as well. This will help to understand how rural and urban places with the same institutional setting behaved in terms of inequality and if and how geographic position influences inequality. In addition, Luxembourg is a small country that nowadays has the highest household net wealth among the OECD countries.[24] In the past decades, the national fiscal system with respect to royalties and interest payments paid by businesses based in Luxembourg contributed to increase the wealth of the country (Tørsløv et al. 2018). Luxembourg could be used in comparison with other small countries that in the past introduced a favourable fiscal system for companies; an example could be the Republic of San Marino or the Principality of Monaco. Studying the wealth distribution of these places in the past could help to understand what the key factors that promoted wealth accumulation were. The research has focused so far on big countries that have also big economic power; no one focused on small countries that were able to create wealthy economies, and this is a first step to fill in this gap in the inequality research literature.

3.2 Historical context

The death of Charles II, the last of the Spanish Habsburgs that had no children, caused the War of the Spanish Succession that lasted from 1701 until 1714 (Kreins, 2007, pages 39-68). At the end of the war, the treaty of Utrecht of 1713 and of Rastatt of 1714 assigned the control of Luxembourg to Charles VI of Habsburg that in the meantime inherited the empire from his older brother Joseph that died of smallpox. In the absence of a male heir and according to the law in force, the first in the succession line would have been the daughter of Joseph. However, Charles spent his life in assuring that his daughter, Maria Theresa, could become the sovereign of the empire at his death. In 1740, Charles VI died and Maria Theresa succeeded her father and became a reigning queen (Mahan, 1932). Luxembourg remained under the Austria

[23] Luxembourg, Archives nationales, A-XIV Cadastre de Marie-Thérèse, 1752-1772 (Fonds)

[24] See: https://stats.oecd.org/Index.aspx?DataSetCode=BLI

Hungarian domination until 1795, when the French Revolution spread across the country (Hudemann-Simon, 1986).

The empress Maria Theresa tried to create a more egalitarian state, she introduced reforms aiming at reducing inequalities and she tried to condemn the practice of torture (Kreins, 2007, pages 52-53). She gave birth to sixteen children while being always involved in the political and institutional control of the Austria-Hungarian Empire (Mahan, 1932). Despite the wars that constantly affected her Empire, Maria Theresa tried to create a more egalitarian state where welfare was central in reforms. It is in this context that the Maria Theresa cadastre was introduced. The cadastre aimed at increasing the fiscal burden for the richest part of the population, including the clergy and the nobility, and at decreasing it for the poorest. In addition to finance wars, the tax paid by the citizens were used by the Queen to introduce state schools over the Empire, wherever she could, and a health care system (Mahan, 1932).

The period of reforms that started with Maria Theresa aimed at increasing and supporting the industrial and agricultural production and at protecting private ownership of land (Trausch, 1993, pp. 35). However, the government intention to protect the poorest is visible in the contrasts that originated between the State and the feudal lords with respect to the practice to ask more work and resources to the peasants. The nobility and the clergy also opposed to the introduction of the *dénombrement* of 1766 that in addition to recalculate the fiscal distribution according to the family units populating the country, it did not exempt the upper classes from paying the taxes that were until that moment on the shoulders of peasants, farmers and artisans.

Citizens were divided into social groups with different functions and roles. Villages, clergy, nobility, guilds and officials were part of a system. Each group had its own rights, privileges or duties and they contributed to the social and economic equilibrium of the country. More generally, the representatives of the nobility, the clergy and the third estate, formed *les État Provinciaux*, which was responsible for voting the distribution of taxes, subsides and state aids. Despite the third estate represented 98 per cent of the population, the representatives were elected among the bourgeoisies and the officers and not among peasants and farmers.

Therefore, the peasants and the poorest were not represented and the distribution of taxes was unfair thus, the *Marie Thérèse cadastre* intervened to introduce a more egalitarian tax distribution system (Trausch, 1993, pp. 84).

The status of noble was inherited or attributed directly by the sovereign; a last opportunity to become noble was to be the president of the county council. In this last case, the status could not be passed to the offspring. The nobles could not work if they wanted to maintain their social status and titles, although some exceptions were allowed. The *Siège de Nobles* was the institution grouping together the nobility. During the eighteenth century, to avoid mixing with the new rich, namely the bourgeoisie, the *Siège de Nobles* refused the admission of the ones

that were not able to demonstrate the status of noble of the four grand-parents. The secular clergy was endowed with strong power and their status relies on the fiscal revenues such as the dime, shared with the feudal lords, or the *casuel* received by the priest after officiating marriages or baptisms. The bourgeoisie that represented the third estate, was very limited in numbers since it represented the free citizens living in free cities or villages. However, Luxembourg was still a feudal country and only Luxembourg City could be considered as a free, economically and commercially autonomous city. Luxembourg was poor in commercial roads that could connect the country with Belgium and Germany and only with Maria Theresa the road, connecting Luxembourg City with Trier and Brussels, was built. The bourgeoisie includes the *échevins*, lawyers, notaries, and craftsmen. All the rest of the population fell into the peasant category or fourth estate. This last category was not politically represented since it was supposed to be indirectly represented by the owners of the place where they lived, which were nobles or part or the clergy. Indeed, in the eighteenth century only 30 per cent of the population lived in a city or a village that was free, the remaining 70 per cent lived in feudal lordships. The system relied on impartible farms that were transmitted from father to son. The land and the tools to cultivate it could not be shared among the children, only the livestock and furniture could be partly partitioned. However, the heir could not impose the other members of the family to leave the farm and they could either live within the same household or move in another dwelling that surfaces in the same land of the farm (Atten, 1989).

3.2.1 Economy: agriculture and industry

Luxembourg at the time of the theresian cadastre was overall a rural country, not well connected with the neighbours France, Belgium and Germany. The roads were not paved until the end of the eighteenth century and the Ardennes created a natural barrier to access the country. The isolation of the country resulted in very high costs and time to import goods and food (Trausch, 1993). The production of food in Luxembourg was not abundant and its productivity was low. The most common cultivation was wheat while potatoes started to become popular only in the mid eighteenth century. In the cadastre, the cultivable land is split in arable land and *terre sartable*. The arable land represents the land that is most appropriate to be cultivated according to a three seasons rotational system. During the year, the land was left uncultivated for one season, in the other two seasons it was cultivated with either winter or summer crops. The *terres sartables* were cultivated only once in 20 years because of very poor quality.

In this very rural context, the other economic activities that had an important role in the economy of the country were related to the steel industry and the textile. At the time of the *Marie Thérèse cadastre*, the richest person in the city of Luxembourg was known to be Nicolas Loutz, a tanner. This is reported in Sprunck (1980, pp. 94) and confirmed by the cadastre (see Appendix table A3.1). The development of the steel industry was related to the availability of charcoal, water

and minerals. Because of the economic importance of this sector, Charles VI allowed the nobility to open furnaces without losing their titles in 1736 (Atten, 1989). In Dudelange, the steel factory was built only in the second half of the nineteenth century, at the time of the cadastre it was not an industrial pole.

3.3 Data

Luxembourg at the time of the introduction of the cadastre and until 1795 was part of the Austria-Hungarian Empire. The Maria Theresa cadastre in Luxembourg is the sum of individual declarations done by the owners or the users of the land in the municipality where the land was. The first article of the law of the 12 of March 1766, that introduced the Maria Theresa cadastre, reads:

«Nous ordonnons à tous propriétaires, possesseurs ou défructuateurs de bienfonds ou immeubles quelconques, situe dans nos Pays Duché du Luxembourg et Compté de Chini, de quelque état ou condition qu'ils puissent être, sans nulle exception, Ecclésiastiques, Nobles ou Routiers, domicilies ou forains, privilégiés ou non privilégiés, ainsi qu'a tous Corps Collèges ou Communautés Ecclésiastiques ou Laïque, de remettre sans faute... une déclaration par écrit pertinente et spécifique... de tous biens-fonds ou immeubles... et généralement tout fond raportant fruit ou utilité quelconque... prestations ou Droits quelconques dont il résulte quelqu'utilité, profit, raport ou revenu… ».[25]

The law clearly stated that the tax on properties had to be paid by owners and users with no difference among the nobility, clergy and the rest of the population. This reform aimed from the one hand at collecting more taxes to finance the wars and on the other hand at creating a more egalitarian state.

The declarations of the 1766 cadastre are self-reported and they do not rely on real measurements done by professionals. The law clearly stated that if someone was reported to the authorities to have declared less than what really owned or used, would have lost the net revenues associated to the part that was not declared. The net revenues of this part would have been shared, in half, between the State and the person who correctly reported the fraudulent declarant. Despite this pair control system, historians estimated that a quarter of the land surface of the country was missing from the declarations (Thewes, 2008, pag. 350). Since the declarations where not based on real measurement, it is probable that this is the result of an imprecise knowledge of the real surface owned or used. Although the cadastre is imperfect, it represents a valuable and reliable source to study inequality in the 1766.

[25] Luxembourg, Archives nationales, B-0103 Cadastre de 1766 - Lois et instructions sur le nouveau cadastre, 1227-1238 (Dossier), Placcard concernant le rapport et l'estimation générale de tous les biens fonds de nos Pays, Duché de Luxembourg et Compté de Chiny, du 12 Mars 1766, Art. 4.

The Luxembourgish theresian cadastre of 1766 that is available in the national archive of Luxembourg is the sum of 28,000 individual declarations organised in 48 different *hauts-commands*, which were divided in different *justices*. The declarations were to be filled and provided to the *justice* where the land or the real estate was. The national archive of Luxembourg collected and digitalised them in microfilms, which are publicly available. Within each microfilm, the declarations are organised in *liasse*, so that the declarations of the same *justice* are grouped together. It is worth to note that the declarations are ordered such that the richest individuals appear first in the microfilms. The cadastre includes also some summary tables showing the total of net revenues and surface of land owned or used by each declarants. The individual declarations report the revenues and the net revenues (that represent the 4 per cent of the revenues) associated to each declared land or real estate. The declarations are based on a pre-filled form sent by the central government to Luxembourg and the tables are divided in different sections. Each declaration starts with the details related to the district where the *biens fond*s were and after this, we can find the name, surname, profession and place of residence of the declarant. The declaration table continues with the list of the things to declare grouped in different sections and groups. The first section groups seven categories of land to declare. These categories are arable land, gardens, forests, vineyards, meadows, enclosures, ponds, pastures and wasteland. The second section in the tables is the *batiments*, which includes real estate such as houses. The last section is called *droits et prestations* that are fees paid to the owners to use or cultivate the land or to rent a building. We are still in a feudal system based on the payment of fees to the clergy and to the nobles. The different categories of fees reported are the tithe, cense and rents, *banalités* (a tax to pay to use the facilities of the owner such as mills and ovens), the *terrage* (the right for the feudal lord to keep part of the harvest) and other feudal taxes not included in the previous categories (Hudemann-Simon, 1985). When the declarant was not the one receiving the *droits et prestations* but the one paying them, this amount was subtracted from the sum of the revenues. Each declaration ends with the total revenues left after the payment of the feudal burdens.

This paper focuses on the *hauts-command* of the *Ville de Luxembourg* and of the *Seigneurie Mont Saint Jean* that corresponds to the municipality of Dudelange.

For Luxembourg City, there are 1,119 declarations, after summing together the declarations made from the same individual, I obtain 1,071 declarations; after I exclude the institutions and groups, I obtain 1,045 individual observations. In Luxembourg City, 16 per cent of the declarants are female. For Dudelange, the original number of declarations is 273, after merging the declarations that share the same name (3 cases), and excluding the declarations related to the church of Ottange, the abbey of Marienthal, the church and the commune of Dudelange, I have 266 observations and only 10 per cent of declarants are female. The monetary unit used

to fill in the declarations is not always the same. In Dudelange, declarants use deniers, sols (one corresponds to 12 deniers), escalins (one is made of 7 sols) and écu (one is made of 8 escalins). The declarations for Luxembourg City are mostly in deniers, sols and florins; this last is made of 20 sols. For comparability reasons, I converted the net revenues in écu.

3.3.1 The declarants

The profession is available in around 70 per cent of the declarations. The most common professions in Luxembourg City are *journalier*, *marchand* and *bourgeois,* while in Dudelange there is an overrepresentation of *journaliers* and *labourers*. This reflects of course the economy of the two municipalities, one being an urban centre and the other one being a rural place.

The declaration had to be filled in also by congregations, religious institutions such as abbeys, churches and convents, and administrative entities such as municipalities and hospitals. These entities are excluded from the current analysis since the scope of the paper is to analyse inequality among citizens.

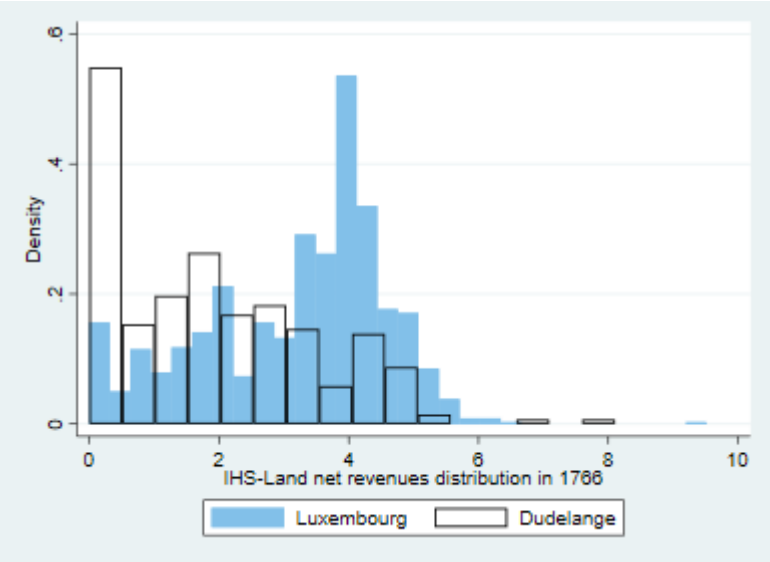
3.3.2 Country of origin

More than 90 per cent of the declarants were resident in Luxembourg. This is important because not a lot of people resident abroad had land in Luxembourg, thus I can assume that also not a lot of people from Luxembourg had land outside the country. This is essential because the collection of the data for the entire country can give a real picture of inequality in 1766. This percentage is stable also in Dudelange, despite the fact that Dudelange, contrary to Luxembourg City, borders with France. In terms of origin, in both places more or less half of the declarants have a surname with French origin while the other half have a German origin's surname.

3.4 Data Analysis

The first question that I wanted to address is if Luxembourg City and Dudelange have different per capita net revenues. Luxembourg City was the capital and economic centre of the country while Dudelange was a feudal seigneury based on agriculture. The average net revenues in the two places are 23.1 and 17.2 écu respectively. This tells that potentially, net revenues associated with land and real estates are not so different among urban and rural places in Luxembourg. However, the main question is whether net revenues are equally distributed among declarants and if the potential productivity of the land and of real estates are enough to assure the same standards of living in the two municipalities. Figure 3.1 presents two very different distributions. The net revenues distribution for the city of Luxembourg is more normally distributed while the distribution for Dudelange is more skewed to the right, meaning that there are many people having very low net revenues and very few people owning high net revenues.

Figure 3.1 and distribution in Dudelange and Luxembourg City in 1766 (IHS transformation)



The professions of the richest declarants already help the interpretation of these results. By selecting the top 5 per cent of the distributions, the profession associated with these people in Luxembourg are baron, pharmacist, lawyer, banker, count, shoemaker, trader, master, notary, priest, blacksmith, food steward, merchant, innkeeper, butcher, brewer, haberdasher, miller, tanner, glazier or inspector. In Dudelange, the ones in the top 5 per cent of the distribution are countess, peasant, trader, widow and council member. The two distributions share the Chanclos family among the richest 5 per cent, this family was resident in Brussels and was the owner of part of the seigneury of Dudelange. This family is also the richest in absolute terms if we consider the declarations filled in both municipalities.

The total net revenues of the Chanclos are more than three times the ones declared by François-Albert de Boland, the second richest person and owner of the rest of the seigneury of Dudelange, and more than eight times the revenues declared by the third richest person that is a merchant resident in Luxembourg City. Dudelange is the picture of the feudal system where the society revolves around the figure of the feudal lords, while Luxembourg City presents a complete different picture, based on second sector activities that created the base for the development of the bourgeoisie. Table A3.1 in the appendix shows the details of the richest top 2 per cent for both places.

The descriptive statistics presented in Table 3.1 show the distributions of net revenues associated with different categories of land and other revenues for the two municipalities under study.

Table 3.1 Descriptive Statistics Net revenues by land category (no zeros)

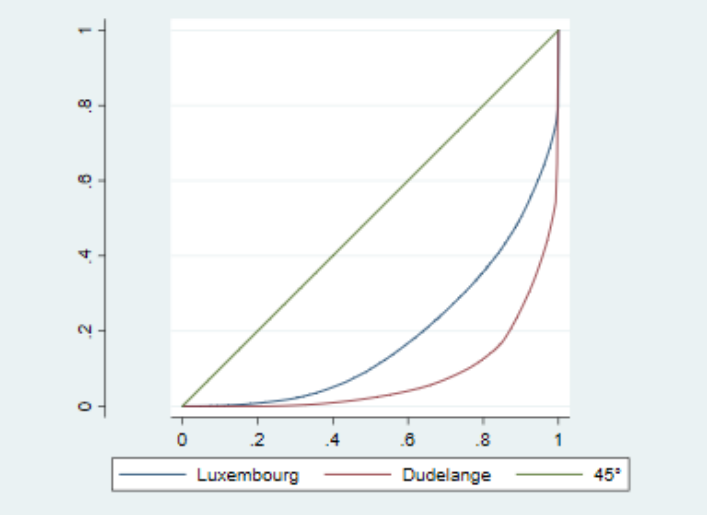
Variable	Obs		Mean		Std. Dev.		Min		Max	
	Lux City	Dudelange	Lux City	Dudelange	Lux City	Dudelange	Lux City	Dudelange	Lux City	Dudelange
Buildings and Rights	941	16	37.1	131.1	38.3	382.0	0.1	0.3	287.5	1513.0
Forest	27	2	0.5	43.6	1.2	0.0	0.0	43.6	5.9	43.6
Charges	951	172	12.6	6.3	15.0	16.5	0.0	0.1	98.6	168.4
Intermittent arable land	45		0.4		0.8		0.0		4.1	
Vineyards	6		0.6		0.8		0.1		2.2	
Ponds	1		0.2		.		0.2		0.2	
Uncultivated land	2		0.8		0.3		0.6		1.1	
Enclosures	23	20	1.0	2.2	1.2	1.6	0.0	0.2	4.1	5.4
Gardens	479	187	1.2	0.7	2.0	1.1	0.0	0.0	22.0	10.1
Arable land	68	197	7.3	7.8	12.8	13.6	0.0	0.1	65.5	116.8
Pastures	1	2	0.0	0.4	.	0.3	0.0	0.2	0.0	0.6
Meadows	46	188	2.1	8.9	4.3	14.1	0.0	0.1	24.0	103.5
Total (with zeros)	1045	266								

For Dudelange, the net revenues are associated mainly to arable land, gardens and meadows, as expected from its rural nature. For Luxembourg City, the most common categories are buildings and rights, and gardens. The hypothesis is that the owners of second sector activities work in buildings that they owned or rented. In the last case, they generated a charge for themselves and a right to the real owner of the building where their business was.

3.4.1 Inequality analysis

Figure 3.1 shows that the two distributions of net revenues are very different, despite the source used is the same as well as the year under study for the two municipalities. This difference is confirmed by the Lorenz curves and the Gini coefficients. The Lorenz curves in Figure 3.2 show that inequality is lower in Luxembourg City and that in Dudelange the high number of declarants reporting net revenues of zero leads this trend. The people on the left hand side of the Dudelange distribution have actually net revenues that were lower than the charges that they had to pay to the feudal lord. These represent around 16.5 per cent of the total number of declarants. It is worth to note that in Luxembourg City, we have very few declarants that have charges higher than the revenues, thus net revenues are almost always greater than zero and the Lorenz Curve starts to outdistance the *x-axis* from the very beginning. For Luxembourg City the Gini is 0.53 while for Dudelange is 0.87.

Figure 3.2 Lorenz Curve for Luxembourg City and Dudelange 1766



This confirms the political and economic differences of the two places considering that only Luxembourg City was a free city while Dudelange was a fief. For Dudelange, the Lorenz Curve lies on the *x-axis* for the bottom 40 per cent of the distribution, thus the high inequality is driven by the property-less declarants.

This finding also suggests that almost everyone that had a property or a business in the city was able to have some positive revenues, contrary to what happened in Dudelange.

To understand better what are the main sources of inequality among the categories of revenues reported in the cadastre, Table 3.2 and Table 3.3 show the inequality decomposition by factor components.[26] In light of the summary statistics, the focus is on the categories that were filled the most in both places.

Table 3.2 Inequality decomposition by factor components (Lerman & Yitzhaki, 1985): Luxembourg City

Variable	**Shares**	**Coeff. g**	**Corr. r**	**Conc. c=g*r**	**Contri. s*g*r**	**%Contri. s*g*r/G**	**Elasticity s*g*r/G-s**
Buildings and rights	1.45	0.57	0.98	0.55	0.80	1.50	0.06
Charges	-0.50	-0.62	-0.89	0.55	-0.28	-0.52	-0.02
Arable land	0.02	0.98	0.38	0.37	0.01	0.01	-0.01
Others	0.03	0.85	-0.02	-0.01	0.00	0.00	-0.03
TOTAL	1.0	0.53	1.0	0.53	0.53	1.0	0.0

Note: Institutions and groups excluded.

[26] Stata command used is *sgini* by Van Kerm, P. (2009)

Table 3.3 Inequality decomposition by factor components (Lerman & Yitzhaki, 1985): Dudelange

	Shares	**Coeff. g**	**Corr. r**	**Conc. c=g*r**	**Contri. s*g*r**	**%Contri. s*g*r/G**	**Elasticity s*g*r/G-s**
Buildings and rights	0.47	0.99	0.98	0.98	0.46	0.52	0.06
Charges	-0.24	-0.78	-0.66	0.52	-0.12	-0.14	0.10
Arable land	0.34	0.76	0.92	0.70	0.24	0.27	-0.07
Others	0.43	0.74	0.94	0.69	0.30	0.34	-0.09
TOTAL	1.00	0.87	1.00	0.87	0.87	1.00	0.00

Note: Institutions and groups excluded.

In Luxembourg, the total Gini is very similar to the one related to buildings and rights, while in Dudelange arable lands have a Gini coefficient of 0.76. It seems that the total Gini increases because of the buildings and rights, since the analysis includes the two families owners of the fiefs and receiving also all the rents paid by the peasants. Charges are paid, in percentage, by more declarants in Luxembourg City than Dudelange where they are less egalitarian. There are different hypothesis on why the Gini coefficient for Luxembourg City is smaller than in Dudelange. There could be a self-selection of people living in the city. This means that there is a higher probability that the declarants living in Luxembourg City owned the land or building that is reported in the declaration instead of being simply users. Another explanation for a low Gini coefficient in Luxembourg City is that the cadastre does not include people that worked for someone else and that did not have their own house and lived in the shops where they worked or the owner of the shop provided them a place to stay. In this last case, the Gini coefficient would be downward biased with respect to Dudelange where the property-less had to rent the land and cultivate it to survive. This second hypothesis seems to be the most probable since the number of declarations for Luxembourg City is lower than what expected considering the population of the city in 1766.

To check for this, I replicated the Gini coefficient after adding the property-less individuals that did not fill in the declaration and are thus missing from the analysis. Considering that the population of Luxembourg City in 1765 was of 8,500 inhabitants (Atten, 1989, pp.31) and according to the *dénombrement* the family multiplier was between four and five, while only for the nobles it was of 3.5 (Hudemann-Simon, 1986), the *Marie Thérèse Cadastre* should cover around 1,900 declarations. The individual declarations that I recorded from the cadastre are 1,045. When the property-less are added to the analysis, the Gini coefficient rises to 0.73. Even if I take into account the different social and economic structure between Luxembourg City and Dudelange, adding the property-less that in the city do not work the land and are free, inequality in the city remains lower. If it is true the assumption that these people are missing

from the cadastre because they were working for someone else, then they were better off than the declarants in Dudelange that had to pay a fee to live and work the land in the fief.

Whatever the explanation for the low inequality, Luxembourg in 1766 seems to be more developed than Dudelange a decade before the industrial revolution took place since in 1872 the municipality registered a Gini coefficient of 0.69 (Schifano and Paccoud, 2022). In addition, if I exclude de Chanclos from the analysis, the Gini coefficient of Dudelange is 0.76 and if I exclude both the Chanclos and the Boland and the ones that are not resident in Dudelange, the Gini becomes 0.72, while this exercise for Luxembourg City leaves the Gini coefficient almost unchanged. This shows that the left of the distribution, more than the right, drives inequality in the rural place as Figure 3.1 predicted.

Table 3.4 Distribution of land in Luxembourg and Dudelange. Deciles and top percentages

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	0-95	95-100	0-99	99-100
Luxembourg	0.2	0.9	1.7	3.8	6.2	9.1	11.2	13.6	18.5	34.8	79.0	21.0	94.1	5.9
Dudelange	0	0	0.2	0.7	1.2	1.9	3.1	5.5	13.0	74.3	37.5	62.5	52.0	48.0

Table 3.4 shows how much wealth, in percentage with respect to the total, is owned by each decile of the distribution. In the city of Luxembourg, the percentage of wealth owned grows gradually from a decile to the next. In Dudelange, the ninth decile owns 13.6 per cent of the total wealth, and the tenth decile owns 74.3 per cent of wealth, of this, 48 per cent is owned by the top 1 per cent of the distribution.

Since Luxembourg borders with France and Germany, and the residence of the declarants is mostly in Luxembourg, the origin of the surnames could be used to differentiate between people that have French or German origins. German and French surnames are almost equally distributed in the sample for Luxembourg City and Dudelange, despite this borders with France. The average net wealth for the two groups is completely different for Dudelange, where of course the countess De Boland influences disproportionally the measure. In Luxembourg City, the average net wealth is almost equally distributed between the two groups. Overall, both groups in both places perfectly replicate the difference in the Gini coefficients mentioned above.

Table 3.5 Average net wealth (ANW) and Gini coefficients by surname origin

Hautscommands	Origin of surname	Obs	ANW	Gini
Mont St Jean (Dudelange)	French	146	24.95	0.87
	German	120	7.68	0.70
Mont St Jean (Dudelange) Total		266	17.16	
Luxembourg City	French	463	25.69	0.49

	German	581	21.09	0.55
	n.a.	1	24.17	
Luxembourg City total		1045	23.13	
Grand Total		1311	21.92	

Since the profession of the declarants is available for 68 per cent of the declarations, tables 3.6 and 3.7 report the number of observations, the average net wealth (ANW) and the percentage of declarants in each professional category (according to the HISCO class scheme) with respect to the total, by place of analysis. Looking at the full distribution, the nobility is the class with the highest average net wealth in both places.

After splitting the distribution, among the richest categories in the bottom 50 per cent of the distribution there are workers in the secondary sector and that provide services to the community. In Dudelange, there are the government executive workers (one of them is also among the top 10 per cent) while for Luxembourg City apart from the metalworkers, there are the masters, that follow the "2-2 Supervisors, Foremen and Inspectors" category and after them all the workers in the commercial sector. The average net wealth for the bottom 50 per cent of the distribution in Dudelange is 2.7 écu while in Luxembourg City it is of 4.3 and the differences between the richest category and the following ones is gradual and more or less constant, apart from the 1.3 écu difference between the richest and the second richest category. For Dudelange, the difference between the first two categories is of 4.9 écu, and this trend is confirmed in all the other parts of the distribution presented in the two tables. For the top 10 per cent in Luxembourg City there are again sales workers, masters, lawyers and then there are religious workers and nobles, while a noble occupies the first position for the top 10 per cent in Dudelange. This applies also to the top 5 percent and 1 per cent.

Table 3.6 Distribution of net revenues by profession in Luxembourg City (1766)

Hautscommands Ville de Luxembourg	**All**			**1-50%**			**Top 10%**			**Top 5%**			**Top 1%**		
HISCO class															
	Obs	**ANW**	**%**	**Obs**	**ANW**	**%**	**Obs**	**ANW**	**%**	**Obs**	**ANW**	**%**	**Obs**	**ANW**	**%**
(-) 2 bourgeois	76	13.5	7%	48	5.1	11%	1	55.6	1%						
(-)1 Nobility	20	56.2	2%	3	3.9	1%	11	87.2	9%	7	102.5	12%	2	132.7	18%
0-6/0-7 Medical, Dental, Veterinary and Related Workers	7	44.0	1%				2	74.9	2%	1	89.9	2%			
1-2 Jurists	21	51.8	2%	3	4.3	1%	8	94.6	7%	6	105.8	10%	3	122.8	27%
1-4 Workers in Religion	19	18.0	2%	14	3.3	3%	2	90.3	2%	1	123.8	2%	1	123.8	9%
2-0 Legislative Officials and Government Administrators	5	21.1	0%	2	0.3	0%									
2-1 Managers	1	12.2	0%												

2-2 Supervisors, Foremen and Inspectors	52	26.1	5%	12	6.9	3%	5	78.3	4%	2	99.8	3%	1	117.6	9%
3-1 Government Executive Officials	22	40.0	2%				6	65.0	5%	2	77.3	3%			
3-9 Clerical and Related Workers Not Elsewhere Classified	3	32.6	0%												
4-1 Working Proprietors (Wholesale and Retail Trade)	1	0.3	0%	1	0.3	0%									
4-5 Salesmen, Shop Assistants and Related Workers	91	42.6	9%	8	5.7	2%	25	80.4	22%	15	94.3	25%	2	159.3	18%
5-1 Working Proprietors (Catering, Lodging and Leisure Services)	8	36.9	1%	1	3.1	0%	2	71.3	2%	1	78.9	2%			
5-4 Maids and Related Housekeeping Service Workers Not Elsewhere Classified	2	11.8	0%	1	3.6	0%									
5-7 Hairdressers, Barbers, Beauticians and Related Workers	6	29.9	1%	1	0.4	0%	1	69.9	1%						
5-8 Protective Service Workers	13	25.0	1%	4	3.1	1%	1	64.9	1%						
5-9 Service Workers Not Elsewhere Classified	2	15.0	0%	1	0.1	0%									
6-1 Farmers	21	10.2	2%	14	3.7	3%									
6-2 Agricultural and Animal Husbandry Workers	16	3.7	2%	15	2.7	3%									
6-3 Forestry Workers	2	1.7	0%	2	1.7	0%									
7-2 Metal Processors	6	26.2	1%	2	8.2	0%	1	61.3	1%						
7-5 Spinners, Weavers, Knitters, Dyers and Related Workers	26	17.1	2%	12	5.8	3%	2	50.4	2%						
7-6 Tanners, Fellmongers and Pelt Dressers	17	27.4	2%				2	67.0	2%	1	75.5	2%			
7-7 Food and Beverage Processors	62	31.7	6%	18	4.6	4%	12	77.8	10%	7	88.5	12%	1	133.4	9%
7-9 Tailors, Dressmakers, Sewers, Upholsterers and Related Workers	20	22.2	2%	6	6.6	1%	1	92.8	1%	1	92.8	2%			
8-0 Shoemakers and Leather Goods Makers	2	27.4	0%												
8-1 Cabinetmakers and Related Woodworkers	42	18.0	4%	17	4.1	4%	1	107.2	1%	1	107.2	2%			
8-3 Blacksmiths, Toolmakers and Machine Tool Operators	17	13.9	2%	8	4.5	2%									
8-7 Plumbers, Welders, Sheet Metal and Structural Metal Preparers and Erectors	2	30.1	0%												
9-2 Printers and Related Workers	1	52.7	0%				1	52.7	1%						

9-3 Painters	1	2.0	0%	1	2.0	0%									
9-4 Production and Related Workers Not Elsewhere Classified	1	22.9	0%												
9-5 Bricklayers, Carpenters and Other Construction Workers	38	19.6	4%	17	5.8	4%	2	74.0	2%	1	79.8	2%			
9-8 Transport Equipment Operators	2	15.8	0%												
9-9 Labourers Not Elsewhere Classified	68	5.7	7%	63	4.1	14%									
n.a.	3	22.9	0%	1	0.2	0%									
(blank)	349	19.8	33%	171	4.0	38%	30	73.5	26%	13	89.3	22%	1	155.3	9%
total	**1,045**	**23.1**	**100%**	**446**	**4.3**	**100%**	**116**	**77.7**	**100%**	**59**	**94.1**	**100%**	**11**	**134.8**	**100%**

Note(s): This table is the result of the profession reported in the *cadastre* codified using the HISCO class system (https://historyofwork.iisg.nl/index.php). See reference for more details Van Leeuwen et al. (2002).

Table 3.7 Distribution of net revenues by profession in Dudelange (1766)

Hautscommands de Mont St Jean	**All**			**1-50%**			**Top 10%**			**Top 5%**			**Top 1%**		
HISCO class															
	Obs	**ANW**	**%**	**Obs**	**ANW**	**%**	**Obs**	**ANW**	**%**	**Obs**	**ANW**	**%**	**Obs**	**ANW**	**%**
(-)1 Nobility	2	827.9	1%	1	4.3	0%	1	1651.5	7%	1	1651.5	20%	1	1651.5	50%
1-2 Jurists	2	18.2	1%	1	4.8	0%									
1-3 Teachers	1	1.3	0%	1	1.3	0%									
1-4 Workers in Religion	7	10.3	3%	4	3.3	2%									
2-2 Supervisors, Foremen and Inspectors	1	0.1	0%	1	0.1	0%									
3-1 Government Executive Officials	3	23.6	1%	2	10.0	1%	1	50.9	7%						
3-9 Clerical and Related Workers Not Elsewhere Classified	1	35.9	0%												
4-5 Salesmen, Shop Assistants and Related Workers	3	29.1	1%	1	0.8	0%	1	70.0	7%						
5-1 Working Proprietors (Catering, Lodging and Leisure Services)	2	1.3	1%	2	1.3	1%									
5-8 Protective Service Workers	3	4.9	1%	3	4.9	1%									
6-1 Farmers	67	17.4	25%	40	3.0	19%	7	66.4	50%	3	83.0	60%			

6-2 Agricultural and Animal Husbandry Workers	2	0.3	1%	2	0.3	1%									
7-3 Wood Preparation Workers and Paper Makers	1	0.0	0%	1	0.0	0%									
7-5 Spinners, Weavers, Knitters, Dyers and Related Workers	17	3.7	6%	17	3.7	8%									
7-6 Tanners, Fellmongers and Pelt Dressers	1	3.4	0%	1	3.4	0%									
7-7 Food and Beverage Processors	5	9.9	2%	4	2.9	2%									
7-9 Tailors, Dressmakers, Sewers, Upholsterers and Related Workers	13	4.1	5%	12	3.0	6%									
8-0 Shoemakers and Leather Goods Makers	8	2.6	3%	8	2.6	4%									
8-1 Cabinetmakers and Related Woodworkers	6	9.5	2%	5	5.1	2%									
8-3 Blacksmiths, Toolmakers and Machine Tool Operators	7	7.0	3%	6	4.0	3%									
9-5 Bricklayers, Carpenters and Other Construction Workers	10	2.7	4%	10	2.7	5%									
9-9 Workers Not Elsewhere Classified	43	2.4	16%	42	2.1	20%									
n.a.	5	2.4	2%	4	0.0	2%									
(blank)	56	17.6	21%	43	1.8	20%	4	162.8	29%	1	476.1	20%	1	476.1	50%
total	**266**	**17.2**	**100%**	**211**	**2.7**	**100%**	**14**	**206.3**	**100%**	**5**	**475.3**	**100%**	**2**	**1063.8**	**100%**

Note(s): This table is the result of the profession reported in the *cadastre* codified using the HISCO class system (https://historyofwork.iisg.nl/index.php). See reference for more details Van Leeuwen et al. (2002).

The availability of the professions and the knowledge of the family multipliers in Luxembourg City and Dudelange in 1766, allow the computation of the equalised Gini coefficient. The unit of measure of the declarations is the household; the equalised Gini allows

computing wealth inequality at the individual level. For Dudelange, I relied on Pauly (2014) to compute the family multiplier based on the real number of children of the declarants.

For the municipality of Dudelange the family multiplier is almost 6 while for Luxembourg City it was between 4 and 5, with the exception of the nobles for which the family multiplier was one point smaller (Hudemann-Simon, 1985).

To generate the correct number of individuals (adults and children) living in the same household, I computed the average number of children by profession for the municipality of Dudelange and I attributed this to everyone declaring the same profession in Luxembourg City and in Dudelange. Since some professions were not associated to any number of children, I proceeded to compute the average number of children by professional categories according to the HISCO major and minor group of 1 or 2 number code, starting from the most detailed to the least detailed classification. Nobles and all the rest had a multiplier of 3.5 so that the average family multiplier mirrored the documented one. After this, the database has around 5,800 observations and the Gini coefficients of Luxembourg City and Dudelange are 0.55 and 0.82 respectively. If I also add the property-less declarants in Luxembourg City, that as supposed above may be missing in the cadastre, the Gini coefficient for Luxembourg City rises to 0.69 and the number of observations is 8,493 reflecting the population of Luxembourg City in 1766.

Table 3.8 shows that going from the household level to an estimated individual level Gini for the original sample, would reduce the inequality distance between Luxembourg City and Dudelange, being this last one much less egalitarian. For the estimated full population sample, that includes the estimated property-less declarants in Luxembourg City, there is not much difference between the household level and the equalised Gini, being the individual one more reliable and egalitarian.

Table 3.8 Different Gini coefficients and samples

	Original Sample		**Estimated full population**		**Original Sample**		**Estimated full population**	
	Obs	**Gini**	**Obs**	**Gini**	**Obs**	**Equalised Gini**	**Obs**	**Equalised Gini**
Luxembourg City	1,045	0.53	1,797	0.73	5,861	0.55	8,493	0.69
Dudelange	266	0.84	266	0.84	1,921	0.82	1,921	0.82

3.5 Conclusions

In this paper, I analysed wealth distribution in Dudelange, a municipality in the south of Luxembourg, and Luxembourg City, the capital of the Grand Duchy. The possibility to use the same source, the Maria Theresa cadastre of 1766, in both places, allows a comparative analysis in addition to an estimation of inequality in both places. This study shows that inequality is much smaller in the city than in the rural Dudelange that is completely absorbed by the feudal system that was in force at the time of the cadastre as suggested by the fact that the two richest declarants are also the owners of the seigneury. In Dudelange, the high number of property-less drives the Lorenz curve since it follows the *x-axis* for the poorer 40 per cent of the distribution and it clearly reflects this into the Gini coefficient. In Luxembourg City, very few property-less declarants appear in the cadastre while most of them probably simply did not fill in the declarations. The estimated number of property-less for Luxembourg City is more or less 4,800 and the equalised Gini coefficient remains smaller than in Dudelange even when they are included in the analysis.

The paper also allows comparing these two places in terms of economic activities. The professions of the declarants disclose two different societies. Luxembourg City shows a variety of jobs that are typical of cities, where people outsource some activities, such as the production of bread that in a rural place people probably produced at home. A high variety of professions in Luxembourg City belongs to commercial activities, while the majority of declarants in Dudelange has a profession related to the cultivation of the land. The urban place has a higher average net wealth per capita, in addition to lower inequality, than the rural counterpart. The average net wealth per professional category reveal that Luxembourg City had a higher average net wealth for the bottom 50 per cent of the distribution than Dudelange. This is reversed when the analysis moves to the richest ones in the top 10, 5, and 1 per cent.

The identification of the origin of surnames of declarants informs us that half of them share a French surname and other half a German surname. In addition, the fact that the percentage of declarants resident abroad is very low for both Luxembourg City and Dudelange (that borders with France), confirm that the cadastre of Maria Theresa used on the entire country, could give a real picture of inequality in Luxembourg in the pre-industrial time. Indeed, these results should be considered as preliminary with respect to a bigger study on wealth inequality in the entire Luxembourg over the long-term.

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Appendix

Table A3.1 Top 2 per cent richest

Declarant	Justice	Profession	Net revenues
Chanclos (de)	Dudelange	Comtesse Maréchale	1652
Boland (de) François-Albert	Dudelange		475
Paulus Nicolas	Dudelange	Laboureur	94
Barthels Nicolas	Dudelange	Laboureur	79
Schmit Nicolas	Dudelange	Laboureur	77
Loutz Nicolas	Lux city	Négociant	191
Lanser (de) Jean-Henri	Lux city		155
Chanclos (de)	Lux city	Comtesse Maréchale	135
Remy Nicolas	Lux city	Boulangèr	133
Lefèbre (de)	Lux city	Baron	130
Eyden Jean-Baptiste	Lux city	Avocat	128
Braska Catherine	Lux city	Marchand	128
Eydt Joseph	Lux city	Prêtre	124
Terweich François	Lux city	Avocat	124
Schmit Jean-Nicolas	Lux city	Maître	118
Heuschling Antoine-Hubert	Lux city	Notaire	117
Wurmelding Marie	Lux city	Notaire	115
Jardin André-Christophe (de)	Lux city	Seigneur De Bernabrück	113
Olinger Mathias	Lux city	Cordonnier	107
Didenhoven Antoine	Lux city	Boucher	107
Deleau Marie et Thérèse	Lux city		106
Roehr Jean, les héritiers	Lux city		100
Soleuvre (de) (les cohéritiers)	Lux city	Baron	99
Serwais Jean	Lux city	Marchand	99
Georges Mathias	Lux city	Marchand	95
Rinck Jacques	Lux city	Marchand	95

Chapter 4. Well-being and working from home during COVID-19

Well-being and working from home during COVID-19

With

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4.1 Introduction

The coronavirus disease 2019 (COVID-19) pandemic has had a profound impact on everyday life for the majority of the World population and continues to present challenges for the way in which we live our lives. Part of the policy response to the pandemic has been lockdown and social- distancing measures. While these measures have helped limit the spread of the virus (Anderson *et al.*, 2020; Hsiang *et al.*, 2020), they have also had substantial impacts on economic activity and individual well-being. A survey of a number of the consequences of COVID-19 is provided by Brodeur *et al*. (2021b), and an attempt to integrate many of the costs and benefits of lockdown appears in Layard *et al*. (2020). One of the key elements in the calculus of these costs and benefits is the well-being of the population, and we here evaluate how well-being is related to changes in the way we work.

To the best of our knowledge, our contribution here is the first to use individual-level longitudinal data from multiple countries to explore the effects of the COVID-19 pandemic on individual well- being. One of the pandemic's most important impacts on peoples' daily routines has been the sudden and massive change in the workplace, from the office to the home.

The sheer size of this unexpected movement provides an unprecedented opportunity to evaluate the potential well-being consequences of workplaces in the future, where physical presence may be less ubiquitous. This type of evaluation would have been more unreliable in pre-pandemic times, as so few people worked at home (and those that did were unlikely to be representative of the general population).

We will use pooled cross-section and panel regression analysis to establish the relationship between working from home and five measures of subjective well-being: life satisfaction, individuals' feelings that what they were doing in their life was worthwhile, loneliness, depression and anxiety. Our baseline model considers how place of work and pandemic policy stringency are related to well-being, conditional on a small number of demographic control variables. We then turn to the role of a number of potential mediators of working from home and well-being (such as income). This will allow us to see whether any advantage or disadvantage from working from home works via income (for example) or can be assigned to other unmeasured variables. Last, we ask whether working from home hurts some people more than it does others in a moderation analysis. While the main regressions will identify the average effect of working from home on well-being, some groups may well fare worse than others. We would wish to identify these groups both in terms of policy responses and the measurement of inequality (here in terms of subjective well-being) on the labour market.

The remainder of the paper is organised as follows. Section 2 discusses some of the existing work in this area in the context of COVID-19 and presents our hypotheses, and Section 3 describes the data we use here. Section 4 then introduces our empirical analysis and discusses the results. Last, Section 5 concludes.

4.2 The literature and hypotheses

Following the outbreak of COVID-19, there has been great interest in the pandemic's consequences on individual well-being. During the rapid spread of the SARS (severe acute respiratory syndrome) virus in the early 2000s, research revealed that individuals who had been in quarantine showed symptoms of post-traumatic stress disorder and depression (Reynolds *et al*., 2008). The length of quarantine is important, with longer periods exacerbating these symptoms (Hawryluck *et al*., 2004). One key factor in the development of psychological disorders was quarantine's associated fall in income (Mihashi *et al*., 2009), and this is one of the questions that we will address via our mediation analysis. These negative effects of lockdown on mental health seem to have persisted for a number of years (Liu *et al*., 2012).

The COVID-19 outbreak offers a new possibility to examine the well-being of those living under mobility restrictions. Fancourt *et al.* (2020) consider lockdown and mental health in the UK, via a longitudinal observational study (the UCL COVID-19 Social Study). They find that

depression and anxiety levels fell during the weeks following the introduction of lockdown, suggesting some adaptation to the new modes of life. Felstead and Reuschke (2020) explicitly look at working from home and mental health, finding this relationship to be negative, especially for those working from home for the first time; they also uncover evidence of adaptation. In Patrick et al. (2020), parents reported worse mental health for themselves and worse behavioural health of their children in the United States between March and June 2020. Sibley *et al*. (2020) find worse mental health after the introduction of lockdown in panel data from New Zealand, and during the first two weeks of the Coronavirus outbreak, one-fifth of the Spanish population reported elements of potential depression or anxiety diagnosis (González-Sanguino *et al*., 2020). Last, a survey in Austria revealed that individuals were more exposed to depression and had a lower quality of life during COVID-19 relative to before the outbreak (Pieh *et al*., 2020). Research in this area has suggested that those who are most affected by the COVID-19 measures were already in at-risk groups, such as women, young adults, those with lower education or income and those living alone (Bu *et al*., 2020): as such the pandemic has increased well-being inequality.

One of the specific measures taken to reduce interactions between individuals, and so the risk of infection, has been the advent of working from home: what De Fraja *et al.* (2020) call the "zoomshock". Working from home has risen spectacularly during 2020. British Household Panel Survey data reveals that only around two per cent of workers did so in the early 2000s (see www.iser.essex.ac.uk/bhps/documentation/volb/wave18/rindresp8.html#rjbpl for the 2008 Wave 18 figure), with an analogous figure of 5% across all of the EU in 2019 (ec.europa.eu/jrc/sites/jrcsh/files/jrc120945_policy_brief_-_covid_and_telework_final.pdf). Following the pandemic, the percentage working at home rose from 8% in February 2020 to 35% in May 2020 in the US, despite the milder lockdown conditions there than in Europe. In July 2020, more than one worker in three worked only at home in the EU-27 (www.eurofound.europa.eu/publications/report/2020/living-working-and-covid-19). Dingel and Neiman (2020) estimate that over one-third of jobs in the US can now be carried out entirely at home, and Alipour *et al.* (2020) suggest that working from home is feasible for over half of the jobs in Germany.

Working from home has had public-health benefits (Alipour *et al.*, 2021; Angelucci *et al*., 2020) and has been suggested to lead to greater worker productivity (Bloom *et al.*, 2015). However, there are likely also costs. Working from home leads to a greater blurring of the boundaries between work and non-work. In this context, Molino *et al.* (2020) discuss the "technostress" that comes from permanent interaction with digital technology that will increase disruption in individuals' work–life balance. The European Parliament has passed a non-binding resolution arguing that individuals have a "right to disconnect"

(www.europarl.europa.eu/news/en/press- room/20201126IPR92512/meps-call-for-an-eu-wide-right-to-disconnect), arguing that homeworking has led to adverse effects on both mental and physical health. Bellmann and Hübler (2021) consider the relationship between working at home, on the one hand, and work–life balance and job satisfaction on the other in three waves of German panel data, with mixed results. Xiao *et al.* (2021) conducted an online survey with mostly US respondents, between April and June 2020, targeting people who had switched to working from home. They find lower mental and physical well-being and a greater number of mental issues, as compared to pre-working from home. The home work environment and reduced communication with co-workers are suggested as potential culprits for this reduced well-being, and it has been shown that teleworking may generate a lack of support and a sense of isolation (Tavares, 2017). A survey of the relationship between working at home and health appears in Oakman *et al.* (2020), where it is emphasised that working at home may have negative or positive impacts on mental health.

It is worth reflecting on what impact we might have expected this drastic reorganisation in the world of work to have had on the well-being of the employed.

In general, researchers in social science are interested in how the organisation of work affects both firm profits and workers' income and subjective well-being. The combination of the willingness of firms to allow working from home and of workers to do is key factors behind its prevalence.

The typical problem in establishing these effects on firm and worker outcomes is endogeneity: certain types of firms and workers may be more likely to be engaged in working from home, and we have an omitted-variable bias. In this case, it is difficult to tease out a causal relationship that would tell us about the consequences of a major roll-out of home working.

One of the consequences of the pandemic has been to change the work environments of tens of millions of people across Europe (and the world), independently of what they, and their firms, may have wished. We can consider the pandemic to have changed outcomes independently of worker and firm preferences, which can realistically have been expected to remain fixed around Easter 2020.

The subsequent effect of working from home on worker well-being will then depend on whether there was pent-up demand for homeworking amongst workers. In normal times, firms may not have responded to this demand for homeworking for agency or co-ordination reasons. If there was pent-up demand, then the increase in homeworking during the pandemic will produce a better match between what workers value and the characteristics of their jobs and so increase their well- being. If this was not the case, then workers did not want to work from home; hence, we expect their well-being to fall. We do not know which of these situations predominated at the start of the pandemic and are thus agnostic about what the empirical

analysis will produce regarding home working and worker well-being: this is the first relationship we test.

It is important to separate the effect of restrictions from that of the pandemic itself. In the context of our work here, the shift to working from home was not exogenous and reflected the restrictions brought about by the pandemic's spread. As the latter has almost certainly affected well-being, including that of workers, it needs to be held constant (i.e. it is a confounder). We will do so by controlling for the COVID-19 policy-stringency index in all of our empirical analyses.

While we may not know a priori in which direction working from home is correlated with well- being, we can make some more unambiguous predictions regarding mediation and moderation: these are the second and third empirical relationships that we will estimate. With respect to mediation, working from home might lead to lower income, which in turn will reduce well-being (as in Mihashi *et al.*, 2009). For moderation, we suspect that those who have greater resources (larger houses) or fewer demands on their time (fewer young children at home) will do better when they work from home, as in Bu *et al.* (2020).

Our empirical contribution to the literature on working from home and worker well-being uses data from a novel high-frequency harmonised panel survey that has been carried out in five European countries since Easter 2020. This survey includes five separate well-being constructs, based on validated psychometric scales. The data we use allow us to examine the relationship between working from home and well-being at different phases of the COVID-19 crisis. We broadly find that working at home is associated with lower levels of well-being, but with some evidence of an initial boost at the time of the transition. On the contrary, the stringency of the policy response to the pandemic is consistently associated with lower well-being on all five of our scales.

4.3 Data

Our data come from the ongoing COME-HERE (COVID-19, MEntal HEalth, REsilience and Self- regulation) panel survey run by the University of Luxembourg. This survey is conducted by Qualtrics using representative samples (by age, gender and region) from France, Germany, Italy, Spain and Sweden. Respondents complete on-line questionnaires that take approximately 20 min. Ethics approval was granted by the Ethics Review Panel of the University of Luxembourg. This dataset includes information at both the individual and household levels and is longitudinal, with the same individuals being interviewed repeatedly at the different waves. The first four survey waves were conducted around May 1st, June 9th, September 5th and November 20th 2020. At least four more waves are planned in 2021. COME-HERE data have recently been used to analyse the evolution of income inequality (Clark *et al.*, 2021), which

rose but then fell to below its initial level, and poverty (Menta, 2021), which rose and then partially recovered.

Over 8,000 individuals took part in the first wave and were then invited to reply to the subsequent waves. A total of 83% of Wave-1 respondents replied to at least one more survey: 42% appear in all four surveys, 25% in three surveys and 16% in two surveys. The working at home diary information comes from Wave 4, and our empirical analysis will be carried out on an unbalanced panel of individuals who replied to at least this wave. This produces a sample of a little over 9,700 observations.

The survey collected a battery of information on living and mental-health conditions during COVID-19 and the changes and events in individuals' lives. Standard sociodemographic characteristics, such as age, gender, education, labour force and marital statuses, were also recorded. Special modules in different waves addressed topics such as risk attitudes, time discounting, preferences for redistribution, income comparisons and working conditions.

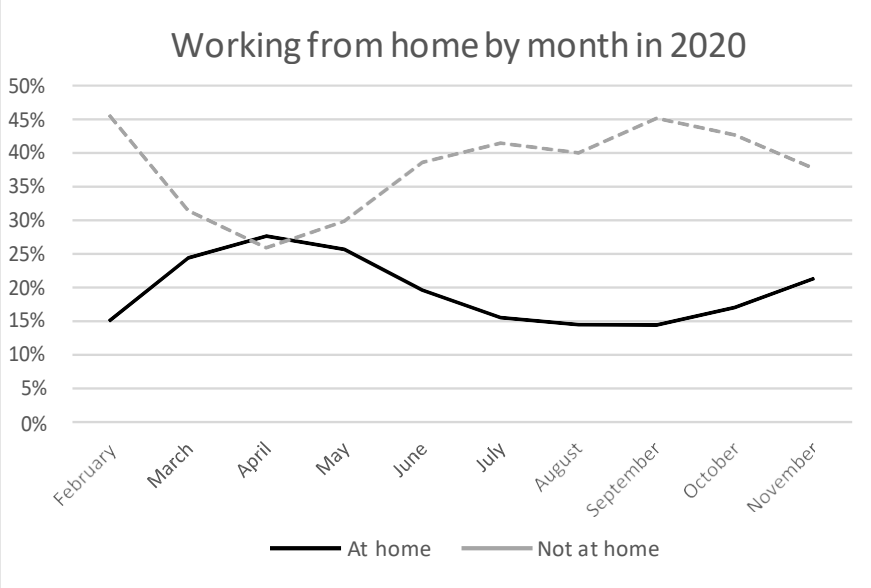
Our key variables are subjective well-being and working from home. We have five measures of the former that are available in all survey waves: life satisfaction, a worthwhile life, loneliness, depression and anxiety.

Working from home information comes from a diary that was proposed to all Wave-4 respondents (in November 2020) about their work in each month since February 2020: they could report working mostly from home, working mostly not at home or not working. Our working from home dummy variable (WHit) indicates that individual *i* was working at home in month *t*. The time profile of working at home/not at home in every month in the retrospective diary appears in Figure 4.1: the complement of these two numbers is respondents who are not working (which shows relatively little trend over the period).

Working from home peaked in April at almost 30% of all respondents (and over 50% of those working), before falling to 15% in August and September (25% of those working) and then starting to rise again as the autumn progressed. We match the respondents' replies from this diary question to the date at which the well-being information was supplied by the individual in the various survey waves. For example, the working-at-home status in May from the diary of an individual who replied to Wave 4 in November will be matched to the SWBiMay, well-being scores that the same individual reported when interviewed in Wave 1.

The five dependent well-being variables come from validated psychological scales, as follows.

Figure 4.1 Working from home by month in 2020.



Note(s). These figures show the percentage of Wave-4 COME-HERE respondents who reported working at home and working not at home for each month in February 2020 through November 2020. The omitted category is those who were not working

4.3.1 Life satisfaction and Life worthwhile

These come from two similarly-phrased questions: *Overall, in the past week, how satisfied have you been with your life? and in the past week, to what extent have you felt the things you are doing in your life are worthwhile?* Both are answered on a 11-point scale from 0 to 10, where 0 is labelled as "Not at all" and 10 "Completely".

4.3.2 Loneliness

This is measured by the reduced eight-item version of the UCLA Loneliness Scale (ULS-8: Hays and DiMatteo, 1987). The items are, over the last two weeks, *1) How often do you feel that you lack companionship? 2) How often do you feel that there is no one you can turn to? 3) How often do you feel outgoing and friendly? 4) How often do you feel left out? 5) How often do you feel isolated from others? 6) How often do you feel you can find companionship when you want it? 7) How often do you feel shy? 8) How often do you feel that people are around you but not with you?*

Each of these eight questions is answered on a one-to-four scale of Never, Rarely, Sometimes and Often. The sum of these answers produces a figure between 8 and 32, which we invert so that higher scores refer to greater well-being (less loneliness).

4.3.3 Depression

We measure depression via the nine-item Patient Health Questionnaire (PHQ-9: Löwe *et al.*,

2004), which is widely used to assess mental disorders. Respondents state how often over the last two weeks they have been bothered by the following problems: *1) Little interest or pleasure in doing things. 2) Feeling down, depressed or hopeless. 3) Trouble falling or staying asleep or sleeping too much. 4) Feeling tired or having little energy. 5) Poor appetite or overeating. 6) Feeling bad about yourself, or that you are a failure or have let yourself or your family down. 7) Trouble concentrating on things, such as reading the newspaper or watching television. 8) Moving or speaking so slowly that other people could have noticed? Or the opposite– being so fidgety or restless that you have been moving around a lot more than usual. 9) Thoughts that you would be better off dead or of hurting yourself in some way*. The replies are on a 0–3 scale: Not at all, Several days, More than half of the days and Nearly every day. The sum of the answers produces a scale from 0 to 27, which we again reverse so that higher scores refer to greater well-being.

4.3.4 Anxiety

The Generalized Anxiety Disorder seven-item (GAD-7) Scale (Spitzer *et al.*, 2006) contains seven questions regarding the incidence of problems over the last two weeks: *1) Feeling nervous, anxious or on edge. 2) Not being able to stop or control worrying. 3) Worrying too much about different things. 4) Trouble relaxing. 5) Being so restless that it is hard to sit still. 6) Becoming easily annoyed or irritable. 7) Feeling afraid as if something awful might happen.* The responses are on the same scale as those for the PHQ-9 above, producing an overall anxiety score of 0–21; this is again reverse-coded.

We include an array of control variables. The demographic information consists of age in three groups (we retain working-age respondents only and split the sample 18–29, 30–49 and 50–64) and dummy variables for male and living with a partner. Education is coded into three mutually- exclusive categories: up to age 16, up to age 18 or a non-degree post-high school qualification and a Bachelor degree or higher.

Last, household disposable income at the time of the survey is recorded in the following bands: “0 to 1,250 euros”, “1,250 to 2,000 euros”, “2,000 to 4,000 euros”, “4,000 to 6,000 euros”, “6,000 to 8,000 euros” and “Over 8,000 euros”. As this latter is measured in bands, we take the mid-point in Euros and in PPP (using 2019 Euros for household final consumption expenditures as the reference). We attribute a value of 11,090 euros to the open-ended top income category: this value produces the best fit for our survey data to the information produced by Eurostat in 2019 on the income distribution in January 2020. Income will be entered in logarithmic form.

The household characteristics include a series of dummies for the presence of children aged between 0 and 3, 4 and 12, and 13 and 18, as well as the presence of a partner. Regarding housing, we know whether the accommodation has a balcony, a terrace, a rooftop, a large

garden, a small garden or a park. We combine this information into two dummies, having a garden or a park and having a balcony, rooftop or terrace. We equally consider the number of rooms per person in the house (excluding children under 4), taking on three values "less than one", "one" and "more than one". Residential urbanisation is measured as under 10,000 inhabitants, 10,000–50,000 inhabitants and over 50,000 inhabitants.

We last include the stringency index from Our World in Data (2020), which picks up the government-policy response to the COVID-19 crisis. This is available daily from January 2020 to December 2020 for 192 countries across the world and takes on values from 0 to 100, with higher values indicating greater stringency in restrictions. We match the stringency index to individual responses at the country and day-of-response level. We divide the index by 100 in order to see the estimated regression coefficients more clearly: in our sample of countries and months this stringency index ranges from 0.44 to 0.94. Stringency changed during 2020: the sample mean stringency index was 0.83 during the first wave in May, fell to 0.60 in June and 0.55 in August, and then rose again to 0.72 between November and December. We control for stringency in order to isolate the effect of working at home independently of other mobility restrictions.

The descriptive statistics of all of the variables described above appear in Appendix Table A4.1. Note that age, sex, education, household and housing characteristics and country of residence are only asked in Wave 1 and therefore are not considered to change over the seven months that we analyse here. Average purchasing power parity (PPP) monthly disposable household income is around 3,300 euros. A little over half of the observations come from men. We will present two broad specifications in terms of the control variables. The first will look at well-being and working controlling only for variables that we consider as exogenous over the seven months of our panel data: stringency, age, sex and education (as well as country and wave dummies): this reveals the overall average relationship between working from home and our measures of subjective well- being. The second extended set of controls includes variables that may well mediate the relationship between working from home and well-being: income, household composition and housing characteristics and will also address moderation (whereby working from home affects some groups more than others). As we wish to consider here the relationship between working from home and subjective well-being, we restrict our sample to individuals who were of working age (18–64) and in work at Wave 1 and who are not students. Last, we exclude the few respondents who say that they live with more than six children.

4.4 Working from home and well-being

We present our results on the correlation between well-being and working from home in a number of blocks. The first, as noted above, uses a minimal set of exogenous controls, and the second a broader set in order to investigate mediation and moderation (for example, mediation

via household income and moderation by age). We also show both pooled cross-section and panel results: standard errors in all analyses are clustered at the individual level. All estimations are linear, and all of the subjective well-being dependent variables have been standardised, so that the effect sizes from the estimated coefficients should be read in terms of percentages of a well-being standard deviation.

4.4.1 Baseline results

The simplest specification is set out in Equation (1), relating the subjective well-being of individual *i* at time *t* (*i.e.* in one of the four survey waves)), SWBit,, to dummies for working at home, WHit, and not working, NWit ,, and the other controls: the stringency index SIit of the respondent's country the day the individual filled out the survey questionnaire, and Xi a set of exogenous characteristics that do not change over time. Last, Tt is the survey wave fixed effect and Ci is the country fixed effect.

$$SWB\text{it} = \beta 0 + \beta 1 WH\text{it} + \beta 2 NW\text{it} + \beta 3 SI\text{it} + \beta 4 X\text{i} + \beta 5 T\text{t} + \beta 6 C\text{i} + \epsilon\text{it}. \qquad (1)$$

The pooled cross-section results from this estimation appear in Table 4.1. Compared to those who work but not at home (the omitted category), working from home is associated with lower well- being of around 0.1 of a standard deviation in all five of the columns. Well-being is even lower for those who do not work at all, with the gap between not working and working at home being significant for life satisfaction and worthwhile in the first two columns. The stringency index itself, conditional on these two working variables, also attracts negative coefficients (which are significant in three out of the five columns). The estimated coefficient in the life-satisfaction regression implies that a one standard deviation rise in stringency (of 0.14, from Appendix Table A4.1) reduces life satisfaction by around 0.05 of a standard deviation. There are two, not necessarily conflicting, ways of reading this negative correlation. The first is that stringency itself, via its restrictions on activity and human interaction, has caused a drop in well-being; the second is that stringency is reflecting the severity of the course of the pandemic, which is responsible for the evolution of well-being in our data.

Table 4.1 Working from home and well-being. Baseline specification.

	Life satisfaction	Worthwhile	Not lonely	Not depressed	Not anxious
At home	-0.09***	-0.07**	-0.08**	-0.09***	-0.09***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Not working	-0.22***	-0.20***	-0.13***	-0.14***	-0.12***
	(0.05)	(0.05)	(0.04)	(0.05)	(0.04)
Stringency Index	-0.31***	-0.21*	-0.19*	-0.03	-0.08
	(0.11)	(0.11)	(0.10)	(0.10)	(0.10)
30-49 years old	0.04	0.17***	0.29***	0.36***	0.28***
	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
50-64 years old	0.10**	0.33***	0.51***	0.61***	0.51***
	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)

Male	0.09***	0.03	0.08**	0.16***	0.20***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Upper Secondary/Vocational	0.03	0.03	0.14**	0.17***	0.14***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Bachelor degree or more	0.04	0.07	0.21***	0.18***	0.15***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Germany	0.18***	0.03	-0.01	0.07	0.07
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Italy	-0.05	0.07	-0.24***	-0.25***	-0.34***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Spain	0.05	-0.02	0.06	-0.15***	-0.18***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Sweden	-0.05	-0.18***	0.02	0.03	0.08
	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)
June	0.08**	-0.05	0.07**	0.03	0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
August	0.17***	-0.04	0.04	0.08**	0.12***
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
November	0.03	-0.10***	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.03	-0.04	-0.35***	-0.53***	-0.41***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
Observations	9713	9713	9713	9713	9713
Adjusted R^2	0.027	0.018	0.049	0.069	0.079

Note(s): These are OLS regressions on four waves of COME-HERE data. Standard errors clustered at the individual level are in parentheses. *p < 0.1, **p < 0.05 and ***p < 0.01.

The other control variables in this basic cross-section analysis indicate that well-being is higher for men, older respondents and the better-educated. Relative to France (the omitted country), lower well-being is often found in Italy and (to an extent) Spain. Last, relative to Wave 1 (May), well- being was notably higher during August in Wave 3.

We next turn to the panel analysis, in which an individual fixed effect is introduced into Equation (1). This specification relates changes in the right-hand side variables over time to changes in subjective well-being. In our case, the estimated coefficients on working at home and not working reflect the experience of individuals who change working category over the seven months of our panel survey. Table 4.2 shows the transition matrix in our sample between the three working statuses, relating the status at wave *t* to that at wave *t+1*. The most-common experience for those who are working is immobility from one wave to the next, as shown in the diagonal cells. This in particular applies to over 70% of those working at home and over 80% of those working not at home. However, there is a certain amount of mobility in the off-diagonal cells, and it is this variability that is used in the panel regressions. And it is notable that the dominant transition for those not working is to be back in work outside of the home at the next wave: recall that our sample consists only those who were in work at Wave 1, so that this transition likely reflects the end of furlough.

The panel results in Table 4.3 tell a somewhat different story to the cross-section results in Table 4.1. The estimated coefficients on not working continue to be negative, but are not here significant. This may reflect relatively few workers losing their jobs over this period with the furlough programmes that were in force (from Table 4.2, only 3.7% of those working from home switched to not working, with an analogous figure of 3.9% for those working not at home). However, switching to working from home reduces anxiety but also the sense of a worthwhile life. Stringency continues to be negatively significantly correlated with life satisfaction and a worthwhile life, with estimated coefficients that are somewhat attenuated from those in the cross-section regressions. Last, well- being is again higher in August (note that the country dummies are absorbed into the individual fixed effects in the panel regressions).

Table 4.2 Transition matrix of working from home in our sample.

t/t+1	At home	Not working	Not at home	***Total***
At home	*72.2%*	3.7%	24.2%	***1767***
Not working	13.4%	*30.9%*	55.7%	***544***
Not at home	8.9%	3.9%	*87.4%*	***3805***
Total	***1683***	***378***	***4 055***	***6 116***

Table 4.3 Working from home and well-being. Baseline panel specification.

	Life satisfaction	Worthwhile	Not lonely	Not depressed	Not anxious
At home	-0.03	-0.07**	0.03	0.03	0.05*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Not working	-0.02	-0.05	-0.05	-0.02	-0.02
	(0.04)	(0.04)	(0.03)	(0.03)	(0.04)
Stringency Index	-0.20**	-0.17*	-0.12	0.01	-0.00
	(0.10)	(0.10)	(0.09)	(0.09)	(0.09)
June	0.13***	-0.02	0.08***	0.06**	0.05
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
August	0.21***	-0.03	0.08**	0.11***	0.16***
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)
November	0.05**	-0.09***	0.03	0.03	0.04*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.06	0.18**	0.04	-0.06	-0.07
	(0.08)	(0.09)	(0.07)	(0.08)	(0.08)
Observations	9713	9713	9713	9713	9713
Overall R2	0.013	0.003	0.003	0.001	0.002

Note(s): These are linear panel regressions using four waves of COME-HERE data. Standard errors clustered at the individual level are in parentheses. *p < 0.1, **p < 0.05 and ***p < 0.01.

The comparison of the cross-section and panel results could therefore reflect some kind of selection into working from home. Those who are more anxious, depressed etc. would prefer to work from home if possible all the time: as such, we do not observe them changing work status between May and November. A second possibility is adaptation, in that the movement

from work at the office to home relieves anxiety around the time it takes place, but this effect vanishes and indeed switches sign, over time, producing an average positive correlation between working at home and anxiety in the cross-section. In their analysis of Google Trends data, Brodeur *et al.* (2021a) find evidence of mean-reversion in the effect of lockdowns on a number of measures of well-being in Europe and the US. Equally, in Fancourt *et al.* (2020) depression and anxiety levels gradually dropped off in the weeks following the introduction of lockdown in the UK.

4.4.2 Mediation

We now move to the extended set of control variables in Table 4.4. We rely on mediator theory to understand whether our results are driven by factors that are caused by our key explanatory variable, working from home and themselves influence well-being. For example, part of the negative correlation between working from home and life satisfaction could flow via lower income or family living arrangements. The part that goes through these third variables is called a mediator effect (Wu and Zumbo, 2008).

The data reveal almost no evidence of mediation of the working-status variables via income (nor via household characteristics): the estimated coefficients on the working-status variables are almost identical in Tables 4.1 and 4.4. The furlough programme that was applied in all of our sample countries guaranteed a significant part of earnings for those who stopped working (so that the well- being effect of the latter is largely independent of income). Equally, the income of those who switched from work at home to/from not at home was likely only little affected by this shift in the workplace. We should also underline here that we only have information on the household and housing variables in Wave 1, so these can only mediate working from home that started before the date of the Wave-1 interview in early May. The same conclusion applies to the stringency index, the estimated coefficients on which are very similar in Tables 4.1 and 4.4. Overall, we find no mediation for working at home or stringency, with all of the estimated coefficients continuing to be negative and with a significance pattern that is unchanged from that in Table 4.1.

It is worth noting that the introduction of housing and income does somewhat attenuate the estimated (positive) coefficients on education, as might be expected: part of the well-being return to education works via higher income and wealth (as reflected in housing). In terms of the country dummies, those on Italy and Spain in Table 4.5 are a little less negative than those in Table 4.1, suggesting that income, housing, family etc. (as compared to France) are partly behind the lower well-being in these two countries. There is no change in the wave dummies. The significant coefficients on the extended control variables reveal that living with a partner consistently attracts a positive estimated coefficient (and very notably so for loneliness); on the contrary, children are associated with greater levels of depression and anxiety (a not unusual

empirical finding: see Blanchflower and Clark, 2021, for a recent contribution). Log income is positive and significant in all of our well-being regressions, with an estimated coefficient that is fairly consistent at around 0.15 (so that doubling monthly income increases well-being by around 0.1 of a standard deviation). The somewhat larger coefficient on life satisfaction than on the "affect" variables of depression and anxiety is consistent with the US findings in Kahneman and Deaton (2010).

Table 4.4 Working from home and well-being. Extended specification.

	Life satisfaction	Worthwhile	Not lonely	Not depressed	Not anxious
At home	-0.10***	-0.08***	-0.08**	-0.08**	-0.08**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Not working	-0.18***	-0.16***	-0.11**	-0.12**	-0.10**
	(0.05)	(0.05)	(0.04)	(0.05)	(0.04)
Stringency Index	-0.32***	-0.21*	-0.20**	-0.04	-0.08
	(0.11)	(0.11)	(0.10)	(0.10)	(0.10)
30-49 years old	-0.02	0.11**	0.22***	0.37***	0.30***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
50-64 years old	0.05	0.27***	0.39***	0.52***	0.44***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
Male	0.06*	-0.00	0.05	0.14***	0.19***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Upper Secondary/Vocational	-0.01	-0.01	0.10*	0.14***	0.12**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Bachelor degree or more	-0.06	-0.03	0.14***	0.14***	0.12**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Log monthly income	0.21***	0.18***	0.12***	0.12***	0.10***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Living with a partner	0.04	0.07*	0.25***	0.06*	0.01
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Having children between 0-3	0.08	0.09**	-0.07	-0.15**	-0.16***
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)
Having children between 4-12	0.02	0.04	-0.10**	-0.14***	-0.14***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Having children between 13-18	0.01	0.06	0.00	-0.13***	-0.12***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
One room per person	0.16**	0.19**	0.16*	0.14	0.09
	(0.08)	(0.07)	(0.08)	(0.09)	(0.08)
More than 1 room per person	0.19***	0.26***	0.31***	0.32***	0.27***
	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)
Garden or park	0.11***	0.08**	-0.01	-0.03	-0.03
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
Balcony, rooftop or terrace	0.06	0.10**	0.05	-0.02	-0.02
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
10000-50000 inhabitants	-0.08*	-0.07	-0.07	-0.13***	-0.11**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Over 50000 inhabitants	-0.01	0.02	-0.04	-0.16***	-0.14***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Germany	0.16***	0.01	-0.02	0.07	0.06
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)

Italy	0.01	0.11**	-0.20***	-0.17***	-0.27***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Spain	0.14***	0.05	0.13**	-0.04	-0.09*
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Sweden	-0.02	-0.16***	0.06	0.08	0.11*
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
June	0.09***	-0.04	0.08***	0.04	0.03
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
August	0.19***	-0.03	0.05	0.09**	0.13***
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
November	0.03	-0.10***	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	-1.78***	-1.75***	-1.53***	-1.54***	-1.24***
	(0.23)	(0.23)	(0.23)	(0.24)	(0.23)
Observations	9713	9713	9713	9713	9713
Adjusted R^2	0.056	0.048	0.078	0.097	0.102

Note(s): These are OLS regressions using four waves of COME-HERE data. Standard errors clustered at the individual level are in parentheses. *p < 0.1, **p < 0.05 and ***p < 0.01.

Table 4.5 Working from home and well-being. Extended panel specification.

	Life satisfaction	Worthwhile	Not lonely	Not depressed	Not anxious
At home	-0.03	-0.07**	0.03	0.03	0.05*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Not working	-0.02	-0.05	-0.05	-0.03	-0.02
	(0.04)	(0.04)	(0.03)	(0.03)	(0.04)
Stringency Index	-0.20**	-0.17*	-0.12	0.01	-0.00
	(0.10)	(0.10)	(0.09)	(0.09)	(0.09)
Log monthly income	0.07**	0.01	-0.00	0.04	0.01
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
June	0.13***	-0.02	0.08***	0.07**	0.05
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
August	0.21***	-0.03	0.08**	0.12***	0.16***
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)
November	0.05**	-0.09***	0.03	0.03	0.04*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	-0.51**	0.08	0.05	-0.38*	-0.15
	(0.26)	(0.27)	(0.20)	(0.23)	(0.22)
Observations	9713	9713	9713	9713	9713
Overall R2	0.029	0.006	0.003	0.007	0.003

Note(s): These are linear panel regressions using four waves of COME-HERE data. Standard errors clustered at the individual level are in parentheses. *p < 0.1, **p < 0.05 and ***p < 0.01.

The log income coefficient for life satisfaction, 0.21 in column 1 of Table 4.4, is almost exactly equal to the average of those estimated in four major social science datasets in Table 2.2 of Clark *et al.* (2018). Regarding housing, rooms per person attracts a large positive coefficient, and housing amenities are associated with higher life satisfaction and worthwhile life. Last, more urban areas are often associated with lower well-being (and particularly so for depression and anxiety). This is a common finding in the subjective well-being literature: see Piper (2015), for example.

The panel "extended" well-being regressions appear in Table 4.5; compared to Table 4.3, the only additional control is the log of monthly income. As in the cross-section analysis, controlling for income makes barely any difference to the estimated coefficients on working at home and stringency. The estimated panel coefficient on income is always positive, but only significantly so for life satisfaction; it is also smaller in size than that in the cross-section regression in Table 4.4, which is often the case in the literature (reflecting either attenuation due to measurement error in panel data or an omitted variable that is correlated with both income and well-being: see Chapter 2 of Clark *et al.*, 2018).

4.4.3 Moderation

We last consider the question of the moderation of the main effects of working at home and not working described above. Baron and Kenny (1986, p. 1,174) define a moderator as "a qualitative (e.g. sex, race, class) or quantitative (e.g. level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable". The moderation effect is commonly known as the interaction effect (Wu and Zumbo, 2008). In words, we wish to see whether the relationship between working from home and subjective well-being is weaker or stronger for certain groups of people. Oakman *et al.* (2020), for example, highlight that studies on the relationship between mental health and working at home should be considered in light of the (home) working environment.

The results for the cross-section specification appear in Table 4.6. There is only little evidence that some of the variables we have introduced moderate the relationship between working at home and well-being. Despite the expectation of gender differences, in particular with respect to housework and childcare during the pandemic (see, for example, Cheng *et al.*, 2021; Cotofan *et al.*, 2021), we do not find that men's and women's well-being reacts any differently to working at home. There is equally no difference by level of education. It is however notable that older workers tend to do worse when working at home, particularly so for life satisfaction and loneliness. Last, considering loneliness, depression and anxiety, those who are not working in Italy and Spain fare better than their counterparts in France (the omitted category).

Table 4.7 then shows the equivalent moderation analysis for the panel specification. While we cannot include a main effect for gender, say, in panel regressions, we can ask whether the well-being of men and women changes in the same way as they move to working at home or go back to the office. The results are to an extent consistent with those in Table 4.6. Older workers notably experience sharper falls in life satisfaction as they move to working at home (and greater rises when they go back to the office). There is again little consistent evidence that the relationship between home working and well-being is moderated by sex. Last, working at

home to an extent produces greater falls in well-being for the better-educated.

We can carry out the same analyses for the extended specifications that appeared in Tables 4.4 and 4.5. We do not show these here, for space reasons (they are available on request). Broadly, workers with young children dislike working at home more, while on the contrary workers living in more urban areas and those in more spacious accommodation (with more rooms per person) do better. Last, there are no significant interactions with either having a partner or household income.

Table 4.6 Working from home and well-being. Moderation in the baseline specification.

	Life satisfaction	Worthwhile	Not lonely	Not depressed	Not anxious
At home	0.08	-0.03	-0.09	-0.03	0.11
	(0.15)	(0.14)	(0.15)	(0.14)	(0.14)
Not working	-0.39**	-0.48**	-0.35**	-0.39**	-0.26
	(0.19)	(0.19)	(0.16)	(0.18)	(0.17)
Stringency Index	-0.34***	-0.21*	-0.20*	-0.06	-0.11
	(0.11)	(0.11)	(0.10)	(0.10)	(0.10)
30-49 years old	0.05	0.16***	0.31***	0.40***	0.32***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
50-64 years old	0.17***	0.37***	0.56***	0.64***	0.55***
	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)
Male	0.08**	0.02	0.08**	0.17***	0.22***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Upper Secondary/Vocational	0.02	0.01	0.08	0.13**	0.14**
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Bachelor degree or more	0.06	0.09	0.22***	0.17***	0.16***
	(0.06)	(0.05)	(0.06)	(0.06)	(0.06)
30-49 years old # At home	-0.11	0.02	-0.09	-0.09	-0.12
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
30-49 years old # Not working	0.15	0.03	0.05	-0.03	-0.06
	(0.13)	(0.13)	(0.11)	(0.13)	(0.12)
50-64 years old # At home	-0.27***	-0.16	-0.22**	-0.12	-0.13
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
50-64 years old # Not working	0.08	0.04	0.12	0.06	0.06
	(0.14)	(0.15)	(0.13)	(0.14)	(0.13)
Male # At home	0.05	0.03	-0.01	-0.04	-0.04
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Male # Not working	0.01	0.08	-0.02	0.03	-0.01
	(0.10)	(0.10)	(0.09)	(0.09)	(0.09)
Upper Secondary/Vocational # At home	-0.05	-0.03	0.25*	0.09	-0.02
	(0.13)	(0.12)	(0.13)	(0.13)	(0.13)
Upper Secondary/Vocational # Not working	0.09	0.21	0.02	0.17	0.04
	(0.16)	(0.16)	(0.12)	(0.14)	(0.12)
Bachelor degree or more # At home	-0.15	-0.13	0.03	0.01	-0.07
	(0.13)	(0.12)	(0.13)	(0.12)	(0.12)

Bachelor degree or more # Not working	0.12	0.20	0.03	0.10	0.06
	(0.15)	(0.15)	(0.12)	(0.14)	(0.13)
Germany	0.18***	0.04	-0.01	0.06	0.09
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Italy	-0.08	0.03	-0.28***	-0.28***	-0.36***
	(0.06)	(0.05)	(0.06)	(0.06)	(0.06)
Spain	0.03	-0.06	-0.02	-0.19***	-0.23***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
Sweden	-0.06	-0.23***	0.02	0.03	0.08
	(0.08)	(0.07)	(0.08)	(0.07)	(0.07)
Germany # At home	0.01	-0.01	-0.04	0.01	-0.08
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Germany # Not working	-0.23	-0.09	0.10	-0.05	-0.07
	(0.21)	(0.23)	(0.15)	(0.18)	(0.16)
Italy # At home	0.15*	0.12	0.04	0.03	-0.01
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Italy # Not working	-0.11	0.09	0.25**	0.21*	0.21*
	(0.12)	(0.12)	(0.11)	(0.12)	(0.12)
Spain # At home	0.08	0.12	0.19**	0.06	0.05
	(0.09)	(0.09)	(0.10)	(0.09)	(0.09)
Spain # Not working	0.05	0.13	0.21*	0.32***	0.30***
	(0.12)	(0.13)	(0.12)	(0.12)	(0.11)
Sweden # At home	0.02	0.19	-0.09	-0.06	-0.07
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
Sweden # Not working	0.17	0.09	0.25	0.09	0.01
	(0.24)	(0.22)	(0.23)	(0.18)	(0.18)
June	0.07**	-0.06	0.07**	0.02	0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
August	0.16***	-0.04	0.04	0.07*	0.11***
	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)
November	0.03	-0.10***	0.02	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.03	-0.01	-0.34***	-0.51***	-0.42***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Observations	9713	9713	9713	9713	9713
Adjusted R^2	0.029	0.020	0.053	0.070	0.079

Note(s): These are OLS regressions using four waves of COME-HERE data. Standard errors clustered at the individual level are in parentheses. *p < 0.1, **p < 0.05 and ***p < 0.01.

Table 4.7 Working from home and well-being. Moderation in the baseline panel specification.

	Life satisfaction	Worthwhile	Not lonely	Not depressed	Not anxious
At home	0.27*	0.13	-0.12	0.16	0.15
	(0.14)	(0.13)	(0.12)	(0.13)	(0.14)
Not working	-0.12	-0.42***	-0.04	-0.09	-0.02
	(0.16)	(0.16)	(0.14)	(0.16)	(0.17)
Stringency Index	-0.24**	-0.22**	-0.11	-0.02	-0.01
	(0.10)	(0.11)	(0.09)	(0.09)	(0.09)
30-49 years old # At home	-0.20*	-0.11	0.13*	-0.00	-0.02
	(0.11)	(0.10)	(0.08)	(0.08)	(0.08)

30-49 years old # Not working	0.20*	0.17	-0.06	0.01	-0.06
	(0.12)	(0.13)	(0.10)	(0.11)	(0.11)
50-64 years old # At home	-0.32***	-0.13	0.05	0.04	0.04
	(0.12)	(0.11)	(0.08)	(0.09)	(0.09)
50-64 years old # Not working	0.20	0.21	-0.01	0.04	0.05
	(0.13)	(0.14)	(0.10)	(0.11)	(0.11)
Male # At home	0.06	0.03	0.05	-0.02	-0.03
	(0.06)	(0.05)	(0.05)	(0.05)	(0.06)
Male # Not working	-0.01	0.03	-0.04	-0.05	-0.11
	(0.08)	(0.08)	(0.06)	(0.07)	(0.07)
Upper Secondary/Vocational # At home	-0.16	-0.21**	0.02	-0.20	-0.13
	(0.12)	(0.10)	(0.12)	(0.12)	(0.13)
Upper Secondary/Vocational # Not working	-0.08	0.13	0.04	0.05	0.01
	(0.12)	(0.12)	(0.10)	(0.12)	(0.12)
Bachelor degree or more # At home	-0.12	-0.16*	-0.02	-0.16	-0.11
	(0.11)	(0.09)	(0.11)	(0.12)	(0.13)
Bachelor degree or more # Not working	-0.13	0.09	-0.06	0.02	0.01
	(0.11)	(0.11)	(0.10)	(0.12)	(0.12)
Germany # At home	0.00	-0.02	-0.14*	0.03	0.04
	(0.09)	(0.09)	(0.07)	(0.09)	(0.08)
Germany # Not working	0.15	0.43***	-0.00	0.13	0.01
	(0.17)	(0.16)	(0.12)	(0.13)	(0.14)
Italy # At home	0.04	0.12	0.00	0.10	0.01
	(0.09)	(0.08)	(0.07)	(0.07)	(0.08)
Italy # Not working	-0.06	0.05	0.08	-0.06	-0.06
	(0.11)	(0.11)	(0.08)	(0.09)	(0.09)
Spain # At home	-0.04	0.09	0.18***	0.01	0.06
	(0.08)	(0.07)	(0.07)	(0.08)	(0.08)
Spain # Not working	0.03	0.17	0.13	0.17*	0.25**
	(0.10)	(0.12)	(0.09)	(0.09)	(0.10)
Sweden # At home	-0.02	-0.08	0.11	-0.01	0.03
	(0.18)	(0.15)	(0.11)	(0.11)	(0.11)
Sweden # Not working	0.55**	0.49**	0.01	0.03	-0.05
	(0.22)	(0.23)	(0.17)	(0.12)	(0.18)
June	0.12***	-0.04	0.09***	0.05*	0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
August	0.20***	-0.04	0.08***	0.10***	0.16***
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
November	0.05**	-0.09***	0.04*	0.03	0.04*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.09	0.22**	0.03	-0.04	-0.07
	(0.09)	(0.09)	(0.07)	(0.08)	(0.08)
Observations	9713	9713	9713	9713	9713
Overall R2	0.011	0.001	0.005	0	0.002

Note(s): These are linear panel regressions using four waves of COME-HERE data. Standard errors clustered at the individual level are in parentheses. *p < 0.1, **p < 0.05 and ***p < 0.01.

4.5 Conclusions

We have here used four waves of European panel data collected regularly since Easter 2020 to consider the relationship between working from home, not working and five measures of subjective well-being. Our main broad result is that the working from home that has become so widespread during the COVID-19 pandemic is associated with lower levels of well-being in the cross-section analysis. However, the results in panel data (where we look only at people who switch status) are less clear on this front, with even a small fall in anxiety when moving to working from home. Harking back to our hypotheses in Section 2, we thus find little strong evidence of pent-up demand by employees for working from home.

The difference between the panel and the cross-section results here could reflect either adaptation over time or selection of certain types of individuals into working at home: if it is the latter, then the analysis of cross-section data will be misleading in terms of the effect of working at home on well-being. It should however be underlined that our panel analysis is not able to provide a complete picture, as a number of the survey respondents were already working from home in Wave 1 and continued to do so: we cannot observe the change in well- being for this group as they changed working status prior to the start of the survey.

We uncover a consistent negative correlation between well-being and stringency in both the cross- section and panel regressions. As such, the public-health measures to restrict social interactions have come at a cost to population well-being, which should be factored in to calculations of any future optimal lockdown policy (as in Layard *et al*., 2020). It is also worth underlining that not working is associated with lower well-being than both working at home and working away from home.

We find almost no evidence of mediation in these analysis via income or household variables. The furlough programmes in place have seemingly ensured that the lower well- being from not working has not transited via sharply lower income.

Not all workers have been equally affected by working from home. The associated well-being penalty is larger for the older, the better-educated, those with young children and those with more crowded housing. As such, lockdown and its associated policies have not only had an effect on the distribution of income but also that of well-being.

We last note that our analysis here is based on an ongoing survey. Lockdowns and their impact on people and their place of work will continue to evolve throughout 2021. Future waves of the panel data that we use here will allow us track the work and well-being of individuals as these changes unfold.

Our results, in combination with follow-up work on their persistence over time, contribute to the identification of the short- and long-term effects of social-distancing measures and

working from home on individual well-being. These numbers are essential inputs for the evaluation of the welfare consequences of the different policy responses to current and future public-health crises and for the focusing of resources on those who have suffered more from mobility restrictions.

There are a number of limitations related to data collection. First, we use unbalanced panel data, meaning that not all respondents are observed in all four waves. We have limited this problem here by using information from individuals who are observed at least twice (in Waves 1 and 4). Second, information on home working was collected retrospectively during Wave 4. This could potentially produce measurement error, as individuals may not remember exactly when their working status changed. This measurement error may attenuate the estimated coefficient on the working from home variable. However, posing this question retroactively may help the comparability of the working-status information over the four waves (as the individual is in the same frame of mind when providing the information). Last, we do not observe the transition into working from home for all those who currently do so and so cannot correlate their change in subjective well-being with the change in working arrangements. With restrictions being variously relaxed and reintroduced in our survey countries, it is likely that we will be able to appeal to more changes in working from home (and changes in well-being) in future survey waves.

In terms of practice, it is important to establish the longer-run effects of working from home on well-being. As argued by Barrero *et al.* (2021), working from home may be here to stay for a number of reasons, including perceptions of home working that have become more positive and little evidence of significant falls in productivity. These suggest that both workers and firms may have misperceived the benefits from home working. Barrero *et al.* (2021) note that US firms expect the number of days worked from home post-pandemic to triple relative to the pre-pandemic number. The shift on the worker side is even more striking, with the average desire to work from home being over two days per week; Taneja *et al.* (2021) find an almost identical figure for the UK. With the results from the (enforced) experience of working from home for both firms and workers, what seemed very unlikely in the past may become commonplace in the future.

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Appendix

Table A4.1 Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Life satisfaction	9713	6.28	2.12	0	10
Worthwhile	9713	6.71	2.21	0	10
Lack of loneliness	9713	23.47	5.17	8	32
Lack of depression	9713	20.23	6.30	0	27
Lack of anxiety	9713	15.03	5.30	0	21
Working (D)					
At home	9713	0.30			
Not working (D)	9713	0.07			
Not at home (D)	9713	0.62			
Stringency index	9713	0.69	0.14	0.44	0.94
Age (W1)	9713	43.53	10.88	18	64
Male (D; W1)	9713	0.52			
Education (D; W1)					
Primary/secondary O-level	9713	0.13			
Upper Secondary or Vocational	9713	0.35			
Bachelor degree or more	9713	0.52			
Log(monthly income)	9713	7.82	0.65	6.14	9.35
Living with partner (D; W1)	9713	0.64			
Children 0-3 (D; W1)	9713	0.10			
Children 4-12 (D; W1)	9713	0.27			
Children 13-18 (D; W1)	9713	0.22			
Garden or park (D; W1)	9713	0.49			
Balcony, terrace or rooftop (D; W1)	9713	0.82			
Less than one room pp (D, W1)	9713	0.06			
One room pp (D; W1)	9713	0.13			
More than 1 room pp (D; W1)	9713	0.81			
Population density (D; W1)					
Under 10000 inhabitants	9713	0.25			
10000-50000 inhabitants	9713	0.21			
Over 50000 inhabitants	9713	0.54			
Residence (W1)					
France	9713	0.24			
Germany	9713	0.21			
Italy	9713	0.21			
Spain	9713	0.23			
Sweden	9713	0.11			
Month					
May	9713	0.28			
June	9713	0.20			
August	9713	0.24			

November	9713	0.28

Note(s): D refers to a dummy variable and W1 to information collected at Wave 1 only.

Future Developments and Research

Future Developments and Research

The central chapters of this thesis represent a pilot study on the *Marie Thérèse cadastre* of 1766 for Luxembourg. The complete series of microfilms of the 1766 Luxembourgish Maria Theresa cadastre includes 28,000 declarations collected and digitalised in 99 microfilms by the National Archive of Luxembourg.

I have already collected four microfilms that refer only to Luxembourg City, four on the bigger judiciary district of Luxembourg and the declarations on the municipality of Dudelange.

The declarations have all the same structure; however, the monetary units used can be different. So far, I encountered declarations that are in écu, escalins, sols and deniers or in florins, sols and deniers. To make the declarations comparable, it is necessary to convert them to the same monetary unit. The data collection process will be the most time consuming part of the project, but having a database with declarations, profession of the declarants, gender, and different categories of land owned would be of great importance to investigate the inequality differences between the urban and rural areas. It is of value to collect information on the entire country also because people had to declare the land owned or used in the municipality where the land was. This means that if an individual had some land in Dudelange and some in the municipality of Esch-sur-Alzette, I would not have a complete picture of the land owned by each declarant unless I combine the declarations for Dudelange and Esch-sur-Alzette. In case the owner or user of the property was not resident in the municipality of the declaration, he or she had to fill in the declaration table anyway, meaning that I could measure the percentage of land owned by non-residents. The declarants could also be resident in other countries even if, according to the data already collected they are not many in percentage with respect to the total declarations.

If adequately exploited, the Maria Theresa cadastre is a source that will generate new knowledge on inequality in pre-industrial societies especially if we consider that the same law, at the origin of the Maria Theresa cadastre, was applied to the rest of the Austro-Hungarian reign.

The theresian cadastre of 1766 is available in other areas of Europe such as Milan and Wien. I had the possibility to explore the Italian *Marie-Thérèse cadastre* of Milan and I could realise that it had a different structure than the Luxembourgish one. In my future career, I would like to study the sources that are available for the rest of Europe to be able to compare inequality levels of these areas using the same official source.

Being able to create a comparative study on land inequality among different countries for a given year using the same source, would allow a better understanding of how much of the current level of inequality has been inherited from the past.

The first chapter shows that data on wealth inequality for the pre-industrial time are few and focuses very often on a city or a specific place that represents a country. My future research agenda would be helpful to create more knowledge based on new and systematic data for Luxembourg, a country not really involved in the pre-industrial inequality research literature, and that is today an economic and political centre for Europe. The land registries are an important source to be able to implement a social mobility analysis from the wealth and the occupational point of view.

I am currently working on a social mobility comparison in Luxembourg City and Dudelange in 1766-1842. This comparison would allow to isolate the effect of the abolishment of the feudal system since Luxembourg City was a free city contrary to Dudelange.

I am also analysing Dudelange from a demographic perspective looking at the effect of the industrialization and of the immigration flow on the population dynamics.

The fourth chapter emphasised the need to link the research about past inequality level to what we experience in current times. The Covid-19 pandemic highlighted a new and huge difference among the rich and the poor. Despite the demographic, economic, climate and epidemiologic shocks of the last years, the rich are accumulating even more wealth while in the past such shocks had a distributive effect. There is no doubt that societies today are different from those of the past, but individuals have the same basic needs that should be guaranteed no matter their position in the wealth distribution. The interconnection between past and present, that the long-term perspective research allows, is my goal for my future research agenda.

Co-author Statement

Chapter 1 - **Wealth inequality in the long run** – co-authored with Guido Alfani (Bocconi University). Guido Alfani is at the origin of the research question. I was in charge of the collection, cleaning and analysis of data, and I produced the outputs that are in the paper. Guido supported me in this process and I shared with him the writing and revision of the paper in the different steps.

Chapter 2 - **The distribution of land in Luxembourg (1766-1872): family-level wealth persistence in the midst of institutional change** – co-authored with Antoine Paccoud (LISER, LSE). I am at the origin of the research question. I did the archival research and the collection and interpretation of the data that I found for the land survey of the 1766. Antoine provided me the resources for collecting the data of 1842 and 1872 and made available to me some external help to collect some of the data. I am responsible for the design of the data collection, data cleaning and of the analysis and production of results. Antoine always supported me in these steps and provided a qualitative interpretation of the data. I wrote the first draft of the paper and I worked with Antoine on its revisions.

Chapter 3 - **Land distribution in pre-industrial Luxembourg: a comparison of urban and rural areas** – This is a single author project that represents a work in progress and the starting point of a more complete and complex project that I designed.

Chapter 4 - **Well-being and working from home during COVID-19,** co-authored with Andrew E. Clark (Paris School of Economics, CNRS), Samuel Greiff (University of Luxembourg), Claus Vögele (University of Luxembourg) and Conchita D'Ambrosio (University of Luxembourg). Conchita, Andrew, Claus and Samuel designed the research question, I was in charge of the data cleaning and analysis and the writing of the first draft of the paper. Andrew and Conchita constantly supported me in the data analysis, the interpretation of the results and in the revision and writing of the paper.

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