Three essays in economic history, institutional change and inequality

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Introduction

The thesis collects three papers on the economic history of different social and political organizations of western societies. The first two essays focus on the peculiar political and economic path of the late medieval independent commune of Siena, underlying its process of state formation and the consequences on its public finance. The third paper is about the economic performance of Scandinavian countries during the 20th century, with a comparison of these experiences with different contemporary and past societies.

In the first paper, the study of late medieval Siena focuses on the problem of state formation in western Europe. The subject, which has recently become object of several important contributions\(^1\), is here tackled with a case study that represents an unique experience in the political and economic development of late medieval Italian independent communes. These city-states, important industrial and commercial centers in the 12th-13th century Europe, were, in these decades, all ruled by consular governments largely formed by economic élites. In the years after the 1348 Black Death, a bubonic plague that dramatically struck almost all European regions, several popular governments briefly took control of these cities but, at the beginning of the 14th century, these were progressively substituted by oligarchic regimes and then by monarchies head by leading economic and military families\(^2\). Siena had a different political path. The city, which had shared with other italian communes the pre-plague consular phase, after the pestilence and a brief popular oligarchy, went through almost two centuries of coalitional governments where a progressively increasing part of population was represented. During this period, the commune did not lose its economic importance, expanded its territory and maintained its capacity to contrast external attacks and provide services to its citizens. This different political path raises, therefore, a question on why social groups in the city did cooperate instead of conflicting and what does this historical case suggest about factors affecting process of state formation. The paper is based on a peculiar approach on the problem introduced in Greif (2008), where the organization of society is interpreted as made-up of two distinct phases: the political one, in which decisions are taken, and the administrative phase, in which policies are implemented. The historical narrative of the city and the integration of it with a game-theory treatment of collective action taken from Bowles (2003), will show that the peculiar political path of Siena might be interpreted as the interaction between the exogenous demographic shock consequent to

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\(^2\)See for example the history of Renaissance Florence in Becker (1967).
the Black Death and the peculiar organizational response in the administrative function. The way in which the Tuscan city organized its implementation phase represents, therefore, the peculiar trait of the evolution of the commune that differentiated it from other Italian and European experiences.

Consequences of these administrative changes on state capacity, considered as the capability of the city to raise resources from the community and expend them\(^3\), is the subject of the second paper. There, with the use of a novel and unexplored fiscal dataset, the impact of external and internal changes on Sienese public finance are assessed. Many novel conclusions are shown. It is evaluated the actual impact of the Black Death on the capacity to raise and expend resources, the role played by other external shocks, such as mercenary attacks and, overall, the relevance of political and administrative changes on the total amount of resources raised and expended. Conclusions reveal the importance of administrative reforms on the capacity of a political organization to raise resources and use them.

The third paper drastically changes the object of study and, with a focus on the economic and social performance of 20th century Scandinavian countries, investigates on factors affecting wealth inequality in the course of human history. It relies on a large dataset of archeological, historical and ethnographic data on material, somatic and relational inequality\(^4\) and uses quantitative and analytical method to assess to what extent might nortic countries be considered exceptional in their degree of wealth distribution. The answer to the question shows that, rather than degree of material wealth or human capital inequality, what distinguishes Scandinavian countries from other historical experiences is their capability to reduce the importance of material wealth in the total well-being of citizens through two main means: the large flow of services which is indistinguishably granted to all individuals in society and the sensible reduction in the degree of inequality in wealth transmission.

In conclusion, the three papers, although being different in the objects studied and methods used, have in common the aim to understand the importance of political institutions and organizational changes on different economic aspects of human society. Very different historical experiences are studied and, however, they reveal similar problems across centuries: what goods and services should be produced and distributed in common, the reasons why are social entities tied together in political organization, how should resources commonly raised and used, and, overall, the equal or unequal distribution in the society of what is produced together. These are the main questions to which this thesis aims to give a contribution.

\(^3\)The subject, which has been recently treated in many relevant studied. See for example Stasavage (2011), Dincecco (2009a), Dincecco (2009b) and Dincecco and Katz (2012).

\(^4\)The work is part of a large project on the dynamics of wealth inequality developed at SantaFe Institute and made possible by the effort of several economist, anthropologist, archeologists and ethnographers. See also Borgerhoff-Mulder et al. (2009) and Fochesato and Bowles (2013b) for other results of this project.
There are many people who I have to warmly thank for their support, comments and help in the making of this dissertation.

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1 Administrative organization and state formation.  
Siena in the 14th century

Abstract

This paper investigates the institutional process that characterized political change and state capacity in the late medieval independent commune of Siena. After the mid-14th century demographic crisis, Italian city-states were either turning to oligarchic forms of power or they were losing independence under the pressure of external threats. Siena, instead, developed an institutional framework based on extended participation of social groups to administrative and political power. In the following two centuries the city remained independent and preserved its capacity to collect and use financial resources. Combining historical and theoretical analysis, the paper underlines the mechanisms through which reforms of administrative organization were selecting and supporting coalitional governments with high popular representation. The use of data from original registers will show that increased cooperation maintained the capacity of the commune to collect resources from the community and to provide public services to the city and the controlled territory.

Keywords: State Formation, State Capacity, Administration, Oligarchy, Coalition.
JEL Classification Numbers: D02, N43, P48.
1.1 Introduction

This paper investigates factors that caused the formation of modern political organizations, affected their capability to limit within-states conflict, to resist to external threats and to mobilize resources for the provision of public services.

The unit of analysis will be the history of late medieval Italian commune of Siena.

The choice relies on the emblematic political and economic trajectory of this city among the other northern and central Italian city-states. Since the beginning of the 12th century throughout all the first half of the 14th century, these urban centers knew a common political path. While experiencing great commercial and manufacturing expansion, they also became important independent political centers. City-states were headed by consular governments representing the leading economic sectors of the communities and developed sophisticated political and administrative organizations. A large urban and economic expansion was accompanied with an innovative way of organizing the political life of society\(^1\).

In 1348 almost all Italian city-states were dramatically affected by the *Black Death*, a bubonic plague that struck most of the European regions. The pestilence strongly reduced population of Italian urban centers and had relevant consequences on trade networks, agricultural production and manufacturing activities\(^2\).

After the shock, these cities followed one main political trajectory.

Many communes aggregated in large regional states lead by oligarchic governments. Most of the smaller independent urban centers, which had flourished in the previous centuries lost their independence and became peripheral parts of those regional states\(^3\).

The commune of Siena had a different fortune.

The city was lead by an oligarchy of merchants and bankers since the end of the 13th century and throughout all the first half of the following century. After the *Black Death*, and a following brief oligarchy of craftsmen, it preserved its independence until mid-16th century developing a coalitional form of political power where all the main social groups of the city were represented. Participation to political life was guaranteed to the largest part of population\(^4\).

\(^1\)A general study of Italian independent medieval urban centers is in Waley (1973). For an historical analysis of industrial and trade development of Italian communes in late Middle Age see Lopez (1976). See .Tabacco (1989) for a comprehensive analysis of their political changes. Among the many economic history analyses of medieval city-states see Long and Shleifer (1993), where links between political change, urban growth and economic expansion are analyzed. In Greif (1997) a theoretical analysis of the mechanisms underlining internal political change in the medieval Genoa are presented.

\(^2\)A full analysis of causes, effects and consequences of the bubonic plague on European society are in Aberth (2005) and Horrox (1994). In Del Panta (1980) a complete statistical analysis of the impact of *Black Death* on Italian demography is provided. In Voigtländer and Voth (2009) an analytical explanation of the long run effects of the 1348 bubonic disease on European growth has been provided.

\(^3\)After the mid-14th century crisis, cities as Venice and Florence extended their territorial domain conquering nearby independent communes, see Brucker (1962) and Becker (1967) for the history of Florence. Venice after the *Black Death* has been studied in Norwich (1982) and Lane (1973). Other large and small towns as Genoa, Pisa and Lucca, either lost their independence under the pressure of regional states or developed forms of political oligarchies, see Manselli (1986) and Epstein (1996).

\(^4\)A long run history of the medieval Siena is in Douglas (1902), Schevill (1964) and Fusai (1987).
What do we learn from the way in which the Tuscan city survived to its mid-14th century crisis and remained independent in the following two centuries? Why did social groups cooperate rather than conflict? What does this historical case show about the mechanisms through which a political organization emerges from a society?

The conjecture of this research is that, after the mid-14th century crisis, the city of Siena developed a modern form of organization of administrative functions which allowed the social groups of the city to cooperate in political power. This institutional change facilitated the maintenance of a low level of intra-state conflict and allowed to preserve state capacity required to resist external conflicts and continue to provide public services to the community.

This hypothesis introduces a novel explanation about state formation, the role of administration and its consequences on state capacity. In fact, recent approaches in social sciences to the process of formation of European modern political organizations, present characteristics that do not allow to fully comprehend the historical pattern of Siena.

In Acemoglu and Robinson (2000) as well as in more recent development of this approach\textsuperscript{5}, the role of franchise extension and its impact on economic inequality have been deeply analyzed in the political evolution of modern England. In addition, the history of British constitution and the extension of political rights, have been studied in North and Weingast (1989). Both the approaches, introducing mechanisms of credible commitment as the basis of state formation, have the characteristic to model political institutions as the rules of interactions between social groups determining certain political outcomes. In these models, one group extend part of its power to the others (or a fraction of them) with the objective to credibly commit to a less unequal distribution of rents from state activities. Institutional changes occur when \( \text{élites} \) consider threats of revolts of \( \text{non-élites} \) serious and potentially destroying their rents. Therefore, leading social classes change institutions in order to redistribute a part of rents with the objective to reduce the threat of revolts. In this framework, however, insurrections do not occur and institutions, interpreted as rules of the game, change as unilateral decisions of the \( \text{élites} \) to prevent social turmoils.

The history of Siena, instead, shows different factors affecting state formation. First, it introduces the importance of successful collective actions in changing the status quo. As it will be shown, during the second half of the 14th century several revolts, made both by the \( \text{élites} \) and \( \text{non-élites} \), occurred and substantially changed political equilibrium. Second, it reveals the importance of administrative organization as a fundamental component of the interaction between groups. For these reasons, the present research analyzes Siena adopting the approach in Greif (2008), where a fundamental distinction between political and administrative phases of social life organization is presented. The former identifies the set of interactions between social actors on public policies, goods and services to be undertaken in the interest of relevant groups in society. Administration, instead, entails all

\textsuperscript{5}See for example Lizzeri and Persico (2004).
the organizations, offices and individuals devoted to the actual implementation of political decisions\textsuperscript{6}.

The adoption of this point of view also distinguishes the present paper from recent economic, political and sociological analyses on this issue. In works as Kiser (1999) or Evans and Rauch (1999), administration is identified with the bureaucratic apparatus, formed by a social group distinguished by those participating to political representation and acting as an agent employed by the rulers who, in turns, are the principal. This approach does not allow to capture the historical pattern of Siena, where the same social groups were participating or excluded to both political and administrative phases.

Finally, this research also represents a novel hypothesis for the explanation of the political and economic decline of Italian city-states at the end of the Middle Age. The history of Siena shows a unique institutional pattern that can enlighten the reasons for different trajectories in states formation in late medieval Italy and Europe.

The paper combines historical and theoretical analysis to prove the fundamental conjecture.

Section 1.2 shows the oligarchic phase of the history of Siena: the regime of merchants and bankers (1287-1355) and the following brief experience of government of craftsmen (1355-1368). Interactions of social groups, the impact of the \textit{Black Death} on economy and society and the peculiar organizations and rules governing administrative and political functions are deeply described. In order to enlighten factors that allowed leading groups to maintain a strict control on the government of the city, section 1.3 provides an analytical model showing how political institutions reacted to exogenous changes during the first half of the 14th century. Section 1.4 presents the second phase of the history of Siena. Specifically, it shows changes occurred in administrative organizations, the long phase of cooperation in political power (1368-1480) and the final decline of the city with the lost of independence (1480-1555). Section 1.5 extends the analytical treatment of section 1.3 to show factors that determined the switch towards coalitional organization of power and eventually accounted for the institutional decline at the end of Siena independency. Section 3.8 concludes.

\subsection*{1.2 The oligarchic phase}

Since its foundation (12th century) until the end of the 13th century, the independent commune of Siena grew its economic prosperity around trade and banking activities. The lack of a river and other relevant natural resources caused underdevelopment in manufacturing industry, while the favorable position on the \textit{Francigena}, one of the main Medieval European route, made Sienese bankers the most important creditors of the Pope and fostered their trade expansion in northern Europe. During that period the city was head by a consular government composed by representatives of both the economic \textit{élites} of the city and popular

\textsuperscript{6}A first example of application of this method for the history of Venice has been provided in González de Lara et al. (2008).
factions, with a declared Ghibelline political orientation\textsuperscript{7}.

In 1260 Siena, together with the Imperial troops of King Manfred, defeated the Guelph League lead by the close city of Florence in the battle of Montaperti. The military success, while reinforcing the capacity of the city to control the southern Tuscan territories, also gave rise to a long conflict with the Pope, who would have interrupted his credit relationships with the city if they would have continued to contrast the Guelph League\textsuperscript{8}.

After more than 20 years of conflicts, Siena accepted papal conditions. The city would have excluded Ghibelline factions from government and joined the Guelph League. In addition, the need for internal stability lead social groups to design a government held by nine representatives of the sole families involved in trade and banking activities. Aristocracy, whose political participation had been always associated with continuous internal conflicts, would have not been directly represented. In 1287, merchants and bankers took full control of the city.

\subsection{The Regime of Nine (1287-1355)}

The new non-aristocratic élite was at the centre of any decision concerning political life of the city. The Nine governors were selected through a strictly regulated procedure guaranteeing continuity in their policies\textsuperscript{9} and exerted their power concentrating in their hands both political and administrative control. Their power regarded economic, fiscal and judicial issues.

Economic decisions pertained to both internal and external problems. Nine used to directly decide about prices and salaries in all the productive sectors in the city. In addition, they were regulating all trade relationships with other communes. The General Council, a consultive body including the aristocracy clans as well as members of merchant and trade sectors, had the task to link the activity of governors with families temporarily not represented in government\textsuperscript{10}. Members of other productive sectors had no participation in political bodies and were subjected to decisions taken by merchants and bankers. Only one economic organization, the Guild of Merchants, had the power to practically implement economic decisions. Once these were taken by governors, they were transmitted to the Guild, whose leaders determined times and methods of implementation. They also set and enforced sanctions towards all the members of any other productive sector not obeying to economic rules\textsuperscript{11}.

\textsuperscript{7} The foundation of the independent commune of Siena is conventionally dated in year 1125, when the bishop left the power to a secular government. For the early history of the commune and the consular period see Fusai (1987).

\textsuperscript{8} For a detailed description of the contrast with the Pope and the internal fights after the battle of Montaperti, see Martini (1961).

\textsuperscript{9} In order to guarantee continuity in the political representation, the governors, before terminating their mandate, used to name the group of citizens who could be elected for the following tenure. See Bowsky (1981).

\textsuperscript{10} See Bowsky (1981).

\textsuperscript{11} The role of the guild of merchants during the Regime of Nine is deeply analyzed in Bowsky (1981). For
Extraction of financial resources from the city and the controlled territories was concentrated in the hands of the Nine. When the commune needed money, usually the General Council gave the Nine the power to choose the way to raise it. Governors were completely autonomous in the decision of who had to pay and how to collect resources. Fiscal policies implementation, in turn, was left to two communal offices: the Biccherna and the General Gabella. The Biccherna had control of any revenue and expenditure of the commune. Although its officials could not decide how much to ask to the community or who had to pay, they were responsible for the successful collection of both direct taxation and penalties imposed by communal policies. In addition, they had the power to set and enforce sanctions for those delaying or missing tax payment. In case that governors decided to ask to the community to finance expenditures with voluntary loans, usually the officials of the Biccherna were responsible of selecting citizens able and willing to lend to the commune, who would have received a prompt repayment of both the principal and the interest. Every semester, the incoming new officials of the Biccherna had to guarantee with personal finances the correct functioning of the office. They used to pay the unsolved duties of the outstanding administration and receive, at the end of their mandate, the sum advanced. With this mechanism, only wealthy citizens could access to the head of the office. The General Gabella, instead, was devoted to the collection of indirect taxes (the so-called gabelle). The progressive rising importance of this source of revenue in the communal budget and the possibility to choose citizens who could farm single indirect taxes, increased the importance of administrators of the office. After the Nine had decided how much the commune would have obtained from an indirect tax, officials of the General Gabella could decide to whom to sell the right for the extraction of the imposition and how much to gain from it. During the first half of the century, only bankers were entitled with this right.

Merchants and bankers, therefore, had full control on fiscal policy decisions. Administration was held by members of the same social group and members from the aristocratic clans. This extension was in part due to the necessity to select officials with sufficient wealth to guarantee direct financing of public expenditure. In addition, the high gains that nobles could obtain from implementation, rewarded them from the exclusion from power.

The administration of judicial power was the only issue in which the Nine had to extend participation to other social groups. Norms regarding the solution of internal and external conflicts were formally administrated from the Podestá and the General Council.

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12 See Bowsky (1970).
13 The hypothesis that aristocratic clans accepted exclusion from power as a form of mutual deterrence which would have prevented any of the clans to prevail on the others is stated in Bowsky (1981). An example reinforces the validity of the thesis. In 1318 a rebellion of aristocratic clans and members of guilds excluded from power, motivated governors to advance in the General Council, the political assembly of the city, the proposal to extend political participation. Members of the most important clans renounced the opportunity in order to not reciprocally reinforce each other. The hypothesis of exclusion of main clans from direct political power as a form of mutual deterrence as also been treated in Greif (1997), where the solution for aristocratic contrasts in Genoa was, in this case, the creation of the Podestá.
14 As almost all the other main Italian city-states, since the beginning of the 13th century Siena had
In practice, power was held by the Nine. Implementation of such decisions, the execution of sentences and the practical regulation of every-day legal disputes among citizens were, instead, left to judges and notaries, a social group distinct from merchants and bankers. The wide diffusion of their intervention in the communal life progressively increased their importance and power. Nine limited it excluding them from political representation and appointing, in 1310, a constitution, with the objective to clarify relationships between rulers, administrators and citizens. It was deliberately written in vulgar, the language of merchants, with the aim to force judges and notaries to abandon latin as the field of disputes\textsuperscript{15}.

The described institutional equilibrium was based on the concentration of power, in both decisional and implementation phases, in the hands of the leading economic group of the city. Excluded wealthy groups, as the aristocratic clans, were rewarded through gains from financial administration. Members of other guilds as well as wage workers were not entitled of any political rights and accepted every decision taken by governors.

The political and administrative system had precise consequences in the economic, fiscal and judicial life of the city.

Every policy regulating prices and salaries, favored merchant and banking activities and confirmed their prominent position among all the economic sectors of the city. Foreign policies were addressed in order to foster Sienese trade. During almost all their government, the élites formed alliances with all surrounding city-states in order to protect merchants. As part of these relations, Siena often agreed to mutual suspension of reprisals against foreign merchants: at least 47 out of 70 years of Regime of Nine were characterized by trading deals with the close cities of Florence, Lucca, Arezzo and Perugia\textsuperscript{16}.

The organization of public finance guaranteed an high capacity for the city-state to provide public services to the society and to find the necessary resources to finance them. An efficient system of water provision was appointed in all the main areas of the city. Streets and fortifications were continuously renewed or repaired both in the urban and rural areas. Indigents of the city were weekly assisted with a communal distribution of alms and the financial support given to the Hospital of Santa Maria della Scala\textsuperscript{17}. The most important public service furnished by the city consisted in the defense of the territory. These expenditures were unpredictable and extremely demanding for communal budgets. During the Regime of Nine, Siena faced at least 12 years of military campaigns that forced the commune to require large amounts of resources to the city\textsuperscript{18}. The strict relationship between politics and the administration in public finances guaranteed a prompt response to the unexpected demand of resources. Governors relied mainly on revenues from voluntary loans

\textit{a} Podesta, a foreign magistrate for the administration of the political life of the city. Formally, he was guaranteeing impartiality in the disputes between different factions. Practically, its importance was overcame by government offices. See Bowsky (1981).

\textsuperscript{15}See Ascheri and Papi (2009).
\textsuperscript{16}The number of years of reprisals suspension are computed using information in Bowsky (1981).
\textsuperscript{17}For the increasing relevance of the Hospital in the city life see Sordini (2011) and Piccinni (2012).
\textsuperscript{18}The years of war are counted from Bowsky (1981) and Redon (1994).
(paid by wealthy groups and repaid with extended indirect taxation) and direct transfers from Biccherna officials.

Administration in public finances was coordinate with the governors decisions. When indirect taxes were increased, these were farmed to the wealthier citizens who, in change of a personal gain obtained through tax extraction, could pay to the commune the sum required in advance. When voluntary loans were required, administrators of the Biccherna, usually members of the aristocratic clans, used to select families who could give resources to the commune and get repaid for their financial and political support. As a result, leading groups largely financed state expenditure with their resources and obtained, in turns, large returns from policies implemented and from the financing itself. Lower social groups accepted their exclusion from politics and administration in change of a low contribution to Communal expenditures and the provision of public service. As a consequence, revolts during the first half of the century were rare.\textsuperscript{19}

The 1348 Black Death, dramatically affected social and political state of the city.

The bubonic plague arrived in Siena in May 1348 and struck the city during the following three months. The disease reduced population from almost 50,000 inhabitants to about 15,000 in the urban area.\textsuperscript{20}

Among the main economic consequences were food shortage and related increase in its price, the shut down of silver mines in the southern countryside and, above all, a striking decrease in labor supply. In the following months, workers reduction in the countryside was faced by special laws appointed to favor the employment at fixed salaries of farmers from outside Siena. In the city, instead, the decrease in the number of craftsmen, judges and notaries resulted in an increase of their contractual power.\textsuperscript{21}

These facts had severe consequences on the political equilibrium.

Control of merchants on economic administration was no more effective. Although governors tried to cap salaries of craftsmen in the city, the continuous threats of strikes vanished these attempts. The Guild of Merchant was no more capable to enforce economic rules and to effectively set wages and prices for all the other guilds.

The increasing power of judges and notaries reduced the Nines capacity to control their activity. In 1349, as a response to an imposed cap on salaries, they refused to work and the commune substituted them with members of religious orders. This solution failed and the Nine had to accept the salary conditions of the rebel category.

The plague had also a strong impact on public finances. Especially, the risen contractual power of previously excluded social classes increased their capability to finance the commune.

\textsuperscript{19}During the 1287-1348 period only two relevant revolts are reported. Both were made by a very limited part of excluded from power and were easily repressed by the Nine. See Bowsky (1981).

\textsuperscript{20}Numerical estimations of the demographic impact of the bubonic plague on the city of Siena has been provided in Bowsky (1964) and Piccinni (1995).

\textsuperscript{21}Prices of grain, wine and salt increased of 25%. The deterioration in labor relationships are reported from the contemporary chronicles. No numerical data are available. Detailed information on the measures to cap salaries are in Bowsky (1964).
and to demand, in change, a larger control and share of public services produced. As a result, élites lost their exclusiveness in financing alone city expenditures. In 1349, under the pressure of non-represented groups, the Nine had to revoke bankers’ monopoly in tax farming. Members of judicial administration explicitly accused officials of the Biccherna to favor those from the élites in debt repayment and to promote speculation on voluntary loans. These charges were renewed in the following two years. On July 1351, under the increasing pressures of internal protests, Nine were compelled to renounce to elect themselves or other members of merchants and bankers family to any financial office. With this act, the implementation of norms, rules and financial decisions were no more a prerogatives of those governing the city.  

Seven years after the Black Death, the Regime of Nine collapsed. While members of aristocratic clans had lost their privileges from public finances, emerging groups were claiming for more participation to both politics and administration. In March 1355, the alliance between these two social groups caused the end of the Regime of Nine.

1.2.2 The Regime of Twelve (1355-1368)

After a revolt, occurred in 1355, a new oligarchy composed by twelve citizens took full control of government. Members of families of merchants and bankers who had participated to the previous regime were excluded from power. Aristocratic clans, who took part in the 1355 revolt, accepted to be excluded from government in change of a strong participation in administration.  

Members of Twelve were representative of the new emerging economic sectors. In the Sienese productive system, guilds were grouped in twelve capitidini, organizations clustering arts operating in the same sector. Participation to the government during the 13 years of the new regime, was granted to all the capitidini. None of them had a percentage participation higher than 15%, the lowest one had 5%. On average, participation for each capitidine was around 8%.

Inside each capitidine, however, some guilds were represented more than the others. The most active one, clustering small retailers of goods, had a representation of 14.37%. Among them, food retailers participated for 88% of times, while the extant 12% was divided among sellers of fodder and iron. A similarly unequal internal distribution is found in the capitidine of lawyers, represented for the 11.83% of times in the government. In the category, notaries participation was of 90%, while judges and other functionaries had 10%. The third capitidine was the one grouping all the workers involved in wool production and had a 9.3% of participation. The 82% of this representativeness was reserved to wool producers, while dyers, tanners and other 10 guilds related to wool sector, divided among them the remaining

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22 The description of main economic, financial and political facts of the years following the Black Death are in Bowsky (1964, 1981).
23 For a complete analysis of the political transition from the Regime of Nine to the new government of Twelve, see Moscadelli (1982) and Wainwright (1983).
18%. Overall, among the 56 guilds active in the city of Siena, three of them (food retailers, notaries and woolworkers) concentrated about the 30% of political participation. The other 53 divided the extant 70% with an average of 1.1% for guild. 47 guilds were below 2% of representation and 11 guilds had never been represented.24

The Regime of Twelve, although considerably increasing participation to political power, was an oligarchy. Some guilds were clearly more represented than others and members’ election was regulated by a strict procedure.25

Organization and distribution of administrative power under the new oligarchy was different than under the government of merchants and bankers.

Economic decisions were still taken by governors who, as in the previous regime, were joined by the consultive work of the General Council. Norms and rules, instead, were implemented by a new office: the Twelve Priors of the Arts. Members of the office were representing each capitudine and had the power to implement decisions taken by governors. They were responsible to set prices and salaries in each sector and to implement norms and sanctions.26 As in the Regime of Nine, there was a wide coincidence between those who were deciding and those who were implementing economic policies. However, participation was increased and both political and administrative phases were now representing the interest of a greater part of the productive system.

Some relevant changes also occurred in judicial organization. Decisions were still taken by governors but members of the capitudine of lawyers were allowed to participate to politics and, even if the Constitution was the same, conflicts between law decision and law implementation were reduced. The implementation of justice was reoriented towards popular interests. The Captain of the People, an official already existing under the Nine when he was appointed for the formal defense of the interest of popular factions,27 acquired more power under the Twelve. He contributed with governors to decisions and had the power to implement and change any judicial action regarding members of the people.

Some changes also involved public finance administration. Decisions were still taken by governors and implementation was left to the Biccherna and the General Gabella. The main innovation consisted the creation of the office of Regolatori (the regulators).28 This administrative body was entitled to check the regularity of all financial operations of the Biccherna, the General Gabella and other communal offices. Regolatori responded to the need of the government to control the activity of fiscal administration. Members of aristocratic clans

24 Data used for the computation of guilds and capitudini participation to political life under the Twelve are in Wainwright (1983).
25 As the members of the Regime of Nine, the new governors were selecting, before leaving the mandate, the group of citizens among which the new representatives would have been chosen. See Moscadelli (1982).
26 Details on the functioning of the Twelve Priors of the Arts are in Wainwright (1983).
27 During the Regime of Nine the role of the Captain of the People was limited by the fact that he was a foreign individual nominated directly by governors. See Bowsky (1981).
28 The office was created in 1358 and was originally called the office of Riveditori (the revisors). In 1363 it was institutionalized, had an own internal regulation and was transformed in the office of Regolatori (the regulators). See also Catoni (1975).
Figure 1.1: **Communal revenues in the oligarchic phase.** "Real net income" represents the total income raised by the commune in each semester via current imposition while "Real transfer" is the amount of personal wealth transmitted in each period from the subsequent officials to equate revenues and expenditures. As shown in Ch.2, structural break analysis of real transfers reveals that the Black Death was a significant turning point in the evolution of this aggregate that dropped, in the 10 years after the plague, of 49% than its average value in the previous 10 years. The same analysis has also shown no effect of the Black Death on real net income while the beginning of the Regime of Twelve represented a significant break for the aggregate: the value increased on average of 94% than the value before. All aggregates are deflated for a CPI from Malanima (2002). Source: Ch.2.

were still strongly participating to public finances and, however, their autonomy was limited by this office.

Sienese public finance reacted positively to exogenous shocks and administrative changes. Alongside the constant provision of usual public services, such as the construction and maintenance of streets and city walls the government had to face continuous mercenary attacks devastating the countryside. As already observed, the 1348 Black Death had dramatically altered the internal distribution of wealth: financing the state activity in a way similar to the one of the Nine was no more possible. However, distribution of fiscal burdens did not limit the Sienese state capacity. Figure 1.1 summarizes these findings.

The end of the Regime of Twelve occurred in September 1368, when members of aristocratic clans revolted and instituted a new oligarchy. This new experience lasted only one

\[29\text{Since the end of the 1350s the city suffered almost every year of attacks from mercenary companies, see Caferro (1998).}\]

\[30\text{A deep description of political facts of the end of the Regime of Twelve is in Wainwright (1987) and}\]
month. At the beginning of October, an insurrection lead by popular factions excluded from previous government, took control of the city and gave birth to a coalition with members of families governing during the Regime of Nine and those of the Regime of Twelve. In December of the same year, popular factions tried to impose a new oligarchy with a government made of 15 representatives of their group. The experience ended almost immediately and a more stable coalition, including again merchants, bankers and members of the twelve was formed.

The oligarchic era was ended and a new political period would have characterized the city of Siena: the phase of political cooperation among social groups.

However, some questions arise from facts presented so far. How can be explained the impact of the bubonic plague on the unequal political equilibrium of the first half of the 14th century? Why lower social groups did start to revolt after the 1348? Why were their first governments unstable and characterized by counter-revolts?

Next section uses a game theory interaction to answer to the above questions.

1.3 Oligarchic equilibrium and revolts

The aim of this section is to analytically represent the interaction between social groups in the city of Siena in order to understand how an exogenous shock, the 1348 bubonic plague, might have induced part of the community to revolt against the previously accepted oligarchy without bringing to a persistent alternative political equilibrium. The general framework for this analysis will be a model for collective action presented in Bowles (2003), which is here adopted with a novel interpretation and no relevant formal change.

It is assumed that society was divided in two main social groups: élite and non-élite. The former included aristocracy, merchants and bankers, the leading social components during the Regime of Nine, the latter represented all the other groups excluded from power in the first half of the century. This assumption comes with two prices. First, considering aristocracy to have had the same historical fortune as merchants and bankers is a simplification, since clans were actually excluded from political representation. However they were practically involved in power and their economic and social interests were almost coincident with those of the leading group. Second, as it will be more evident from next historical sections, popular groups did not politically acted unite and had different timing in their participation. Also in this case, however, history shows that they had common economic and social interests.

Groups interacted for the production of a common project, which can be interpreted as the whole set of public services, such as economic policies for the protection of city activities, military defense and city maintenance. All of them were the typical goods produced independently by a medieval Italian commune.

These services could have been produced according two different ”technologies”.

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First, both group could have made an offer to produce the good with their own wealth and, producing the good according to a level of efficiency \( \rho \), each of them would have got a share, \( \sigma \) for the non-élite and \( 1 - \sigma \) for the élite (with \( 0 \leq \sigma \leq 1 \)), proportional to the quantity of the good financed. This way of producing the good was the mechanism used during the Nine to finance communal expenditures with a prevalent use of direct wealth and a lower use of distributed taxation. Alternatively, groups might have produced the good sharing contribution and getting an equal part, \( Q \), of the services produced. This second "technology" reflects the prevalent use of widespread taxation contribution to communal resources since the second half of the 1348, as shown in figure 1.1. Each group had the same set of strategies, concerning the choice of technology. Cooperation consisted in a more equal contribution and share, while Attack was the alternative, personally financed, mode of production. It is here assumed that the quantity of goods that groups obtained, reflected their political power. If they produced with the first technology and one group got a share higher than the other, then this would have meant an oligarchic situation, in which it was possible for a social component to impose an unequal distribution to the other. If groups produced according to more egalitarian technology, it would have corresponded to a coalitional distribution of political power. Results of groups interaction are shown in the following matrix.

<table>
<thead>
<tr>
<th></th>
<th>Élite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperate</td>
<td>Q, 0</td>
</tr>
<tr>
<td>Attack</td>
<td>0, ( (1 - \sigma)\rho )</td>
</tr>
</tbody>
</table>

The payoff matrix shows some implications of our assumptions.

First, groups had to find an agreement to have a positive payoff. This implication captures the fact that in a medieval commune no group could act alone nor there could be one group choosing a way to contribute to expenditures and the other choosing an alternative way. Once a system of rules was set, each group had to obey, or to revolt, to that specific set of rules. Second, it shows that there were two Nash equilibria, the one in which both groups cooperated and the one where both groups made an own offer. Finally, it shows that without a prior assumption on \( \rho, \sigma, Q \) and the way in which, eventually groups might have shifted from one equilibrium to another, it is not possible to predict what convention would have been played.

In order to solve these problems, it is necessary to clarify to what \( \rho \) and \( Q \) correspond in the historical narrative presented so far. During the Regime of Nine, the way of contributing to communal expenditures was such that the wealthier group was financing directly the
greatest part of them getting an high share of the good produced, unequal $\sigma$ and $1 - \sigma$, and highly remunerated all groups for their participation to contribution. This capability of high remuneration is how the efficiency level $\rho$ might be interpreted. The alternative way of producing the common project, instead, would have consisted in all groups giving an equal contribution, determined via distributed forms of taxation and get an equal share from it, $Q$. The payoff from this form would have, in turn, depended on the capability of all groups to equally finance expenditures, a feature affected by exogenous factors, such as shocks changing population size, contractual power between economic actors, wealth and income distribution.

Following all these assumptions, the analytical framework presented might explain the oligarchy of the Regime of Nine.

Initial historical conditions, contractual power and wealth distribution gave to the Nine, at the end of the 12th century, the capability to impose to the community an unequal way of realizing communal goods. They set a very low $\sigma$ with a sufficient high level of efficiency $\rho$ capable of compensating the non-élite for their small share of common project enjoyed.

Why did the non-élite accepted the unequal condition without revolting?

Still following Bowles (2003), the mechanism of switch from the unequal equilibrium to the other is here modeled as a collective action undertaken by one group, the non-élite, when

$$\delta(Q - \sigma \rho) > \sigma \rho.$$  \hspace{1cm} (1.1)

According to the above formula, the non-élite would have revolted, trying to impose the more equal convention if gains from the switch, the left hand side of the inequality, would have overcome the payoff in the status quo convention, the term of the right hand side. Looking at the formula it is possible to observe that gains from the switch, $(Q - \sigma \rho)$, might be increased by a term $\delta$ which, according to Bowles (2003), can be interpreted as the "pleasure of agency", a positive value ranging from 0 to $+\infty$ that represents the increasing benefits that the environment recognizes to those revolting and which is independent on the number of individuals participating to the switch\textsuperscript{31}.

How much was the set of rule and the organization remunerating an eventual effort of the non-élite to change the status quo?

It has been observed how the administrative phase gave large advantages to individuals involved in it. Administrators decided how and when to implement decisions on salaries and prices, had a large power in judicial decisions and, above all, were crucially determinant in fiscal choices. In this environment, limited access to administration would have discouraged groups to revolt, with the expectation that even if reaching a different political equilibrium this would have not immediately transferred to a new administrative organization. On

\textsuperscript{31}An usual way to model a switch in convention in evolutionary game theory is to look at the number of non-best responses in groups playing their best strategy. A switch occurs depending on the size of the group and the number of those non-best responding. Introducing the $\delta$, size constraints are no more binding. See Bowles (2003).
the other side, instead, an eventual increase in administrative inclusion would have driven
groups to change the convention, with the expectation of a great involvement at least in the
implementation phase of decisions.

The Regime of Nine, therefore, can be represented as an oligarchic equilibrium in which
the unequal share imposed by the élite to the non-élite was accepted both because of the
lower level of $Q$, with respect to efficiency in compensation, and the low level of $\delta$, because
of the total control of administration by aristocracy and merchants. The acceptance of the
non-élite is described by the following inequality

$$\delta(Q - \sigma \rho) < \sigma \rho.$$ (1.2)

In figure 1.2, point $w$ shows how an agreement satisfying the above inequality, and
therefore lying above lines of indifference for both the élite and non-élite, would have been
an absorbing state of the groups’ interaction.

How would Black Death changed the above situation?

The plague did not have immediate effect in neither the political nor the administrative
structure, then $\delta$ remained unchanged after 1348. However, it increased the relative potential
output associated to a more equal distribution of contribution and shares, as figure 1.1 has
shown. This might have occurred for at least two mechanisms associated with the shock.
First, because it raised the relative income of lower classes with respect to leading ones,
augmenting the capability of the non-élite to support communal needs. Second, because
it plausibly had an effect on wealth redistribution, lowering the capability of the élite to
directly finance the state and increasing the importance of ordinary taxation for such scope\textsuperscript{32}.

Was the exogenous shock sufficiently high to insure that the élite would have not counter-
revolted?

History shows that non-élite, even if successful in revolting, did not impose a more egalitarian
political equilibrium and, while progressively changing administrative organization, it
was subjected to the continuous threat of revolts of the previously leading groups. In other
words, with a constant $\delta$, $Q$ increased at a level such that the non-élite found convenient to
revolt,

$$\delta(Q - \sigma \rho) > \sigma \rho$$ (1.3)

but at which the élite has the incentive to counter revolt,

$$\delta((1 - \sigma) \rho - Q) > Q.$$ (1.4)

A level of $Q$ such to guarantee the two inequalities is possible if assuming values in the
following interval

\textsuperscript{32}Extant registers do not allow for a full understanding of the effects of the plague on wealth distribution.
However, in contemporary chronicles it is reported the advent of the so-called gente nova, the new people,
representing those who were become wealthier after the plague. See also Piccinni (1995).
Figure 1.2: **Contracts and indifference lines.** The graph shows the lines of points at which the *élite*, \( \delta((1 - \sigma)\rho - Q) = Q \), and *non-élite*, \( \delta(Q - \sigma \rho) = \sigma \rho \), are indifferent between revolting or maintaining the *status quo*. These lines divide the space of unequal contracts in four parts which represent different basins of attraction for the interaction. The area in which point \( w \) lies, represents the basin of attraction for the unequal agreement. Moving clockwise, the area lying below the indifference curve of the *élite* and above the one of the *non-élite* is the one in which both contracts are absorbing. At the bottom, the area below both curves includes agreements for which the more equal convention is absorbing. Finally the left quadrant will represents combinations of \( \sigma \) and \( \rho \) for which none of the equilibria is absorbing. The figure is a slight modification of a similar version in Bowles (2003).
The range is positive for the following conditions

1. \( \forall \rho > 0 \)
2. \( \sigma < 1/2 \)
3. \( \delta > \frac{\sigma + \sqrt{\sigma^2 - \sigma^2}}{1 - 2\sigma} \)

where condition 1 says that it is independent of the efficiency of remuneration, condition 2 requires the initial equilibrium to be unfavorable to the non-\( \text{é} \)lite while condition 3 is easily verified for low levels of \( \sigma \) and \( \delta \). All these conditions were presumably existent during the mid-14th century.

The post-plague situation can be represented in figure 1.2, if change in \( Q \) would have moved point \( w \) in the area in which both conventions are absorbing (right quadrant), a situation that can be interpreted as a state of continuous counter-revolts capable of leading to any of the two possible equilibria.

With the above analytical representation it has been shown that starting from an unequal distribution of political power, an exogenous shock sufficient to incentive the most disadvantaged group to revolt, might not be sufficient to stably avoid counter-revolts of the \( \text{é} \)lites determining a period of continuous internal conflicts in a community. This situation not only describes the post-plague social turmoils of Siena but also fits with similar popular revolts occurred in several Italian and European communities at that time.\textsuperscript{33}

Next sections will present historical facts and the analytical translation that might explain why Sienese social groups switched to a persistent coalitional convention in the following centuries.

### 1.4 The coalitional phase

The long period between the end of the Regime of Twelve and the lost of independency saw the rise of the coalitional distribution of political power.

Three phases can be distinguished: a first period (1368-1404), characterized by continuous changes in coalitions composition and the progressive arise of new social groups on the political scene, a period of stability (1404-1480), and, finally, a period of decline of cooperation among groups, with the return of the oligarchy and the conquest by Florence (1480-1555).

\textsuperscript{33}As shown in Rutenburg (1971) and Cohn (2006), the 14th century was a period of continuous revolts in central and northern Europe.
During the almost four decades which followed the end of the Regime of Twelve, the political life of Siena went through a tumultuous period with alternation at power of different coalitions.

Two main experiences characterized this phase: the government of *Riformatori* (the reformers) starting in 1368 and ending in 1385, and the following government of *Priori* (the priors) ruling from 1385 to 1404. Common characteristics were the continuous changes in coalitions composition, a strong popular participation to government, witnessed by the arise on the political scene of two new social groups, one in each of the two periods, and a constant institutional experimentation.

At the end of September 1368, the government was formed by 5 representatives from *Riformatori*, 3 from the Nine and 4 from the Twelve. In December the attempt of a popular oligarchy, formed by 15 of the *Riformatori*, failed and, one month later, the previous composition was restored. In 1371, the new proportion was of 12 *Riformatori* and 3 from the Nine.

In 1385 4 representative of the Nine, 4 from the Twelve and 2 from the new group of *Popolari*, members of popular factions never represented in the previous decades, formed a new coalition, the government of *Priori*. In 1387, composition was again changed and 1 representative of the *Riformatori* was admitted at government.

The four decades of coalitional experimentation were characterized by two main significant changes. The first regarded the introduction in 1369 of two new councils, the Council of *Riformatori* and the Council of the People. While social groups were sharing political power in government representation, the General Council a wider fraction of society, was increasing in number and becoming slow in its activity. The two new councils, smaller and with an higher popular representativeness were the legislative and consultive body that progressively substituted the old assembly. After the end of *Riformatori*, the two councils became one, with the Council of People assuming functions of both previous assemblies.

Popular factions also introduced a second political innovation: the use of special commissions, called *balìe*, with the objective to handle specific problems of the city. *Balìe* were appointed to take decisions on military, fiscal, and territorial issues. They were formed by individuals chosen by the General Council (under suggestion of members of the Council of...
Riformatori and had a limited competence to specific problems\textsuperscript{38}. Participation to these new political bodies, as well as to all the other administrative offices, was strictly regulated. Across all these 4 decades, it was reflecting proportions of groups in government coalition.

During the first phase, the prevalent ratio of 5:4:3 (the number of governors representing respectively Riformatori, Twelve and Nine) was applied to participation in the General Council (with the addition of a certain number of aristocrats), to the two other councils and to any other judicial and financial office. During the second phase, the Popolari substituted Riformatori and members of aristocratic clans were readmitted to administration\textsuperscript{39}.

No relevant change occurred in the way in which economic and judicial decisions were implemented. The administration of productive sectors had the same structure as during the Regime of Twelve. Prices and salaries regulation, as well as rules regarding guilds, were decided by the groups in the political bodies and applied by the Twelve Priors of the Arts. The coincidence between rulers and administrators guaranteed the possibility to promptly respond to complaints from less represented groups. In 1371, after the insurrection of the wage workers in the wool industry, the two Councils reacted with a new legislation in the interests of revolters. The new rules were immediately applied by the administration\textsuperscript{40}. Justice was administered as in the oligarchic phase. Judges and notaries were now a fully recognized group in political life and the Constitution of 1309 was still defining relations among rulers, officials and citizens\textsuperscript{41}.

Fiscal administration saw the multiplication of offices devoted to tax collection or payment realization. The three main offices, Biccherna, General Gabella and Regolatori, characterizing the previous fiscal structure, were now joined by at least 3 new fiscal centers\textsuperscript{42}. These new offices responded both to the need to deeply control the collection and use of resources and also to the demand for administrative participation of social groups in the city. This increasing dimension of the administrative structure favored the centrality of the office of Regolatori, whose control over the other bodies became a way to insure the correct functioning of the commune and to guarantee the good reputation of governors.

The final phase of the tumultuous coalitional period coincided with 15 years of formal submission to the city of Milan. In 1389 Siena, seriously threatened by the Florentine army, decided to give to the Lord of Milan authority in its foreign policy. Historiography has unanimously interpreted the fact as the capability of the group of the city to mutually

\textsuperscript{38}Procedures for the determination of the composition of balie, their dimension and tasks are fully described in Brizio (1992b).

\textsuperscript{39}The end of the government of Riformatori and the beginning of the government of Priori is described in Wainwright (1987) and Brizio (1992a).

\textsuperscript{40}The 1371 rebellion took the name of the Bruco revolt, from the neighborhood in which wage workers of the wool industry were residing. A complete description of the reasons, facts and consequences of the tumult are in Rutenburg (1971), Wainwright (1987) and Franceschi (1995).

\textsuperscript{41}See Brizio (1992a).

\textsuperscript{42}From the registers of Regolatori it is possible to observe that offices for the collection of tax on salt, pastures and grain became constantly identified as distinct from the Biccherna and General Gabella but never acquired a fully autonomy to spend their resources. See Ch.2.
renounce to a part of autonomy to maintain future independency\textsuperscript{43}. In 1404, as the external threat was ended, Siena did not renew its alliance with Milan and entered in a period of stable cooperation among its social groups.

1.4.2 The phase of stable cooperation (1404-1480)

Unlike the previous four decades, stability characterized participation of social groups to political power in the 15th century.

Since 1404, Riformatori, Popolari and Nine formed a new coalition which lasted until 1480. No new group claimed for political power and, the functioning of the representative mechanism guaranteed the extension of participation to almost all the social parts\textsuperscript{44}. Two groups were excluded from power, Twelve and the aristocracy, and, however, they were involved in administration\textsuperscript{45}.

The institutional changes of the previous phase became stable in this period.

The Council of the People was the fundamental legislative body and rapidly became more important than the General Council. It had full autonomy to constitute the bal\'e and had the power to judge over their activity as well as on the behavior of governors and other important offices, e.g. the Regolatori. Alongside this assembly, also the new Council of Richiesti (namely, the ”required”) acquired importance\textsuperscript{46}. It was summoned by governors with the objective to solve specific problems. Finally, the continuos appointment of bal\'e, represented a characteristic of this period. They were constantly used, formed by a large number of components and usually decided on very important issues. The increasing use of these commissions was responding to three needs: the demand for a rapid solution for many specific problems, the necessity to balance the governors activity and, finally, the willing to include in the decisional phase members of groups explicitly excluded from government\textsuperscript{47}.

Economic and judicial administration had the same structure as in the previous four decades, with social groups participating, even if in different proportions, to both decision and implementation.

Financial decisions, either directly taken by governors or left to the bal\'e, were the expression of different social parts animating the life of the city. Implementation was left to the administrative apparatus, increased in number of offices and with the central importance of Regolatori. A relevant change occurred when the commune decided to create a separate office for the administration of loans required by the city to its creditors. The creation

\textsuperscript{43}The interpretation is confirmed in Brizio (1992a), Ascheri (1985) and Catoni and Piccinni (1987).
\textsuperscript{44}The mechanism of electoral procedure was progressively increasing the number of participants through the existing recognized groups. See Ascheri (1985).
\textsuperscript{45}According to Ascheri (1985) aristocracy could participate to: office streets maintenance (viarii), administration of internal peace, Biccherna, General Gabella, Regolatori, office for salt and pastures indirect taxation, guild of merchant and protection of abandoned minors. Twelve, instead, had no restriction in administrative participation.
\textsuperscript{46}According to Brizio (1992a) the office was present also during the previous four decades but had only a formal role.
\textsuperscript{47}See Ascheri (1985).
of the office represented the acknowledgement of the existence of a communal debt and the commitment of the state to a correct management of it.\textsuperscript{48} Political stability and groups cooperation positively affected state capacity. Siena maintained its independence throughout all the century, proving to be capable to resist to any external attack and to maintain a cohesive internal policy. During these decades, the city reached the maximum territorial expansion in all its history.\textsuperscript{49} The commune also proved its capability to continue to finance public services provision, as the extension of the water system or the continuous financing to the Hospital, the Cathedral and the University.\textsuperscript{50}

Figure 1.3 shows the maintained capacity to expend resources after the end of the Regime of Nine until the first two decades of the stable coalitions phase. The econometric analysis in Ch. 2 also reveals that main positive changes in the expenditures of the commune (horizontal dashed lines in figure 1.3), were associated with changes in the administrative and political participation occurred in the second half of the 14th century.

\subsection{1.4.3 Epilogue: the end of coalitions (1480-1555)}

Starting from the second half of the 15th century the conditions that had permitted political cooperation became factors that undermined institutional equilibrium.

Two main problems arised.

The Council of People, which has served in the past as a mechanism for extension of representation, had also determined concentration of power in popular factions. While all the other administrative offices were representing a larger part of society, the Council was the privileged organism for the promotion of policies in favor of the people. In several situations during the second half of the century, members of the Nine, the group which had formed the old élite, complained about the discrepancies between governors decisions and the more popular-oriented provisions of the Council. The organism that had assured stability extending political power to all the groups previously excluded, was also slowly weakening the fragile relationships between élites and non-élites.\textsuperscript{51}

The continuous use of \textit{balúe} was the second factor undermining political equilibrium. While these commissions had initially been formed by a small number of individuals, from the second half of the 15th century they increased in number and dimensions assuming the importance of temporary councils. These, in turn, while favoring a prompt solution to problems, gave to groups the opportunity to form coalitions different than the one formed at the government level. Around the 1470s the Nine, willing to centralize power and to limit the popular decisions taken by the Council of People, started to make alliances with the

\footnote{Information about the public debt administration through the specific office are scarce. The most recent study of it is in Ginatempo (2000).}

\footnote{The expansion of the city toward southern territories is reported in Cammarosano et al. (2006) and Isaacs Chiancone (1970).}

\footnote{See Hook (1979) and Ascheri (1985).}

\footnote{See Ascheri (1985) for a complete description of the contrasts between the governors decisions and the functioning of the Council of People.}
Figure 1.3: Communal revenues across different political phases. “Real net expenditures” represents the total amount of expenditures made by the commune in each semester. Horizontal dashed lines represent main structural breaks found in chapter 2 implementing a Bai - Perron test for the analysis of turning points when no a priori hypothesis is made on them. They reveal that the beginning of the Regime of Twelve and the beginning of the stable coalitional phase represented two positive shifts, respectively 94% and 87% more than the previous 10 year average, for the capacity of the commune to expend its resources. An linear regression model in chapter 2 confirms that administrative more than political modifications affected this aggregate. No exogenous change, such has the Black Death or the mercenary attacks did relevantly affect the total amount of expenditures. The value is deflated for a CPI from Malaniima (2002). Source: chapter 2.
aristocracy. Using the balìe, the two groups slowly succeeded in dismantling the existent political cooperation.

In 1480, groups determined a new government composition. For the first time since 1287, members of aristocracy were readmitted to political power. The other two represented groups were the Nine, who could address policies in a less popular orientation, and the Twelve. The Council of People was reformed and, with the inclusion of nobles, it lost all its popular exclusiveness and became an assembly representative only of the old élites. The system, which had practically became an oligarchy, abandoned cooperation. Popular factions were again excluded from power and the old élites had reaffirmed their hegemony on the city.

In 1487 a member of the Nine, the Lord Pandolfo Petrucci, emerged from the oligarchy, took control of the city and established a signory which lasted, with his successors, until 1525. In the following three decades the city went through a new oligarchy of Nine and aristocracy and in 1555 lost its independency and became part of the Republic of Florence. Administration, which has functioned as a crucial factor in favoring stable cooperation between groups had also became the possibility for ancient leading groups to collective act for the restoration of unequal political equilibrium.

Next section will show how the analytical framework introduced in section 1.3 might account for the rise and decline of a stable distributed political equilibrium in late medieval Siena.

1.5 A model for administrative changes and cooperative equilibrium

Historical facts presented in the previous section have shown that the continuous increase in administrative participation granted by organizational changes implemented by popular governments, might represent an explanation for understanding the long period of political cooperation in Siena and the decline of such equilibrium at the end of he 15th century.

Administrative reforms, started during the Regime of Twelve, radically changed the organizational set and guaranteed to any revolting social component, a prompt response to the desire for more participation and, especially, to the demand for more equal policies.

In the analytical framework used in section 1.3 this might be translated to a change in δ which, keeping Q constant to the level reached after the Black Death, would have assured the incentive for the non-élite to revolt

$$\delta(Q - \sigma \rho) > \sigma \rho$$

(1.6)

and, at the same time, would have prevented the élite to counter revolt

$$\delta((1 - \sigma) \rho - Q) < Q.$$  

(1.7)

For a deep description of the signory of Pandolfo Petrucci and the last decades of the independent history of Siena, see Hicks (1966) and Hicks (1968).
The two conditions hold when

\[
\frac{Q}{(1 - \sigma)\rho - Q} > \delta > \frac{\sigma \rho}{Q - \sigma \rho}
\]  

(1.8)

an interval existing when

\[
Q > \rho \sqrt{\sigma(1 - \sigma)}
\]  

(1.9)

which in appendix 1.7 is proved to be related with previous interval of \(Q\) in the following way

\[
\frac{(1 - \sigma)\rho \delta}{1 + \delta} > \rho \sqrt{\sigma(1 - \sigma)} > \frac{\sigma \rho (1 + \delta)}{\delta}
\]  

(1.10)

Therefore, assuming that, after the Black Death the \(Q\) would have had a value such that

\[
\frac{(1 - \sigma)\rho \delta}{1 + \delta} > Q > \rho \sqrt{\sigma(1 - \sigma)}
\]  

(1.11)

then there would have existed a range in which increases of \(\delta\) would have determined a stable switch to the cooperative equilibrium, a situation such that point \(w\) would have lied in the bottom area of attraction in figure 1.2.

The model gives a possible explanation for the institutional uniqueness of the city of Siena. While experiencing an exogenous shock common to the one experienced by almost all European cities, Siena succeeded in maintaining a long-lasting cooperative equilibrium because groups increased administrative participation which, giving a positive effects to gains from collective actions, incentive popular groups to revolt and the elite to not counter-revolt.

At the same time, the model also accounts for institutional decline and the return of the oligarchy in the last 50 years of independence. In fact, the \(\delta\) guaranteeing stability to the new convention has an upper bound, \(\frac{Q}{(1 - \sigma)\rho - Q}\). Levels of \(\delta\) larger than it, namely a too high pleasure of agency, would bring to a situation at which the elite would find convenient to collective act to return to the unequal convention

\[
\delta((1 - \sigma)\rho - Q) > Q
\]  

(1.12)

and the elite would find convenient to counter-revolt.

\[
\delta(Q - \sigma \rho) > \sigma \rho
\]  

(1.13)

Paragraph 1.4.3 has shown that a mechanism similar to the one described in the model occurred in Siena in the last decades of the 15th century. The continuous increase in administrative participation and dimensions represented an incentive for collective action not only for the historically disadvantaged groups but it also increased the payoff from revolts for the leading classes which eventually revolted against the more egalitarian equilibrium and succeeded in restoring the oligarchy.
1.6 Conclusion

This paper has investigated the role of exogenous shocks and administrative changes in the determination of political equilibrium in late medieval Siena.

The particular historical trajectory of the commune has motivated the choice.

While, after the Black Death, most of Italian autonomous cities were either turning to regional states ruled by oligarchies, or they were losing their independence, Siena maintained its autonomy and control on nearby territories, developing a coalitional form of political power.

The basic conjecture of the paper is that changes in administration that increased the effectiveness of collective revolts of popular groups selected and supported, after the mid-14th century crisis, political cooperation. This mechanism determined the particular form of the state emerged since the end of the 14th century and allowed the city to remain independent until mid-16th century.

In order to prove the conjecture, a combination of historical narrative and formal treatment has been provided.

Historical facts presented in section 1.2 and 1.4 have detailed the main characteristics of both the oligarchic and coalitional phase, underlining factors that could have favored or undermined existing equilibria. The analytical treatment, presented in section 1.3 and 1.5, have provided the formal representation of mechanisms determining changes in political equilibrium as a response to exogenous shocks, such as the Black Death, and changes in the set of rules and norms appointed by social groups to govern administrative organization.

The model has shown the following causalities.

Since the end of the 13th century, the historical power and wealthier condition of merchants, bankers and aristocracy determined an unequal oligarchy based on a large contribution of those groups to communal expenditures and a related high control on communal politics. Strict rules, together with an organization limiting access to administration for other social groups, reduced potential gains that revolting groups might have obtained from a collective action. Wealth disparity and low real wages limited the potential output that could have been produced with a more distributed system of taxation and correspondent political power.

Black Death dramatically changed the scenario, increased real wages of lower social classes, raised their contractual power and their willingness to increase participation to state financing in order to get larger shares from it. In addition, wealth redistribution increased the possibility to produce public goods in a more distributed way with respect to previous experience. However, as the model has shown, the exogenous shock alone could have not been sufficient to explain a persistent shift towards a more equal distribution of contribution and power. As many other contemporary experiences, also Siena could have returned to oligarchic political equilibria after a popular government.

The Tuscan city, instead, represents an useful case to understand what organizational
changes can determine the redistributive effects of an exogenous shock to be persistent over time. If administrative reforms occurred since the second half of the 14th century were a way to increase the remuneration for groups collectively acting to change the status quo, these changes might have induced groups to choose a more equally distributed way of producing and dividing common projects. Similarly, too high levels of administrative inclusion might have had the effect to reduce stability and induce groups to act collectively, each with the objective to restore its own more favorable political equilibrium.

As a conclusion, this paper provides two main messages.

The first one regards the process of state emergence and formation.

The paper has shown that political equilibria can be interpreted as a result of groups interaction as they are affected and shaped by exogenous shocks and institutional changes. When groups interact in the formation and maintenance of a political organization, the outcomes of such interactions are the results of the joint effect of exogenous shocks on the relative rank of alternative technologies and the way in which the set of rules remunerate collective actions lead by single groups. In this new framework, administration, the implementation phase of political life, can positively absorb demand for power and bring the whole community to a more productive, stable and egalitarian outcome.

The second conclusion relates with the understanding of different political and economic trajectories of Italian city-states at the end of the Middle Age. The historical and analytical treatment of medieval Siena, in fact, provides a new possible interpretation to compare and understand different political paths in Western history. Looking at different ways of organizing administration in late medieval experiences, might serve as a key explanation for divergences as well for similarities in social and economic European institutions.
1.7 Appendix: Existence of \( \delta \) and the interval for \( Q \)

As shown in section 1.5, the following range for \( \delta \)

\[
\frac{Q}{(1-\sigma)p - Q} > \delta > \frac{\sigma \rho}{Q - \sigma \rho}.
\] (1.14)

exists when

\[
Q > \rho \sqrt{\sigma(1-\sigma)}.
\] (1.15)

However, for coherence with respect to the interval of \( Q \) insuring the post-plague mechanism of revolts and counter-revolts, it is necessary to check the relationship of such lower boundary for \( Q \), \( Q > \rho \sqrt{\sigma(1-\sigma)} \), with the two boundaries shown in section 1.3

\[
\frac{(1-\sigma)p\delta}{1+\delta} > Q > \frac{\sigma \rho(1+\delta)}{\delta}.
\] (1.16)

First, it is investigated the relationship between the boundary in eq.(1.15) and lower boundary in eq.(1.16). Assuming, for simplicity, that \( \delta = 1 \), it means, for condition 3 in section 1.3, that

\[
\sigma < \frac{1}{5}.
\] (1.17)

Substituting \( \delta = 1 \) in the two terms under observation, their relation becomes

\[
\rho \sqrt{\sigma(1-\sigma)} > \sigma \rho(2)
\] (1.18)

which is true only when \( 0 < \sigma < 1/5 \) that, in turns is implied when \( \delta = 1 \), which is a condition in eq.(1.17).

Second, the relationship between the boundary in in eq.(1.15) and upper boundary in eq.(1.16) is investigated. Still, for simplicity, assume \( \delta = 1 \) which implies condition in eq.(1.17). The relation becomes

\[
\frac{(1-\sigma)p}{2} > \rho \sqrt{\sigma(1-\sigma)}
\] (1.19)

which is verified when \( \sigma > 1 \) (out of the range of values in our framework) and \( \sigma < 1/5 \), the condition in (1.17). As a conclusion the following relation is verified\(^{53}\)

\[
\frac{(1-\sigma)p\delta}{1+\delta} > \rho \sqrt{\sigma(1-\sigma)} > \frac{\sigma \rho(1+\delta)}{\delta}.
\] (1.20)

\(^{53}\)It can be proved that inequalities are true also assuming values of \( \delta \) smaller and larger than 1, as for example \( \delta = 1/2 \) and \( \delta = 3/2 \).
2 Did oligarchies really work better?
Public finance and state capacity in late medieval Siena

Abstract

This paper is an empirical investigation on the evolution of public finance in a late medieval Italian city-state: Siena in the 14th century. The study has two main novelties. First, it presents and explores a new and large dataset showing communal revenues and expenditures (and their main components) in a period ranging since 1337 to 1418 and including five different political regimes. Second, it checks for the importance of both external facts, such as pestilences and mercenary attacks, and internal changes, such as the shift from oligarchic to coalitional governments, on the evolution of the way in which resources were raised and used in the community. Two are the main findings of the paper. First, it shows that the shift from oligarchy to coalitional political participation did not represent a decrease in the Sienese state capacity and, rather, coincided with an increase in the capability to collect and spend resources. Second, it reveals that changes in administrative participation were more effective than extension in political representativeness for improvements in public finance.

Keywords: Public finance, State capacity, Administration, Oligarchy, Coalition.
JEL Classification Numbers: D02, N43, P48.
2.1 Introduction

This paper analyzes a novel dataset on the evolution of public finance in 14th century Siena in order to assess the effect of different political and administrative institutions on the evolution of fiscal system in a late medieval Italian independent city-state. This study represents an empirical support to the historical and analytical research presented in Ch.1, where it has been suggested a novel interpretation for the peculiar political path of the Tuscan city in late Middle Age.

Siena, after having being ruled for almost 70 years by the wealthy economic class of merchants and bankers, turned to an oligarchy of artisans in 1355 and, after 13 years, to a long phase of coalitional governments with an high popular representativeness that lasted almost until the end of its independence, occurred at the mid-16th century. This is an unique political path in the history of Italian independent city-states since the 14th century onward. At the half of the century, in fact, many Italian communes were struck by several external dramatic facts. In 1348 the arrival of the bubonic plague, called Black Death, dramatically reduced Italian population\(^1\). In the following decades, many mercenary companies attacked the territories of these political entities, threatening their capacity to defense their own citizens\(^2\). As a consequence, independent city-states followed one main political path. Those with the greatest capability to organize military defense, resisted to external attacks and then started to expand their territorial dimensions, becoming regional states ruled by oligarchic governments\(^3\). Other city-states, less capable to mobilize resources for military defense, lost their independence under the pressure of the new regional states\(^4\).

Siena followed its own political trajectory. The city, which was dramatically struck both by mercenary attacks and the Black Death, maintained its independence from external attacks, never reached a regional geographical dimension and did this with a shift from the oligarchic government of the first half of the century to the coalitions of the following 150 years of its history. In chapter 1 it has been shown that this change was anticipated and supported by deep reforms occurred in the way in which the administrative apparatus was organized. This paper addresses a consequence of that argument, the maintenance of state capacity, and, with the support of a novel dataset directly obtained from historical archives, it empirically tests the evolution of Sienese public finance throughout the different political phases of the 14th century.

Two are the questions that are tackled: How did public finance change across the political turmoils involving the city in the 14th-15th century? What were the effects of political and administrative changes occurred during the second half of the 14th century on the capacity of the commune to raise resources from the community and expend them?

\(^{1}\)The high negative impact of the 1348 Black Death on Italian demography is in Del Panta (1980).

\(^{2}\)Mercenary raids in second half of the 14th century Italy are in Caferro (1998).

\(^{3}\)See, for example the political evolution of Florence in Becker (1967) or the history of late medieval Venice in Norwich (1982).

\(^{4}\)See for example Lucca in Manselli (1986).
The answer to these questions will serve as a test to check the maintained or not capacity of the commune to raise resources and use them after the exogenous shock of 1348 Black Death and the end of the long oligarchy of merchants élites occurred seven years later. In addition, it will contribute to the recent wide debate on the evolution of public finance and state capacity in early modern Europe. Especially, in Stasavage (2011), a wide analysis on the evolution of public credit in European national and city-states has been proposed. There, the main argument is that smaller geographic dimensions and the presence of oligarchies of wealthy élites, allowed city-states to have better access to public credit than other small political entities ruled by popular factions or larger political entities whose dimension did not allow for an efficient control on the use of resources and discouraged potential lenders to furnish loans to the state. Therefore, in medieval fiscal systems characterized by low capability to extract resources in form of direct taxation, public credit was the only mean to give the state the capability to mobilize resources and use them. High state capacity was, therefore, possible in small political entities only when the wealthy social classes strictly control power and the way in which resources were used. Once they would have lost power, the community would have lost resources.

Other important contributions, such as Dincecco (2009a,b) or Dincecco and Katz (2012), have focused on European public finance in more recent times and have shown the importance of political changes, such as the introduction of centralized and limited governments, for improvements in the capacity of states in collecting and expending resources.

This paper is not strictly related to the problem of public credit and shows a medieval city-state where coalitional governments with a high popular representation maintained its capacity to collect resources necessary to satisfy the needs of the community. The main argument is that this was possible through an administrative system extending interests and responsibilities towards the common good produced by the state.

The structure of the paper is the following. In section 2.2, it is presented the general historical framework with a specific focus on public finance organization during the period under analysis. Sections 2.3 and 2.4 respectively present the main characteristics of the novel dataset constructed from original data and the first evidences coming from descriptive statistics. Sections 2.5 and 2.6 address the motivating questions of the paper with a specific econometric strategy. Section 3.8 concludes.

2.2 Public finance organization in late medieval Siena

The evolution of the independent commune of Siena during the 14th century represents a unique case in the political scenario that characterized northern and central Italian communes. Being ruled by an oligarchy of merchants and bankers in the first half of the century, Siena suffered from a dramatic demographic decline during the 1348 Black Death. Differently from almost all the other Italian independent cities, the mid-century crisis favored in Siena the advent, in the following years, of coalitional governments with an high popular
representation. While, in the same period, the political evolution of almost all the other Italian city-states followed either the path of regionalization or the lost of independency under external conquest, Siena maintained its autonomy through the extension of political representation and the progressive inclusion of popular factions at the government of the city.

The organization of Public finances radically changed across the century.

During the Regime of Nine (1287-1355), an oligarchy of nine representatives of families of merchants and bankers, fiscal administration was strictly managed by members of the ruling political class. Control occurred in two ways. First, the governors had the power to select officials administering, in each semester, the two main fiscal offices of the commune: the Biccherna, devoted to the control of all incomes and expenditures of public administration, and the General Gabella, appointed for the collection of indirect taxation. Those citizens, elected as administrators, were usually members of aristocratic and non-aristocratic families of merchants and bankers. As a second mean of control, those officials were given full autonomy in decisions regarding the collection of impositions and the authorization of communal expenditures. They assigned the right to farm taxes to private citizens, decided who could have bought the communal debt, time limits of principal restitution and interest payment for communal loans. Officials also collected fines imposed by judicial administrators and, in performing all these tasks, were not subjected to any control by governors or other external power. Their only duty was to guarantee with personal wealth any budgetary deficit not authorized by the Nine. Their autonomy, together with the coincidence of their social extraction with the one of governors, guaranteed to members of families of merchants and bankers the possibility to obtain large personal gains from the administration of public finance. In fact, during the Regime of Nine, indirect taxes were usually farmed to members of trade and banking sectors who, after having bought the right from the commune, had full discretion in the taxation imposition in the city and countryside. This privilege gave them the possibility to obtain large personal gains from this activity. At the same time, officials of the Biccherna autonomously decided who would have lent to the commune through voluntary loans. The system, in turn, guaranteed to the city a prompt availability of necessary resources for public expenditure.

In 1348, the arrival in Siena of the bubonic plague, the Black Death, radically changed demographic, economic and political conditions. In three months, from march to may 1348,

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5 For a detailed qualitative analysis of the public finances during the Regime of Nine see also Bowsky (1970).
7 As in many Italian communes, since the 13th century Siena used to collect two types of loans: forced and voluntary. Forced loans were compulsory and usually required to all population. The contribution given by each citizen was established on the basis of her wealth assessment. These loans paid an annual interest on the sum lent and promised the restitution of the principal at the end of a certain period. Voluntary loans were required to citizens willing to lend to the commune. They implied principal restitution and interest payment. In many cases, the second type of loans brought more resources to city-states and, in change, implied a privileged restitution of the sum lent. See Bowsky (1970), Barbadoro (1929), Becker (1967) and Ginatempo (2000) for cases of forced and voluntary loans in Italian city-states.
population collapsed from about 50,000 inhabitants to 15,000, determining a consequent decline in trade and banking activity and the increase in the contractual power of those economic sectors, artisans and stonemasons, previously subordinated to the leading ones.

The autonomy of merchants and bankers in the administration of public finances was compromised. New arising economic classes were demanding participation in public finance and the abolition of privileges of the ruling class in raising taxation and loans. In 1349 governors were compelled to extend the possibility to farm indirect taxes also to members of economic categories other than trade and banking. In the following two years, officials of the Biccherna were continuously accused to favor members of the social group in debt restitution and interests payment. In 1351, the Nine had to renounce to the privilege to elect themselves or any other member of merchants and bankers family to any financial office.

In 1355 a new oligarchy, the Regime of Twelve, took control of the city and ruled it for the following thirteen years. During their government, these arising economic groups had to cope with high demand of resources to face continuous mercenary attacks and a prolonged period of famines.

In order to meet these unexpected demands of resources, even in absence of large merchants and bankers capitals, the Twelve, in 1358, created a new administrative office: the Riveditori, “the revisers”, (then, in 1363, transformed in the office of Regolatori, the ”regulators”). Their task was to verify, at the end of each period of administration, the validity of the accounts reported in all fiscal registers and to report eventual problems, mistakes and irregularities to governors. The system of control reduced the autonomy of the financial administration, made officials directly responsible for their management and introduced a public system for the accountability of the use of communal resources.

A second radical change, still occurred during this brief oligarchy, regarded the economic administration of the city. The heterogeneous composition of the new ruling class, although not modifying the oligarchic distribution of political power, changed the way in which economic decisions were implemented: from the exclusive power of the guild of merchants to the equal importance given to all the corporations. Following decades were characterized by a continuous alternation at power of coalitions composed by the different social groups of the city with one feature remaining constant: the enlargement of political participation, with an high popular representation, to politics and administration. Since 1414, a stable coalition took control of the city and, although not all groups were politically represented,

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8 See Bowsky (1964) and Piccinni (1995) for a detailed analysis of the social and economic effects of the Black Death in Siena.
9 See Bowsky (1970).
10 A complete description of political, military and social facts under the government of Twelve is in Moscadelli (1982), Wainwright (1983) and Caferro (1998).
11 For a detailed historical analysis of the institution of the Riveditori and Regolatori, see Catoni (1975).
12 This argument has been deeply analyzed in Ch.1.
13 Political, economic and social history of Siena after the Regime of Twelve have been studied in Wainwright (1987), Brizio (1992a) and Moscadelli (1995) for the last decades of the 14th century.
all of them were included in administrative offices\textsuperscript{14}.

In the following two centuries, until the lost of independency in 1555, the city maintained the same public finance organization appointed during the Regime of Twelve. The coincident social extraction of politicians and administrators, together with the system of check on the validity of public accounts, allowed the commune to maintain the state capacity necessary to finance city services, defend its countryside and to support the acquisition of new communities in nearby territories\textsuperscript{15}.

Summarizing, during the 14th century Sienese public finance went through several changes, regarding both administrative and political organization. From one side, since the Regime of Twelve, administrative functions included representatives of groups other than the one at power and introduced instruments to increase communal transparency. From the other side, since the government of Riformatori, coalitional participation to political phase became a constant feature of the Sienese institutional set.

Were these modifications really causing the maintenance of State capacity? How did they affect the way in which communal resources were raised and expended?

Following sections present a quantitative analysis of a novel dataset in order to answer to the above questions.

2.3 A new dataset for Sienese public finance

The evolution of public finance and state capacity during the 14th century Siena is here analyzed using a novel dataset collecting a detailed description of revenues and expenditures of the commune as they were reported in the accounting books of the Biccherna in the period between 1337 and 1418\textsuperscript{16}. In particular, for the years between 1337 and 1361, data have been directly taken from the registers of the Biccherna, while for the following period, communal revenues and expenditures of the central fiscal office have been derived from registers of Regolatori\textsuperscript{17}. The period under observation spans, therefore, from the first semester of 1337 to the second semesters of 1418\textsuperscript{18}. The choice of initial and ending dates is motivated by documents availability: this time range constitutes the most continuous series of original public finance registers for the 14th century Siena\textsuperscript{19}.

This time interval embraces 81 years of fiscal administration during which the commune

\textsuperscript{14}For the historical analysis of Siena in the 15th century, see Ascheri (1985).
\textsuperscript{15}See Ascheri (1985) for details about the Sienese territorial expansion in 15th century.
\textsuperscript{16}The dataset is available from the author under request.
\textsuperscript{17}For a detailed explanation on how data has been collected and summarized see Appendices 2.8.1 and 2.8.2. Data have been reported in the Sienese silver coin, the lira as it was registered in the communal accounts. When sums of money were registered in Florentine gold coins, the fiorini, they have been converted in Sienese lira according to the rates of exchange given by the officials in the same registers of the Biccherna or Regolatori.
\textsuperscript{18}Although the year in Siena used to start on March 25th, the first administrative semesters started on January 1st and ended on June 30th and the second started on July 1st and ended on December 31st. See also Bowsky (1970).
\textsuperscript{19}Before 1337 the archival availability of registers of the Biccherna is not continuous. After 1418, books of both the Regolatori and the Biccherna are fragmentary.
knew 5 different political regimes. The initial 18 years of the dataset (1337-1355) give a picture of public finance during the last two decades of the Regime of Nine. Since 1355 to 1368, the finance under the whole government of Twelve is observed. The following 50 years of the dataset report the effects of three different coalitional phases on fiscal system of the commune. Since 1368 to 1384, data refer to the period of Riformatori, the ”reformers”, characterized by a coalition between popular representatives, merchants and bankers. Then, since 1385 to 1404, it is comprised the government of Priori, the ”priors”, during which those ruling under the Twelve returned at power together with popular factions excluded in the previous two decades. Finally, the dataset includes 14 initial years (1404-1418) of the full coalitional phase in which the city of Siena was ruled by a government representative of members of the Nine, members of the popular factions governing during the Riformatori, members of the Priori while members of the Twelve and the old city aristocracy were excluded from representation in political institutions.

Some caveats must be done about the use of these archival sources.

Data coming from the registers of the Biccherna, especially those referring to the pre-Regolatori period, might not include all the communal revenues and expenditures. It has been observed that voluntary loans were usually not reported in official registers in order to leave discretion to administrators in managing them. In addition, there could have existed subordinate financial offices, other than the General Gabella, whose operations were not registered in the books of the Biccherna.

It has not been possible to resolve the first problem, since no extant archival source reports precise and continuous information about voluntary loans. Instead, registers of Regolatori have been used to partially clarify the second problem. In the research conducted on the documents of this office since 1362 to 1418, it has been found that even if financial offices devoted to the collection of single direct and indirect imposition were proliferating in the second half of the 14th centuries, they only occasionally obtained the right to autonomously expend their revenues for reasons other than their ordinary needs. At the end of their administrative period they usually transferred the incomes collected either to the Biccherna or to the General Gabella (which would have, in turn, given the whole income to the central financial office). It is reasonable, therefore, to suppose that the institutional minimalism of the first half of the century attested in Bowsky (1970), the strong centrality of the Biccherna and the almost absent information about financial offices other than the two main ones, did not admit the existence of centers of autonomous collection and expenditure of resources.

Two data adjustments have been made in order to construct a continuous and comparable

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20 For a detailed analysis of Siena during the Riformatori, see Wainwright (1987), Brizio (1992a) and Moscadelli (1995).
21 The political and administrative analysis of the government of Priori is in Brizio (1992a,b).
22 The detailed history of Siena in the 15th century is in Ascheri (1985).
24 The problem has also been observed in Bowsky (1970) and Caferro (1998).
series of revenues and expenditures. First, data for missing semesters have been filled with linear interpolation between near available periods. Second, public incomes and expenditures have been deflated in order to adjust for inflation during the 14th century. Consumer price index used for adjustment of public finances has been taken from Malanima (2002).

In the following section main descriptive statistics of the new dataset are shown.

2.4 Preliminary evidences on the public finance of Siena

The first measure shown about the evolution of the Sienese public finance, is what will be called ”real gross budget”. It represents the real value of the total amount of resources commanded by the commune in each semester and it is equal to both the total expenditures and incomes of the public administration. As already observed in section 2.2, officials of the Biccherna were obliged in each semester to equate revenues with expenditures. In case these two amounts did not match, administrators of the subsequent period would have anticipated the resources needed to cover the exceeding expenses. This measure, therefore, represents an indicator of the gross quantity of resources used and collected by the commune and gives a first picture of the general trend of public finance in late medieval Siena. As figure 2.1 shows, the total amount of resources commanded by the administration, apart from peaks corresponding to moments of extreme contingencies for the city (as the periodical mercenary attacks suffered during the 1350s), slightly increased throughout all the 80 years. During the Regime of Nine a peak in real gross budget occurred before the advent Black Death which, in turns, seems to correspond to a slight decline in total communal resources. The years of the Regime of Twelve were characterized by an irregular behavior of the communal budget, while the following four decades, characterized by two coalitional governments with an high popular representativeness, show a stable behavior of the measure. Finally, the advent of the 15th century seems to be related with a new period of high peaks in the communal budget. Table 2.3 reveals the existence of a significant positive linear time trend for the real gross budget of the commune over the whole period under observation.

However, this measure does not furnish a meaningful interpretation of the Sienese public finance. In order to get it, a new variable has been derived, representing the current expenditures of the commune in each semester net of the transfers paid by the officials to anticipate expenditures not covered in the previous administration. It will be called ”real net expend-

25The method is commonly used in the analysis of historical dataset. See, for example, Dincecco and Katz (2012).
26The deflation procedure is justified by historically attested inflationary phenomena during the 14th century Tuscany. See de La Ronciere (1982) and Goldwaith (1982) for the inflation problem in the whole region and Balestracci (1977) and Bowsky (1964) for prices variations in the 14th century Siena.
27The consumer price index in Malanima (2002) represents the more continuos and reliable inflation index constructed for the evolution of prices in the late medieval central Italian regions. It is a Laspeyres index and refers to variation of commodities’ prices in Tuscany since 1205 to 1608. The absence of a continuous series of prices and salaries for Siena in the same period has not permitted the construction of a specific consumer price index for the city.
Figure 2.1: **Real gross communal budget.** Source: see Appendices 2.8.1 and 2.8.2.
ditures\textsuperscript{7}, the total amount of current expenditures of the commune in each semester. The new variable, whose evolution is shown in figure 2.2 and whose main descriptive statistics are in table 2.1, reveals some relevant difference with respect to the real gross budget. Removing transfers almost nullifies the peak in expenditures during the Regime of Nine. Two peaks are still observed during the Regime of Twelve and both are contemporary to two great mercenary attacks suffered by the city\textsuperscript{28}. Net expenditures follow, in the subsequent decades a path similar to the one of the real gross budget. Table 2.3 shows that, overall, this new measure had even an higher linear time trend than gross real budget.

**Figure 2.2: Real net expenditures.** Source: see appendices 2.8.1 and 2.8.2.

| Table 2.1: Descriptive statistics of real net expenditure |
|------------------|-----------|-----------|--------|--------|--------|
|                  | Obs.     | Mean      | St. dev. | Min    | Max    |
| All periods (1337-1414) | 164 | 180489 | 98406 | 47263 | 617032 |
| Regime of Nine (1337-1355) | 37 | 123228 | 39422 | 47263 | 204962 |
| Regime of Twelve (1355-1368) | 26 | 221422 | 122337 | 54150 | 617032 |
| Riformatori (1368-1384) | 33 | 155160 | 43088 | 67526 | 227170 |
| Priori (1385-1404) | 39 | 144747 | 47457 | 48804 | 280282 |
| Stable coalitions (1404-1418) | 29 | 293739 | 199070 | 87935 | 513387 |

\textsuperscript{28}See Caferro (1998) for a detailed history of mercenary attacks in the second half of the century Siena.
In order to understand what needs caused the evolution of communal net expenditures, these values have been decomposed in several categories. Administrative costs include all the salaries paid to governors, officials and other workers of the commune. Military costs summarize all the expenditures made to defend the territory from external attacks and to ensure public safety in the city and countryside. The category called city expenditures collects all the costs suffered for services provided to the city and the controlled territories. Finally, also expenditures made for debt restitution and interest payments are isolated. Their percentage in each political phase is shown in figure 2.3.

Administrative costs and military expenditures always represented at least 85% of the total expenditures of the commune, showing that the two main public tasks were the maintenance of the administration and the provision of military defense to the city and its countryside. These two objectives remained predominant in each political phase with only a slight change in their relative weights during the period of Riformatori. Between these

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**Figure 2.3: Percentage composition of real net expenditure.** Source: see appendices 2.8.1 and 2.8.2.

---

29 See appendix 2.8.2 for a detailed explanation of the creation of expenditure categories.

30 The category for debt expenditures does not include all the principal restitution and interest payments made by the commune. As observed in Caferro (1998) and Ginatempo (2000) it was common to restitute loans and pay interests with incomes from certain indirect taxes and without the formal involvement of the Biccherna.
two costs, military ones were higher, always representing at least half of the budget. The other two sources of expenditures, debt repayment and expenditures for city services, followed an inverted tendency. The incidence of city services decreased across the century never reaching, since the Regime of Twelve, the 10% they represented during the oligarchy of merchants and bankers. On the other side, debt payments increased their percentage in the total budget during the government of artisans and reached more than 10% during the phase of stable coalitions. However, on average, the sum of these components never represented more than 15% of the total expenditure.

Turning this preliminary analysis of communal revenues, a procedure similar to the one used for expenditures has been implemented. It has been distinguished, in the gross real budget, the income raised by the public administration in form of current imposition, which will be called here ”real net income” from the personal wealth of the administrators transferred in any period in which revenues did not match expenditures, called ”real transfers”. Time evolution of the two measures is shown in figure 2.4. As also confirmed in table 2.2, there was a clear difference in the use of current taxation and personal wealth, between the Regime of Nine and the following political phases. During the oligarchy of merchants and bankers, at least before the advent of the Black Death, the quantity of income transferred
from the administrators was higher than revenues collected from the community. Since the arrival of the bubonic plague, this relation seems to be inverted. Linear time trends reported in table 2.3 confirm these tendencies.

### Table 2.2: Descriptive statistics of real net income and real transfers

<table>
<thead>
<tr>
<th></th>
<th>Obs.</th>
<th>Mean</th>
<th>St. dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All periods (1337-1414)</td>
<td>164</td>
<td>183281</td>
<td>97958</td>
<td>34648</td>
<td>543739</td>
</tr>
<tr>
<td>Regime of Nine (1337-1355)</td>
<td>37</td>
<td>126382</td>
<td>46538</td>
<td>45740</td>
<td>276680</td>
</tr>
<tr>
<td>Regime of Twelve (1355-1368)</td>
<td>26</td>
<td>209436</td>
<td>99454</td>
<td>91988</td>
<td>543739</td>
</tr>
<tr>
<td>Riformatori (1368-1384)</td>
<td>33</td>
<td>162572</td>
<td>38508</td>
<td>81822</td>
<td>231745</td>
</tr>
<tr>
<td>Priori (1385-1404)</td>
<td>39</td>
<td>139743</td>
<td>41539</td>
<td>34648</td>
<td>237718</td>
</tr>
<tr>
<td>Stable coalitions (1404-1418)</td>
<td>29</td>
<td>314669</td>
<td>119417</td>
<td>117134</td>
<td>521690</td>
</tr>
<tr>
<td><strong>Income from transfers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All periods (1337-1414)</td>
<td>164</td>
<td>77705</td>
<td>62328</td>
<td>0</td>
<td>323175</td>
</tr>
<tr>
<td>Regime of Nine (1337-1355)</td>
<td>37</td>
<td>125172</td>
<td>81508</td>
<td>7809</td>
<td>323175</td>
</tr>
<tr>
<td>Regime of Twelve (1355-1368)</td>
<td>26</td>
<td>72273</td>
<td>40449</td>
<td>24578</td>
<td>205873</td>
</tr>
<tr>
<td>Riformatori (1368-1384)</td>
<td>33</td>
<td>51007</td>
<td>39515</td>
<td>0</td>
<td>137284</td>
</tr>
<tr>
<td>Priori (1385-1404)</td>
<td>39</td>
<td>70383</td>
<td>51498</td>
<td>14118</td>
<td>235846</td>
</tr>
<tr>
<td>Stable coalitions (1404-1418)</td>
<td>29</td>
<td>62238</td>
<td>55330</td>
<td>6178</td>
<td>276576</td>
</tr>
</tbody>
</table>

### Table 2.3: Linear trends in public finance

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Intercept</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real gross communal budget</td>
<td>-1056855*</td>
<td>954*</td>
</tr>
<tr>
<td></td>
<td>(509573)</td>
<td>(369)</td>
</tr>
<tr>
<td>Real net expenditure</td>
<td>-2077480**</td>
<td>1638**</td>
</tr>
<tr>
<td></td>
<td>(412129)</td>
<td>(299)</td>
</tr>
<tr>
<td>Net income</td>
<td>-2398030**</td>
<td>1873**</td>
</tr>
<tr>
<td></td>
<td>(397948)</td>
<td>(288)</td>
</tr>
<tr>
<td>Real transfers</td>
<td>1392058**</td>
<td>-154**</td>
</tr>
<tr>
<td></td>
<td>(264765)</td>
<td>(192)</td>
</tr>
</tbody>
</table>

OLS are used for estimation. All measures are adjusted for seasonality. Standard errors in parentheses. *** Significant at 99%. ** Significant at 95%. * Significant at 90%.

Decomposing the income in its main categories allows for a deeper comprehension of the ways in which the commune financed its needs in each political phase. Four main types of current revenues have been distinguished. Incomes deriving from condemnations include all the resources collected through fines and sanctions imposed in the city and mainly motivated by political reasons. Loans summarize all the forced loans imposed to citizens or inhabitants of the countryside. Direct taxation represented all the imposition made on the basis of the assessed wealth of citizens. Finally, indirect taxation represents the number of taxes (the so-called *gabelle*) imposed on consumption and production activities. Figure 2.5

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31 See appendix 2.8.2 for a detailed explanation of the creation of income categories.
shows that the percentage composition of net communal revenues (not including personal wealth anticipated by the administrators) significantly changed across different regimes. During the oligarchy of merchants and bankers, political condemnations represented more than 40% of communal income. Indirect taxes were more than 20%, while forced loans and direct taxation were both around 10% of total revenues. During the following oligarchy, forced loans became more than 40% while the impact of political condemnations decreased being, also in the following regimes, never higher than 20%. Coalitional phases in next decades were characterized by the persistently high percentage of loans and the increase in the impact of indirect taxation. Direct taxes, instead, from being about the 15% of total revenues in the Regime of Nine, never exceeded the 10% in the following political phases.

Summarizing, this preliminary analysis of Sienese fiscal data has revealed some important conclusions.

The overall finances of the commune during the 81 years under observation showed a slight increase across the political phases observed. Expenditures seem to have increased more after the end of the Regime of Nine and, at a first sight, incomes had the same behavior. Across different regimes, no relevant change is observed in the way in which resources were expended, while the analysis of income has shown important modifications in the com-
position of revenues collection. The Regime of Nine differentiated itself for the propensity to finance its needs through a large use of personal wealth, while following governments financed their expenditure more with current imposition. In addition, this was accompanied by a change in the percentage composition of incomes raised from the population. From the predominant use of political condemnations and personal wealth during the Regime of Nine to the use, in the following political regimes, of forced loans and indirect taxation to respond to the increasing needs of the city.

These evidences, however, do not fully respond to the questions motivating the present research. How did public finance change across the political turmoils that the city suffered in the 14th-15th century? What were the effects of political and administrative changes occurred during this period on the capacity of the commune to raise resources from the community and expend them?

In the following two sections, an two econometric analyses are set to shed lights on these questions.

2.5 Assessing breaks in the evolution of Sienese public finance

Long time trends in real gross budget and other related aggregates of Sienese public finance have revealed an increasing tendency in the evolution of the resources raised and expended by the commune during the whole period under observation. In order to detect statistically significant changes in these time series and to give an historical interpretation to them, it is here implemented the Bai-Perron method for the analysis of structural breaks as presented in Bai and Perron (2003).

The Bai - Perron test, which has also been used in Dincecco (2009a,b), has the property to not impose an a priori assumption of dates for structural change in the series of data. Instead, it allows for testing in a general multiple regression two main hypotheses. First, it checks the existence of at least one break in regression coefficients against the null hypothesis of no breaks. Second, it tests the existence of $n + 1$ breaks against the null hypothesis of a given number $n$ of turning points. Through these two statistical tests, it finds the maximum number of significant changes in regression coefficients when no previous hypothesis is made on it.

The Bai - Perron method is used to check the existence of structural changes in net expenditures\textsuperscript{32}, through the test of the following equation.

\textsuperscript{32}A correct evaluation of expenditure and income over time should be implemented on per capita values. Unfortunately population data are fragmentary and insufficient to obtain measures of expenditures and income for each citizen. In particular, urban population is estimated in Bowsky (1964) around to 50,000 inhabitants. Population after the Black Death is estimated to be about 15,000 and the following values, as reported in Ginatempo and Sandri (1990), are around 17,000 inhabitants. These numbers, which are also confirmed in Bairoch et al. (1988), do not include population living in the controlled territories from which a relevant part of resources came from. For all these data problems, it has been preferred to analyze total measures of income and expenditure.
\[ NetExpenditure_t = \beta_0 + \beta_{t-1} NetExpenditure_{t-1} + \varepsilon_t \]  

(2.1)

where \( NetExpenditure_t \) is the real net expenditure observed at time \( t \), \( \beta_0 \) and \( \beta_{t-1} \) are coefficients to be estimated and \( \varepsilon_t \) is the error term. The same procedure is implemented for real net income and real transfers\(^33\).

Results of Bai - Perron test on real net expenditure, real net income and transfers are presented in table 2.4.

<table>
<thead>
<tr>
<th>Time series</th>
<th>Breakdates</th>
<th>Percentage change*</th>
<th>Main events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real net expenditure</td>
<td>1355 - I semester</td>
<td>94%</td>
<td>End of the Regime of Nine and beginning of the Regime of Twelve</td>
</tr>
<tr>
<td></td>
<td>1367 - II semester</td>
<td>-38%</td>
<td>Last semester of the Regime of Twelve</td>
</tr>
<tr>
<td></td>
<td>1403 - II semester</td>
<td>87%</td>
<td>Last semester of the Priori</td>
</tr>
<tr>
<td>Real net income</td>
<td>1355 - I semester</td>
<td>67%</td>
<td>End of the Regime of Nine and beginning of the Regime of Twelve</td>
</tr>
<tr>
<td></td>
<td>1367 - II semester</td>
<td>-31%</td>
<td>Last semester of the Regime of Twelve</td>
</tr>
<tr>
<td></td>
<td>1402 - II semester</td>
<td>90%</td>
<td>One year before the end of Priori</td>
</tr>
<tr>
<td>Real transfers</td>
<td>1349 - I semester</td>
<td>-49%</td>
<td>One semester after the end of the Black Death</td>
</tr>
</tbody>
</table>

*Percentage changes are computed between the average value of each aggregate in the 20 semesters before the structural change and the average value in 20 semesters following it.

The first break observed is related with transfers of personal wealth used to cover deficits in the communal budget. As shown in Table 2.4 and Figure 2.6, this anticipated income dropped of 49% since the first semester of 1349.

This date is meaningful.

No political or other internal fact occurred in this period while only one year before, the city was dramatically struck by the Black Death. As shown in Bowsky (1964) and Piccinni (1995), the plague, which reduced of about 2/3 the population in the city, probably caused a reduction in wealth availability of those social groups usually represented in fiscal administration. Many contemporary chronicles report of a great wealth redistribution in the city but, unfortunately, there is no extant documents that can be used to quantitatively estimate these changes. However, these years represented a fundamental turning point in the way in which the commune raised its resources. From the prevalent use of personal wealth to a system of communal revenues raised from the whole population. No other statistically significant structural break is observed for this aggregate, meaning that following political regimes never turned to the revenues system used during the government of Nine.

Figures 2.7 and 2.8 and table 2.4 reveal that real net expenditures and real net incomes have in common all the three statistically relevant structural breaks.

\(^33\)Break points and dates are obtained via the implementation of an algorithm for the Bai-Perron structural break test developed for the R-project for statistical analysis and explained in Zeileis et al. (2003).
Figure 2.6: **Structural breaks for real transfers.** Source: table 2.4 and appendices 2.8.1 and 2.8.2.
Figure 2.7: Structural breaks for real expenditure. Source: table 2.4 and appendices 2.8.1 and 2.8.2.
Figure 2.8: **Structural breaks for real income.** Source: table 2.4 and appendices 2.8.1 and 2.8.2.
The first occurred at the beginning of the 1355, in the same semester in which the city experienced a relevant political change from the oligarchy of merchants and bankers to the new government of artisans and other economic groups previously excluded from power. The break is associated with an increase of 94% in expenditures and 67% in income. A second breaks occurred at the end of Twelve’s regime, before the shift to the coalitional phases with a large popular representativeness. Here, expenditures and incomes decreased of 38% and 31% respectively. No break is observed during the tumultuous political phase characterizing the last three decades of the 14th century and, instead, a lower level of real net expenditures and incomes is reported during this phase. Finally, just before the beginning of the period of stable coalitions, net income and expenditure rose again with a percentage change of 90% and 87% respectively.

A preliminary historical analysis might suggest that Black Death negatively affected the capability of higher social classes to use their wealth to finance the commune and, through this practice, obtain personal gains and reinforce their control on public administration. At the same time, the exogenous shock did not relevantly affect the collection and use of resources. In addition, turning points observed in real income and expenditure do not seem to be associated with other exogenous shocks, such as wars or the frequent mercenary raids occurred in the second half of the 14th century34. These results exclude that governments with higher popular representativeness had a lower capability to raise and expend resources as it is suggested in Stasavage (2011).

Data, instead, show that there had been an almost coincidence between some political changes and all major shifts in real net income and expenditure, with some regimes associated with significantly higher average levels of these values. Especially, three political changes are contemporary with breaks in public finance: the shift from the oligarchy of merchants and bankers to the regime of artisans, the beginning of the coalitional phase and, finally, the stability in government representation with full administrative participation.

These political changes were not the only ones occurred in the second half of the 14th century. However, as it has been widely observed in Ch.1, they were associated with the most relevant changes in both political and administrative organization. For example, the Regime of Twelve, while having an oligarchic distribution of political power, did extend participation in economic administration. The Riformatori had both a coalitional distribution of politics and large representation in administration, an organization shared also by the government of Priori. Finally, it can be observed, that the highest increase in net income occurred when all groups were stably represented in administrative power.

In the next section a further econometric analysis is implemented in order to check the importance of these institutional changes on communal revenues and expenditures, together with the role played by other external factors.

34See also appendix 2.8.3.
2.6 The effects of institutional changes on revenues and expenditures

Detecting breaks and turning points in income and expenditure has shown that both external and internal factors had a relevant impact on the evolution of main public finance aggregates.

In this subsection it is presented a second econometric analysis that will be used to check the impact of internal and external facts on the evolution of real net expenditure, income and some relevant aggregates composing them.

Questions are: what factors did affect the evolution of real net expenditures over time? Were they concurrent with changes regarding political and administrative participation or did they depend on other external factors, such as the 1348 Black Death, wars and mercenary attacks or internal revolts?

The hypothesis, introduced in chapter 1 and also suggested by the structural break analysis in section 2.5, is that after the exogenous shock of the Black Death, wealth redistribution and increase in lower social groups’ contractual power made financing the commune via shared form of taxation more advantageous for the whole society than raising resources from personal wealth of officials. In addition, as a response to a period of continuous conflict, subsequent political factions extended the right to participate to administration and this, in turn, supported a cooperative distribution of politics. Here, it is checked whether these changes were relevant for the maintenance of communal capability to raise resources and expend them. In particular, the idea is that more than the extension of political representation, it was the introduction of coalition in administrative functions that allowed the commune to maintain, or even increase its state capacity. In particular, the introduction of a cooperative behavior in administration occurred in two circumstances: when the Regime of Twelve enlarged the participation to economic administration and when all social groups were allowed to be represented in administrative offices. To test this hypothesis, it is implemented a linear regression model for main aggregates of Sienese public finance. Eq. (3.2) shows the model for net expenditures

\[
NetExp_t = \beta_0 + \beta_1 OliCoal_t + \beta_2 FullCoal_t + \beta_3 FullPart_t + \beta_4 BlackDeath_t + \\
\beta_5 MIL_t + \beta_6 INT_t + \beta_7 t + \epsilon_t
\] (2.2)

The linear regression checks for the effect on real net expenditure at each semester \( t \), \( NetExp_t \), of different combinations of political and administrative organization with respect to the initial condition: the one under the Regime of Nine, when both politics and administration were oligarchically distributed. Therefore, the three dummies \( OliCoal_t \), \( FullCoal_t \) and \( FullPart_t \), will indicate, respectively, a situation with oligarchic political power and extended participation to administration (as the one during the Regime of Twelve), the case in which both politics and administration are coalitionally distributed and at least one social group is excluded from both politics and administration (as during the Riformatori
and *Priori*) and a situation in which, full administrative participation is given to all groups (as during the phase of stable coalitions). Other three binary dummies, *BlackDeath*, *MIL* and *INT*, capture respectively whether a semester was before or after the Black Death\(^{35}\), if there was at least one external war or mercenary attack suffered by the city and whether the commune suffered any internal revolt in the semester\(^{36}\). A time trend \( t \) is added to the model\(^{37}\). A same linear regression model is also run on real net income, called *NetInc\(_t\)*. Results are in table 2.5.

Regression results show that no external fact, such as the Black Death or mercenary attacks did play a statistically significant role in the evolution of net income and expenditures. Nor other event, exogenous to the present hypothesis, such as internal revolts, significantly affected the evolution of aggregates. Instead, with respect to the Regime of Nine, two different institutional organizations are associated with positive and statistically significant increases in both income and expenditure: the introduction of cooperation in administrative functions and the extension of the inclusion to this phase for all groups. Extension of political participation, on the other side, has a positive but not statistically significant coefficient. These results, therefore, confirm the initial hypothesis. Exogenous shocks did not impact on the evolution of income and expenditure. Administrative changes positively affected both the two aggregates, while the shift from oligarchy to coalitions in politics did not signify a statistically relevant change in the capacity to raise and use resources by the commune.

A deeper analysis on the real net expenditure might rise a question about how were resources used over time. In other words, combining the descriptive analysis shown in figure 2.3 with the results of previous regression, an investigation is possible on how the qualitative components of net expenditure responded to the variables used in the linear model.

The analysis on expenditure composition is made using two variables. The first, called *CityPerc\(_t\)*, represents the percentage value of city expenditures on the total net resources used by the city. In this measure are included resources used for military defense, the maintenance of streets and walls and services provision (as water and other utilities for citizens). Payments for the administration and interests on communal debt are excluded. The second variable is *AdminPerc\(_t\)*, representing the resources used for the maintenance of the administrative apparatus\(^{38}\). The two variables are regressed on the same linear model in eq.(3.2) and results are shown in table 2.5.

Results of model implementation show that a statistically significant negative effect for the percentage of expenditure for the city was associated with the extension of both

\(^{35}\)The Black Death left the city during the summer of 1348: the post-Black Death phase is considered to start since the first semester of 1349.

\(^{36}\)For the construction of the binary dummies for military attacks and internal conflicts see appendix 2.8.3.

\(^{37}\)Net expenditures and all the following time series variables are adjusted for seasonality.

\(^{38}\)The first variable is a sum of military and city expenditures shown in figure 2.3 while the second is the administration costs percentage still shown in that figure.
administrative and political participation. No significant effect was concurrent with the introduction of full participation of administration and no exogenous factor played a relevant role in the determination of this fraction of expenses. On the other side, an opposite result is found for the part of resources used for administration.

A second conclusion is straightforward.

It was sufficient for the commune to extend participation in both administrative and political power that, even before the inclusion of all groups in the implementation phase, the percentage of expenditures for the city decreased and the one for administration increased. Institutional changes, therefore, were associated with an increasing capability to use resources and to a decreasing use of them for services for the city.

How were the increasing expenses of the commune sustained?

Looking at the descriptive statistics shown in figure 2.5, it is clear that while, during the Regime of Nine, main sources of incomes were officials’ personal wealth and political condemnations, during the following regimes indirect taxation and forced loans became prominent revenues for the public apparatus. How did institutional changes and exogenous factors affect this increased capability of the commune to raise resources via loans and indirect taxation? To answer the question, a variable called $PubCredit_t$, measuring the percentage of income raised via forced loans and indirect taxation on the net total current income raised by the commune in each semester, is constructed. The choice to include both forced loans and indirect taxes is motivated by the fact that, as already observed in section 2.2, when new loans were imposed they were guaranteed with indirect taxes. For this reason, the collection of the two kinds of resources is considered as a measure of the capability of the commune to effectively extract resources in form of public credit from citizens.

Three different types of this variable according to three different possible behavior of citizens are constructed

$$PubCredit_t^1 = \frac{(Loans_t + IndTax_{t-1})}{NetIncome_t}$$  \hspace{1cm} (2.3)

$$PubCredit_t^2 = \frac{(Loans_t + IndTax_t)}{NetIncome_t}$$  \hspace{1cm} (2.4)

$$PubCredit_t^3 = \frac{(Loans_t + IndTax_{t+1})}{NetIncome_t}$$  \hspace{1cm} (2.5)

where $loans_t$ and $IndTax_t$ are respectively loans and indirect taxes raised at time $t$ and $NetIncome_t$ is the real income from current imposition. The three equations show three different possible attitudes of citizens towards loans and taxation. In eq.(3.3), it
is assumed that citizens looked at the quantity of indirect taxes raised in the previous semester in order to effectively lend to the commune at time $t$. Eq. (3.4) shows citizens that considered how much was raised in the same semester they lend. According to eq.(3.5), citizens decided with respect to how much would have been raised in the following period. Since no extant document can inform about citizens’ expectations, all the three specifications are regressed on the same linear model in eq.(3.2). Results are shown in table 2.5. All the three specifications have the common feature of showing that exogenous factors did not have role in determining the change in percentage of resources raised via loans and indirect taxes. Less unambiguous is the message about the role of politics and administration. When considering citizens looking at forced loans and indirect taxation of the same semester, both political and administrative changes played a significant role in increasing loans. When the other two specifications are used, only administration becomes relevant.

Summarizing, results on qualitative composition of current income reveal that extension of administrative participation played a fundamental role for the capacity of the commune to raise resources via public credit. When it is assumed that citizens were lending as a response to the indirect taxation raised in the same period, extension of political representation was even anticipating this positive effect.

### 2.7 Conclusion

In this paper it has been used a novel dataset for the Sienese public finance in the 14th-15th century in order to empirically support the arguments presented in chapter 1. There, it was introduced an hypothesis for the institutional changes in late medieval Siena where administrative organization represents a crucial explanation for the understanding of the

<table>
<thead>
<tr>
<th>Dep. variable</th>
<th>Intercept</th>
<th>$\text{OliCoal}$</th>
<th>$\text{FullCoal}$</th>
<th>$\text{FullPart}$</th>
<th>$\text{BD}$</th>
<th>$\text{MIL}$</th>
<th>$\text{INT}$</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$NetExp_t$</td>
<td>-1018895</td>
<td>92048**</td>
<td>1332</td>
<td>126646***</td>
<td>-19593</td>
<td>4511</td>
<td>-5767</td>
<td>854</td>
</tr>
<tr>
<td>$R^2=0.39$</td>
<td>(1140826)</td>
<td>(28083)</td>
<td>(37846)</td>
<td>(57098)</td>
<td>(28299)</td>
<td>(16024)</td>
<td>(36639)</td>
<td>(849)</td>
</tr>
<tr>
<td>$NetInc_t$</td>
<td>-917095</td>
<td>58590**</td>
<td>-16530</td>
<td>128958**</td>
<td>11456</td>
<td>4234</td>
<td>17865</td>
<td>771</td>
</tr>
<tr>
<td>$R^2=0.45$</td>
<td>(1071970)</td>
<td>(26388)</td>
<td>(35562)</td>
<td>(53652)</td>
<td>(26591)</td>
<td>(15057)</td>
<td>(34428)</td>
<td>(798)</td>
</tr>
<tr>
<td>$CityPerc_t$</td>
<td>-0.97</td>
<td>-0.09*</td>
<td>-0.14**</td>
<td>-0.05</td>
<td>0.02</td>
<td>0.04</td>
<td>0.03</td>
<td>0.002</td>
</tr>
<tr>
<td>$R^2=0.1$</td>
<td>(2.26)</td>
<td>(0.05)</td>
<td>(0.07)</td>
<td>(0.11)</td>
<td>(0.05)</td>
<td>(0.07)</td>
<td>(0.03)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>$AdminPerc_t$</td>
<td>0.62</td>
<td>0.09*</td>
<td>0.14*</td>
<td>0.05</td>
<td>-0.02</td>
<td>-0.03</td>
<td>-0.04</td>
<td>0.002</td>
</tr>
<tr>
<td>$R^2=0.1$</td>
<td>(2.26)</td>
<td>(0.05)</td>
<td>(0.07)</td>
<td>(0.11)</td>
<td>(0.05)</td>
<td>(0.03)</td>
<td>(0.07)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>$PubCredit_1$</td>
<td>7.8</td>
<td>0.52**</td>
<td>0.42</td>
<td>0.56</td>
<td>-0.23</td>
<td>0.01</td>
<td>0.19</td>
<td>-0.005</td>
</tr>
<tr>
<td>$R^2=0.09$</td>
<td>(8.95)</td>
<td>(0.22)</td>
<td>(0.29)</td>
<td>(0.48)</td>
<td>(0.28)</td>
<td>(0.11)</td>
<td>(0.28)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>$PubCredit_2$</td>
<td>3.01</td>
<td>0.09</td>
<td>0.2**</td>
<td>0.35**</td>
<td>0.04</td>
<td>0.10</td>
<td>0.003</td>
<td>0.001</td>
</tr>
<tr>
<td>$R^2=0.22$</td>
<td>(2.3)</td>
<td>(0.05)</td>
<td>(0.07)</td>
<td>(0.12)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.02)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>$PubCredit_3$</td>
<td>8.28</td>
<td>0.29</td>
<td>0.4</td>
<td>0.67*</td>
<td>-0.33</td>
<td>-0.05</td>
<td>0.04</td>
<td>-0.005</td>
</tr>
<tr>
<td>$R^2=0.06$</td>
<td>(7.35)</td>
<td>(0.18)</td>
<td>(0.24)</td>
<td>(0.39)</td>
<td>(0.23)</td>
<td>(0.09)</td>
<td>(0.23)</td>
<td>(0.005)</td>
</tr>
</tbody>
</table>

OLS are used in regression. Standard errors in parentheses. ***Significant at 99%. **Significant at 95%. *Significant at 90%.
peculiar history of the Tuscan city during that period. In Section 2.2 of the present paper, it has been re-presented the main historical facts with a focus on the evolution of the organization of communal finance. In section 2.3, main characteristics of the dataset have been detailed as well as the adjustments made on them in order to compare data across different periods. Section 2.4 has shown the first statistical evidences on fiscal aggregates motivating the need of a deeper econometric analysis. This has been done in section 2.5, with the research of break dates in income and expenditure, and in section 2.6, with the analysis of the impact of different factors on the evolution of these aggregates and their main components.

The analysis has pointed out important findings about Sienese public finance. First, it has revealed that the only significant role played by external events on the evolution of communal fiscal aggregates was the impact of the Black Death on the decrease of personal wealth used to finance expenditures. Mercenary attacks or external wars did not have a relevant effect on resources commanded by the commune. In addition, the analysis has shown the importance of institutional changes for both the evolution of income and expenditures and their qualitative composition. In particular, several tests imposed using the same regression model have confirmed that administrative changes were even more important than political ones to explain shifts occurred in the aggregates analyzed.

The paper, therefore, introduces at least three novel issues in the analysis of early modern public finance.

First, it reveals the importance of the Black Death as an exogenous factor capable of changing the incidence of sources of income on the total resources collected from the community, while no other change in resources collection was associated to the plague. Second, it shows that military attacks did not have a significant effect on trends in communal income and expenditure. This does not mean that they were not important for communal budget and, in fact, they constantly represented at least 40% of resources used in any political phase. Instead, the explanation is that the military use of resources was so ordinary for an Italian commune that any period of war or mercenary raid, never represented a real increasing shift in defensive expenditures. They were already ordinarily high. Finally, the main evidence from this paper is related with the impact of introduction of coalitional participations to administration and politics on the capacity of the commune to raise and expend resources. Past literature, as Stasavage (2011), has argued that shifts from oligarchic to more representative governments were associated with a lower capability to raise resources and, especially, to do it via public credit. Through the use of a novel dataset, this paper has shown the opposite. At the end of the oligarchy of merchants and bankers, contemporarily with important changes occurred in administrative participation, Siena significantly increased the quantity of resources collected and spent in its territory. This capability was maintained when participation was extended also for political representation and, again, increased with the participation of all social groups to administration. More social groups involved in the phase of implementation of fiscal policies implied a greater capability to raise resources and
the guarantee that these were used for shared interests.

Administrative changes had more impact on public finance than the extension of political participation. In a period of dramatic economic crisis and continuous external attacks what really mattered for the capability to raise resources was sharing the phase of implementation. As long as large components of the society were participating to it, this reinforced their willingness to pay and contribute to the realization of the public good, especially the defense of their independency.
Table 2.6: Archival sources

<table>
<thead>
<tr>
<th>Time interval</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1362 II semester - 1365 I semester</td>
<td>Regolatori 2.</td>
</tr>
<tr>
<td>1365 II semester</td>
<td>Biccherna 246.</td>
</tr>
<tr>
<td>1367 I semester - 1376 II semester</td>
<td>Regolatori 3, Biccherna 249.</td>
</tr>
<tr>
<td>1377 I semester - 1384 II semester</td>
<td>Biccherna 259, Biccherna 260, Biccherna 261, Biccherna 262, Biccherna 263, Biccherna 264, Biccherna 265, Biccherna 267, Biccherna 268, Biccherna 270.</td>
</tr>
<tr>
<td>1385 I semester - 1392 II semester</td>
<td>Regolatori 4</td>
</tr>
<tr>
<td>1393 I semester - 1406 I semester</td>
<td>Regolatori 5</td>
</tr>
<tr>
<td>1406 II semester - 1418 II semester</td>
<td>Regolatori 6</td>
</tr>
</tbody>
</table>

2.8 Appendix

2.8.1 Dataset description

Two archival sources have been used for the realization of the dataset for the empirical analysis: the registers of the Biccherna and the reports of the Regolatori. Books are all available in the Public Archive of Siena. In table 2.6 are reported registers used for each time interval.

2.8.2 Categories construction

Original data of semester communal incomes and revenues reported in the registers of the Biccherna have been organized in several categories presented, with a brief description, in table 2.7.

2.8.3 Dummies creation

Table 2.8 presents historical information and sources according to which dummies for military attacks and internal revolts, respectively MIL_t and INT_t, have been created. For internal revolt, the variable has value 1 in the semester after an eventual turmoil, assuming that changes in income and expenditure could be a sudden response to the revolt.
Table 2.7: Categories of communal incomes and revenues

<table>
<thead>
<tr>
<th>Group</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td>Condemnations</td>
<td>All condemnations collected by officials and soldiers of the commune.</td>
</tr>
<tr>
<td></td>
<td>Indirect taxation</td>
<td>Indirect taxes imposed on consumption or economic activities, collected by the General Gabella and then transferred to the Biccherna or directly collected by the central fiscal office. This categories includes also indirect taxes from the countryside.</td>
</tr>
<tr>
<td></td>
<td>Direct taxation</td>
<td>All direct impositions, called dazi, imposed on the assessed movables and immovables of citizens and/or inhabitants of the countryside.</td>
</tr>
<tr>
<td></td>
<td>Loans</td>
<td>Forced loans imposed on the city and the controlled countryside.</td>
</tr>
<tr>
<td></td>
<td>Extraordinary incomes*</td>
<td>All non-regular revenues of the commune, such as gains from currency exchange,</td>
</tr>
<tr>
<td>Expenditures</td>
<td>Administration</td>
<td>All salaries for public administration (including foreign officials) and other costs for ordinary implementation of administrative functions.</td>
</tr>
<tr>
<td></td>
<td>Military expenditures</td>
<td>All the defensive expenditures, sums spent to compensate mercenary companies for not attacking the city and expenditures for maintenance of internal order.</td>
</tr>
<tr>
<td></td>
<td>City services</td>
<td>Ordinary and extraordinary expenditures for the maintenance of city services and other utilities (also including religious celebrations).</td>
</tr>
<tr>
<td></td>
<td>Debt expenditures</td>
<td>Payments of interests and principal on communal debt.</td>
</tr>
<tr>
<td></td>
<td>Extraordinary expenditures*</td>
<td>All non-ordinary expenditures (e.g. loss from currency exchange),</td>
</tr>
</tbody>
</table>

*Not reported in qualitative composition analysis for their discontinuity and low incidence.
### Table 2.8: Dummies creation

#### Military attacks

<table>
<thead>
<tr>
<th>Year*</th>
<th>Event</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1342(II)</td>
<td>Attack from the mercenary company of Werner of Urslingen</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1350(I)</td>
<td>Attack from the mercenary company of Werner of Urslingen</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1357(II)</td>
<td>Attack from the mercenary company of Conrad of Landau</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1359(II)</td>
<td>Attack from the mercenary company of Conrad of Landau</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1360(II)</td>
<td>Attack from the mercenary company of Conrad of Landau</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1362(II)</td>
<td>Attack from the mercenary company of Hannekein Baumgarten</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1363(II)</td>
<td>Attack from the mercenary company of Niccoló da Montefeltro</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1364(II)</td>
<td>Attack from the mercenary company of Hannekein Baumgarten</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1365(I)</td>
<td>Attack from the mercenary company of Albert Sterz</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1365(II)</td>
<td>Attack from the mercenary company of John Hawkwood</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1366(I)</td>
<td>Attack from the mercenary company of John Hawkwood</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1369(II)</td>
<td>Attack from the mercenary company of Misser Anisi</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1370(I)</td>
<td>Attack from the mercenary company of Lucius of Landau</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1375(I)</td>
<td>Attack from the mercenary company of John Hawkwood</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1379(I)</td>
<td>Attack from the mercenary company of John Hawkwood</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1380(II)</td>
<td>Attack from the mercenary company of Charles of Dorazzo</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1381(I)</td>
<td>Attack from the mercenary company of the Bretons</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1381(I)</td>
<td>Attack from the mercenary company of the Bretons</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1382(II)</td>
<td>Attack from the mercenary company of Villanozzo of Brutifort</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1384(I)</td>
<td>Attack from the mercenary company of Bretons</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1384(II)</td>
<td>Attack from the mercenary company of John Hawkwood</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1385(II)</td>
<td>Attack from the mercenary company of Eberhart de Landau</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1386(II)</td>
<td>Attack from the mercenary company of Boldrino da Panicale</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1387(II)</td>
<td>Attack from the mercenary company of Bernardone della Salla</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1388(II)</td>
<td>Attack from the mercenary company of John Delfolt</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1392(II)</td>
<td>Attack from the mercenary company of Cecchino Broglia</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1393(II)</td>
<td>Attack from the mercenary company of Bretons</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1394(II)</td>
<td>Attack from the mercenary company of Bordo de Michelotti</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1395(II)</td>
<td>Attack from the mercenary company of Cecchino Broglia</td>
<td>Caferro (1998)</td>
</tr>
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<td>1395(I)</td>
<td>Attack from the mercenary company of Bernardone della Salla</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1396(II)</td>
<td>Attack from the mercenary company of Bartolomeo da Prato</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td>1399(II)</td>
<td>Attack from the mercenary company of Cecchino Broglia</td>
<td>Caferro (1998)</td>
</tr>
<tr>
<td></td>
<td>War with Florence</td>
<td>Brizio (1992a)</td>
</tr>
</tbody>
</table>

#### Internal revolts

<table>
<thead>
<tr>
<th>Year*</th>
<th>Event</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1344(I)</td>
<td>Conspiracy lead by the Captain of War</td>
<td>Bowsky (1981)</td>
</tr>
<tr>
<td>1346(I)</td>
<td>Conspiracy lead by the Tolomei family</td>
<td>Bowsky (1981)</td>
</tr>
<tr>
<td>1355(I)</td>
<td>Artisans’ and stonemasons’ revolt</td>
<td>Moscadelli (1982)</td>
</tr>
<tr>
<td>1368(I)</td>
<td>Revolt against the Twelve</td>
<td>Moscadelli (1982)</td>
</tr>
<tr>
<td>1370(II)</td>
<td>Bruco’s revolt</td>
<td>Franceschini (1995)</td>
</tr>
</tbody>
</table>

*Semesters in parentheses.*
3  Nordic exceptionalism?
Social democratic egalitarianism in world-historic perspective

Mattia Fochesato and Samuel Bowles

Abstract

We ask: In what respect, if any, are the Nordic economies exceptionally egalitarian when viewed from a world historical perspective? We use archaeological, historical and ethnographic as well as contemporary evidence to estimate the degree of wealth inequality over the past three thousand years. Our data set includes measures of inequality of wealth from economies based on foraging, sedentary hunting and gathering, horticulture, herding, and agriculture, and under institutions ranging from communal property, ancient slavery, feudalism, pre-modern centralized authoritarian systems, pre-modern urban economies, as well as contemporary capitalist economies governed by democratic polities.

The countries exemplifying the Nordic model are not exceptionally equal in the ownership of material wealth. Moreover, the advent of social democracy in the Nordic nations did not result in a more equal distribution of years of schooling. But intergenerational economic and social mobility appears to be exceptional in the Nordic nations, and by most measures, inequalities in living standards in the Nordic economies are less than in other advanced economies. The closest Nordic analogy in our data set is the egalitarian distribution of well-being found in some horticultural and forager economies, in which neither human nor material wealth is strongly transmitted across generations, and one’s ownership of material wealth is not very important as a source of an individual’s livelihood, because one’s livelihood depends more on non-material forms of wealth including group membership, independently of material wealth.

Keywords: wealth inequality, redistribution, Nordic model, economic systems, Gini coefficient, social democracy, hunter-gatherer.
3.1 Introduction

Nobody doubts that the Nordic economies are exceptional, and that among other things, they are exceptionally egalitarian.\footnote{We will see that the Nordic economies - Denmark, Finland, Norway, and Sweden - differ markedly one from another but share common elements sufficient to motivate our reference generically to the Nordic model. To avoid overlap with other papers we do not describe the Nordic model here. Beyond the works cited below and the other papers in this symposium, we have been guided by Moene and Wallerstein (1993, 1995a,b) and Anderson et al. (2007) among other works. We would include Iceland in the Nordic club, but lack adequate data. The term Nordic exceptionalism is associated with the models of welfare capitalism of Esping-Anderson (1990) while the idea of Nordic distinctiveness goes back at least to the representation of Sweden as "the middle way" in Childs (1936).} We use archaeological, ethnographic, and historical data to ask in what respects are the Nordic economies exceptionally egalitarian when compared to the vast range of economic systems that humans have experienced over the course of our history and pre-history. While the Nordic economies are not exceptional in the degree of equality in material wealth or human capital, we find two exceptional aspects of Nordic egalitarianism: the limited relevance of differences in wealth on the distribution of living standards and greater intergeneration mobility in economic and social status.

The unusual nature of our data warrants a comment (the data set is described in detail in Fochesato and Bowles (2013a)\footnote{The paper has not been made available on line yet and it is submitted as an attachment to this thesis.}). Because we wish to compare the Nordic economies with a broad spectrum of other economic systems, in addition to contemporary evidence, we include historical data from land and tax records and wills, as well as archaeological data. As a basis for educated guesses about the degree of inequality in Late Pleistocene and early Holocene economies (before and after the domestication of plants and animals about 12 millennia ago) we also use data collected by ethnographers and archaeologists from societies of foragers, sedentary hunter gatherers, horticulturalists, herders and small scale farmers whose economies arguably resemble those of pre-historic humans (described in Borgerhoff-Mulder et al. (2009)). (Foragers are mobile hunter gatherers; horticulturalists are low technology farmers loosely distinguished from farmers by the use of only hand tools, land abundance and/or the lack of draft animals.)

Our data set on wealth inequality complements that of Branko Milanovic, Peter Lindert and Jeffrey Williamson on ancient income inequality (Milanovic et al. (2011)). We restrict our analysis to cases for which measures of the entire wealth distribution are available and hence we do not consider partial measures of inequality, such as the share of wealth held by the very wealthiest. Where multiple estimates for a given area at about the same time period exist, we have taken averages, so as to avoid overweighting economies and time periods on which there are a large number of estimates of (approximately) the same quantity.

We consider three types of wealth. Somatic wealth is an individual’s strength, cognitive ability, health status and other capacities to produce or provide the goods or services that contribute to well being. Relational wealth is a measure of the extent to which an individual’s social connections contribute to well being, as could be measured by the individual’s position.
in social networks or by group membership. Material wealth refers to such things as tools, livestock, and land, and is synonymous with the traditional economic meaning of wealth, measured by a stock of alienable property that contributes to a flow of well being. We focus on wealth rather than income because for most economies in the past we have more adequate measures of wealth than income (even measured for a single time period) and because we are interested in differences in permanent (rather than transient) economic status. Inequality in annual income may grossly overstate inequality in permanent income (by a factor of 50 percent comparing annual with total income in Sweden over 1951-1989 (Bjorklund (1993)).

In the next section we provide a model of the dynamics of wealth inequality and its relationship to inequalities in living standards, allowing us to identify four mechanisms that may result in a highly egalitarian distribution of living standards. We then ask which, if any, of these mechanisms may account for Nordic egalitarianism. In section 3.3 we consider material wealth inequality in the Nordic and other democratic societies as well as in autocratic societies of the past and the small scale economies of the type that characterized human societies though much of our history and prehistory. In section 3.4 we compare inequalities in somatic wealth across a wide range of economic systems; and we ask whether the marked equality in human assets in the Nordic nations can be attributed to the social democratic model per se, or instead predated its emergence. Section 3.5 contrasts the degree of intergenerational transmission of economic success in the Nordic economies with similar data from other modern economies and small scale societies. Section 3.6 extends the analysis of intergenerational transmission to educational attainments; and, as in section 3.4, we ask if the extensive intergenerational mobility in the Nordic nations today can be attributed to the social democratic model per se. In the penultimate section we use the theoretical results in section 3.2 to show that a variant of Stephen Durlauf’s membership model of inequality captures important aspects of Nordic egalitarianism, as well as the egalitarian forager and horticultural economies of human pre history (Durlauf (1999)). We conclude using the model of section 3.2 to identify which of the four possible ways to be egalitarian account for the relative equality of living standards in the Nordic nations.

3.2 Four ways to be egalitarian

To explore the possible the distinctiveness of social democratic egalitarianism we offer an accounting framework that identifies four causal mechanisms that could contribute to a relatively equal long term stationary distribution of living standards. We first identify two proximate determinants of the stationary distribution of wealth, and then two (also proximate) determinants of the extent to which wealth inequalities result in inequality of the flow of the goods and services making up the living standard. The purpose of the model is taxonomic, not descriptive; we do not estimate it, but rather use it to define and illustrate the classes of distinct phenomena that impact on the degree of equality in living standards so as to clarify the importance of and relationships among the empirical measures of inequality.
to be introduced subsequently.

We refer to consumption units (for example, households) as individuals. There are two kinds of wealth, one of which is held equally and from which the flow of services is equal across households. The wealth that may be unequal (“wealth” hereinafter) is held in positive amounts by all members of the population, and is transmitted from parents to offspring to a degree which will vary according to demographic structure, type of wealth, and inheritance practices (including bequest taxation). (We could consider the different wealth types separately and in the aggregate, but this would add little to the insights of this exercise.) Members of each generation experience idiosyncratic wealth shocks that alter the holdings inherited from their parents. Under conditions to be specified presently, this economy will support a long term stationary distribution of wealth as in Becker and Tomes (1979). An individual’s wealth produces a flow of services (called the individual’s living standard) the extent of which will depend on first, the goods and services produced and the methods of producing them, which determines the extent to which the unequally held wealth generates the goods and services making up an individual’s living standard; and second, the extent of redistributive policies affecting the flow of goods and services associated with privately held wealth, on which we impose an upper bound requiring that increased wealth not be associated with a reduced living standard.

Let an individual’s wealth \( w_i \) vary with parental wealth \( w'_i \) and mean wealth \( \bar{w} \) (all measured in natural logarithms, and normalized so that mean wealth is invariant across generations) according to

\[
  w_i = (1 - \beta)\bar{w} + \beta w'_i + \lambda_i \tag{3.1}
\]

where \( \lambda \) is a wealth shock uncorrelated with parental wealth, with mean zero and variance \( \sigma^2_\lambda \). The parameter \( \beta \) is termed the intergenerational transmission elasticity and \( (1 - \beta) \) is the extent of regression to the mean. Taking the variance of \( w_i \) in (3.1) setting it equal to the variance of \( w'_i \) and solving to find the variance of the stationary distribution of wealth \( \sigma^2_{w^*} \), we have

\[
  \sigma^2_{w^*} = \frac{\sigma^2_\lambda}{(1 - \beta^2)} \tag{3.2}
\]

which means that (for \( \beta < 1 \)) the degree of inequality in the stationary distribution is given by the magnitude of the wealth shocks, expanded by the intergenerational transmission multiplier, \( (1 - \beta^2)^{-1} \), reflecting the fact that where transmission is substantial, the inequalities introduced by wealth shocks in past persist and augment the inequalities induced by contemporaneous shocks.

An individual’s per period flow of living standard acquired as a result of her wealth holding \( Y_i \) depends on her wealth \( W_i \) according to

\[
  Y_i = \alpha W_i^{\alpha - \tau} \tag{3.3}
\]
where $\alpha \geq \tau \geq 0$ and $\alpha - \tau$ is the elasticity of the (after redistribution) flow of living standards with respect to the amount of wealth held. The exponent $\alpha$ measures the importance of wealth as a contributor to one’s living standards in the hypothetical absence of redistribution, and $\tau$ measures effect of redistributive policies. Letting $y$ and $w$ be $\ln Y$ and $\ln W$, and using equation (3.2) our measure of stationary inequality of living standards is thus

$$\sigma^2_y = (\alpha - \tau)^2 \sigma^2_{w^*} = (\alpha - \tau)^2 \sigma^2_\lambda (1 - \beta^2)$$

(3.4)

Equation (3.4) identifies four aspects of an economy that affect the degree of inequality in living standards:

1. the extent of wealth shocks, $\sigma^2_\lambda$;
2. the intergenerational transmission multiplier $(1 - \beta^2)^{-1}$ which varies with the degree to which wealth is transmitted across generations, $\beta$;
3. the importance of the unequally held form of wealth in producing the goods and services making up the living standards of the people, $\alpha$; and
4. the extent of redistributive policies affecting the relationship between the flow of services produced by wealth and the living standards of the wealth’s owner, $\tau$.

We will see that over the course of history, societies have differed substantially in all of these dimensions. These terms represent the proximate determinants of living standard inequality in the model, through which the influence of the underlying causes of inequality work. For example the nature of the goods and services making up a people’s livelihood (wild versus cultivated species, for example) or the technologies by which a livelihood is gained (material capital intensive versus human capital intensive farming, for example) will affect $\sigma^2_\lambda$, $(1 - \beta^2)^{-1}$ and $\alpha$. The distribution of political power and the institutions regulating how the members of society interact in producing their livelihoods will affect $(1 - \beta^2)^{-1}$, $\tau$ and possibly $\sigma^2_\lambda$. Thus when we identify the distinctive aspects of Nordic egalitarianism we will be pointing to proximate determinants, not underlying causes.

To measure the effects of redistributive policies affecting the flow of living standards from an individual’s wealth, and to compare the effects of redistribution across economies, we will need a measure of how redistribution affects inequality of living standards conditional on a given level of inequality in wealth. We call this the redistribution ratio, $\rho$, defined one minus the ratio of post redistribution inequality of living standards to inequality in living standards that would occur in the hypothetical absence of the redistributitional policies captured by $\tau$. Thus in a society with unequally held wealth and perfect equality in living standards, we have $\rho = 1$; while if living standards are no more equally distributed than would have occurred in the absence of redistribution policies, we have $\rho = 0$. Using equation (3.4) and representing the presence and hypothetical absence of redistribution by $\tau > 0$ and $\tau = 0$ we have
\[
\rho = 1 - \left[ \frac{(\alpha - \tau)^2 \sigma_W^2}{\alpha^2 \sigma_W^2} \right] = \left( \frac{\tau}{\alpha} \right) [2 - \left( \frac{\tau}{\alpha} \right)] 
\]

from which one sees that as expected if \( \tau = 0 \) then \( \rho = 0 \) and if \( \alpha - \tau = 0 \) so that variations in private wealth do not affect living standards, then \( \rho = 1 \).

This measure is restricted in a number of ways. It considers only redistribution policies that may attenuate the living standards effects of disparities in the returns on private wealth, not those policies affecting the extent of private wealth inequality or the extent of returns to wealth that would occur in the absence of redistribution. And defining the hypothetical distribution of living standards in the absence of the forms of redistribution associated with our parameter \( \tau \) presents all of the usual challenges associated with counterfactual assumptions. But bearing these caveats in mind we think that estimates of \( \rho \) are informative, for example about the contrast between East Asian and Nordic egalitarianism and the affinities between Nordic and forager egalitarianism.

Many dimensions of inequality have been prominent in debates on public policy and normative evaluations of economic outcomes. We now proceed to ask if the Nordic economies are exceptional in four possible respects (all considering, where data allow, material, somatic or relational wealth), namely that a) wealth inequality is low, b) the intergenerational transmission elasticity is low, c) inequality in living standards is low or d) combining our answers to a) and c) \( \rho \) is substantial. If we do find Nordic distinctiveness in any of these cases, we will ask, where data allow, whether the distinctiveness can be traced to the mid 20th century implementation of the social democratic model, or instead characterized the Nordic nations before that.

### 3.3 Material wealth inequality

The kinds of material wealth on which we have data include such disparate categories as land, various species of livestock, household items, shares in whaling canoes, hunting weapons and other tools, grave goods (the wealth with which one is buried), and ownership of modern capital goods as conventionally measured. Thus problems of comparability of our data are considerably more challenging than those found in more homogeneous data sets (Piketty et al. (2006)), Ohlsson et al. (2006) and Roine and Waldenstrom (2009)). Where possible we have adjusted the raw data on individual or family holdings of material wealth to make the resulting estimates more comparable across types of wealth (for example, land, livestock, tools) as well as across historical epochs, and economic systems.

The most important comparability adjustment (and the reason why our data differ from other estimates) is that in our estimates of the Lorenz curves on which the Gini coefficients are based, we have included as members of the relevant population those holding no wealth of a given type (landless farmers in an agrarian economy, for example, or slaves in a slave owning economy). We have also, where possible, aggregated the estimated wealth of couples,
and in non-market societies assigned shadow prices to disparate items of wealth (rather than the common practice of simple item counts). But in much of the pre-modern data (both historical, archaeological, and ethnographic) there is an unavoidable source of mis-estimation due to the fact that typically just a single measure of wealth is available (livestock or land, for example, but not both). Where holdings of different kinds of wealth are highly correlated the errors will be modest, as is the case, for example, among the Kipsigis farmer herders of Kenya (where the Gini coefficients for livestock wealth, land wealth, and a composite total wealth are 0.59, 0.56 and 0.55 respectively.) But where the ownership of wealth of different types is not highly correlated then the use of a single measure will substantially overstate the degree of wealth inequality.

Another source of bias is that errors in measurement (likely to be substantial in the earlier data sets) will add spurious wealth differences. Possible downward biases include the much smaller geographical scope of many of the earlier estimates, often referring to single villages or language communities rather than the considerably more heterogeneous populations of nation states to which the more recent data refer. For example, inequality in grave wealth among the entire population of fishers on Columbia Plateau a millennium ago was 0.497, while the average of the inequality within the villages making up the population was 0.454 (we use the former number). We address possible biases arising from differing population sizes in more detail in appendix 3.9.4, drawing on the more complete discussion in Fochesato and Bowles (2013a).)

Measures of material wealth inequality are available for three of Nordic economies - Sweden, Norway and Finland - and these (shown in Figure 3.1) rank respectively 4th, 34th and 46th most unequal of the 89 estimates in the data set. (Appendix 3.9.1 presents alternative estimates for Sweden.) If one were to consider our ethnographic estimates from small scale societies as possibly representative of levels of inequality twenty or ten thousand of years ago (in the case of hunter gatherers and those exploiting domesticated species respectively), then the estimates in Figure 3.1 would reinforce the impression that the wealth distributions of the Nordic economies are not exceptionally equal.

The historical evidence on the Nordic economies is limited, but it is consistent with the conclusions one might draw from the other data in Figure 3.1. Estimates of Gini coefficients based on tax and probate records of total privately held wealth (including debts and housing) from the beginning of the 19th century (Soltow (1979, 1981, 1985)) are 0.67 for Finland (1800) and 0.75 for both Norway (1789) and Sweden (1800). An estimate from Finland (tax-based) gives a Gini coefficient for material wealth (excluding land) of 0.49 in 1571.

From the available data it appears that the overall distribution of material wealth in the Nordic countries is not substantially more equal in today’s technologically advanced capitalist economies under social democratic policies than it was two hundred or more years ago in farming economies under autocratic rule. But this is not the right counterfactual comparison for assessing the effects of the Nordic model: a more illuminating but wholly hypothetical counterfactual would be today’s Nordic economies without the Nordic model.
A hint of what such a comparison might show, were it possible is that there were significant reductions in the share of wealth held by the top wealth holders in Sweden in the post-World War II period (Ohlsson et al. (2006)), consistent with a strong Nordic model effect. Measures of the inequality of the wealth distribution as a whole are not available for these periods, however, so we are unable to determine if these losses in top shares of wealth represent a Nordic model induced trend towards reduced overall inequality of wealth, or instead were offset by disequalizing changes elsewhere in the distribution.

3.4 Schooling and human capital

At first glance, the case for Nordic exceptionalism appears much stronger if we turn from material to human capital. In contrast to material wealth, human capital in the Nordic nations quite equally distributed. The mean Gini coefficient for years of schooling in the Nordic countries is one third of the mean for the non Nordic countries on which such measures are available. Moreover, comparing these schooling data with a heterogeneous set of somatic wealth inequality measures, the Nordic nations appear to be at least as equal in this respect as the most egalitarian economic systems in our data set: foragers and horticulturalists. But years of schooling is not a very good proxy for an individual’s somatic and relational wealth, or even for education. If the average quality of schooling is greater for those who complete...
more years of schooling, for example, then the years of schooling Gini will understate the
degree of inequality in education. (At a given level of schooling - that attained by 15 year
olds - the Nordic countries are modestly more equal than other high income societies in the
levels of cognitive performance measured by reading, science and mathematics scores, so
comparisons based on inequality in school years may slightly understate the degree to which
the Nordic countries are more equal. See appendix 3.9.2). In view of the shortcomings of years of schooling measures of inequality, we also consider
a labor market measure of inequalities in individuals’ non material wealth, namely the Gini
coefficient for before tax wages and salaries. The centralized wage bargaining characteristic
of the Nordic model surely reduces wage inequality (compared to some hypothetical Nordic
economy without centralized bargaining) but whether this entails an understatement of
inequalities in non material wealth is difficult to say. The reason is that some of the resulting
wage compression is due to the elimination of idiosyncratic pay differences associated with
place of employment and other individual differences that are not reflective of individuals’
non material wealth.

In Figure 3.2 we present measures of inequality of somatic and relational wealth in
the Nordic economies and small scale economies. Relational wealth is measured by an
individual’s degree in networks of gift exchange, food and labor sharing, and political allies.
These data may overstate inequality as they pertain to quite specific capacities. For example,
among the Tsimane, a hunting and horticultural population in Amazonian Bolivia, both skill
in hunting and gathering and relational and relational wealth (the number of those who cooperate with the
individual in work projects) are quite unequally distributed, but men good at hunting for
example, may not have the most network ties, so a plausible aggregate of these two kinds
of wealth would be less unequally distributed than the components measures making it up.

Perhaps the most comparable measures concern the ability of an individual to make
a living, that is, wage inequality in the Nordic economies and inequality in hunting and
gathering returns among foragers. By this comparison the Nordic nations are substantially
more unequal than the foragers (mean Gini coefficients of 0.42 and 0.25 respectively, $p <
0.001$).

Turning to a comparison of the Nordic nations with other modern national state scale
economies, the Nordic model *per se* is not what accounts for the modest schooling Gini
coefficients in Figure 3.2. Rather, they reflect the fact, common to the set of all nations,
that where schooling levels are high years of schooling inequality is quite limited.

To test for Nordic exceptionalism in schooling, we regressed schooling Gini coefficients
on the average years of schooling across 38 nations for which data are available (excluding
the Nordic nations) and then compared the observed levels of schooling inequality in the
Nordic nations with the expected levels based on the pattern among the non-Nordic nations.
We were also able to exploit the cohort structure of our schooling data to explore whether
individuals who entered schooling in periods before the Nordic nations could be called social
democratic were more differentiated in their eventual years of schooling than those who
Figure 3.2: Non-material wealth inequality in Nordic countries and forager and horticultural small-scale societies. Sources: Borgerhoff-Mulder et al. (2009); Brandolini and Smeeding (2007) and Hertz et al. (2007).

entered schooling under a social democratic regime. While one cannot give a particular date on which the Nordic model was launched, we let that first "Nordic model generation" in our data set be those born between 1941 and 1950. The results are in the left panel of Figure 3.3. (The regression details for both panels of Figure 3.3 are in appendix 3.9.2).

The regression line gives the expected Gini coefficient estimated from the 38 nation data set, while the empty symbols are the pre-regime shift Nordic cohorts. The Nordic observations both before and following the advent of the social democratic model are no more egalitarian than expected given the average level of schooling for the cohort in question. The advent of social democracy per se seems to have had no effect on schooling inequality, conditional on the overall level of schooling. In both cases, when estimated with the Nordic nations included, the coefficient of a dummy variable for cohorts that are Nordic nation under the Nordic model is of the unexpected sign (Nordic model cohorts less egalitarian), small, and insignificantly different from zero (see appendix 3.9.2.)

It is possible that the distinctive nature of the Nordic model in this respect was to expand schooling (with lower Gini coefficients then the expected consequence). To explore the possibility of this scenario of a Nordic pro-schooling bias with greater equality in human capital as a result, we regressed between cohort differences in years of schooling on the average level of schooling in the 38 nation data set, finding an inverse relationship shown by the regression line in the right panel of Figure 3.3. The open symbols above the regression
Figure 3.3: Schooling inequality and schooling expansion compared with expectations based on 38 other nations’ data for pre (open symbols) and Nordic (bold symbols) model cohorts. The left panel gives the expected level of schooling inequality based on a regression of Gini for schooling attainment on the natural logarithm of mean schooling for non-Nordic countries (the line) along with the observed schooling inequality for the Nordic country cohorts. The right panel shows (the line) expected cohort difference in mean schooling levels from a regression of the inter-cohort differences in years of schooling \((S_t - S_{t-1})\) on a transformation of initial level of years of schooling \((S_{t-1})\) along with the values of these two variables for the Nordic nations. For the pre Nordic model. Source and methods: see appendices 3.9.2 and 3.9.2.

The line indicates that compared to other nations, the Nordic nations were markedly (and significantly) more pro-schooling expansion prior to the advent of the social democratic model; but not subsequently.

3.5 Nordic exceptionalism: intergenerational mobility in earnings and wealth

The Nordic model cannot claim to be exceptionally egalitarian in either the size distribution of material wealth or years of schooling. But as we will see, the Nordic economies are exceptionally egalitarian in that the economic and social status of one’s parents matters less in these countries for the eventual success of their children.

Figure 3.4 presents estimates of the degree of intergenerational transmission of economic status as measured by the elasticity of the adult offspring’s economic status with respect to the parents’ status. The four estimates from ethnographic evidence in small scale societies are based on age-adjusted levels of somatic, relational and material wealth, using weights reflecting the importance of each wealth type in the economy under study (Borgerhoff-Mulder et al. (2009)). The modern economy data refer to earnings. The two sets of estimates are not directly comparable, of course, but the data are suggestive of the substantial differences in the heritability of economic status across economic systems and also among the advanced economies in our data set.

Even taking account of the many reasons for lack of direct comparability, it appears that the Nordic economies may be similar to the hunter gatherer and horticultural societies in the
Figure 3.4: Intergenerational transmission of economic status: comparing small-scale society (total wealth) with contemporary advanced countries (wages). Source: Borgerhoff-Mulder et al. (2009), Jantti et al. (2006).

data set, and considerably more mobile than the herding and agricultural small scale societies as well as the U.S. and U.K economies. We selected the data set comparing the Nordic economies with other modern economies because the estimates are more nearly comparable across nations, and because data were available for women as well as men. Alternative estimates (Bjorklund and Jantti (2009), Corak (2006)) confirm the contrast between the U.S and U.K on the one hand (joined by Italy and possibly France) and the Nordic nations (joined by Canada). (The transmission elasticities for the Nordic nations (and Canada) are estimated quite precisely, while this is not the case for other nations.)

A check on these estimates is provided by data on the degree to which biological siblings tend to have similar incomes. This is because siblings have in common their parents’ wealth, schooling, genes, personalities and other possible direct or indirect influences on labor market success. The comparably estimated data appear in Figure 3.5, and are broadly consistent with the conclusion from Figure 3.4. In the case of Sweden, sibling correlations in income fell from 0.49 for the cohort born in 1932-1938 to 0.32 for the cohort born in 1947-1953 with a major contribution to the decline apparently the result of the expansion and associated equalization of years of schooling evident in Figure 3.3 (Bjorklund et al. (2009)).

Reliable estimates of the intergenerational transmission of material wealth are few, in part because data sets typically do not include the wealth of more than a single generation at the same age, and few have measures of second generation wealth after the death (and
Figure 3.5: **Sibling earnings correlations as an indicator of intergenerational transmission of economic status.** Source: Björklund et al. (2002).

hence bequests) of the parents. Boserup et al. (2013), however, make use of three generations of Danish administrative wealth records to estimate the intergenerational transmission elasticity, with 0.19 their preferred estimate (note that this is the same magnitude as the intergenerational transmission of aggregate wealth elasticity for foragers shown in Figure 3.4.) An estimate for the U.S. based on a smaller data set by Charles and Hurst (2003) yields an estimated intergenerational wealth elasticity of 0.365 (but those with zero or negative wealth are excluded and this is a data set in which both parents are still living). The Danish estimate closest in methods and data to this U.S. estimate is 0.268. Because the grandparental generation in this data set did not live as adults prior to the Nordic model’s advent in Denmark, we cannot exploit the three generation structure of the data to make inferences about the effects of the model on intergenerational wealth transmission.

While the Nordic economies thus appear to be distinctive in the lesser degree to which earnings and material wealth are transmitted across generations, the result is far from an intergenerational level playing field. First, transmission elasticities for income are typically much greater than for earnings shown for the Nordic countries in Figure 3.4 (in Sweden, for example 50 per cent greater or more depending on the sample Bjorklund et al. (2012)). Second, quite modest transmission elasticities estimated for an entire population (for example averaging about a quarter for men and women for earnings, as in Sweden) are consistent with the existence of extraordinarily long lived dynasties at the top with income transmission elasticities as high as 0.9 as in Sweden (Bjorklund et al. (2012)). And finally even a
modest transmission elasticity of 0.25 implies (if the parental and offspring distributions of economic success are bivariate normal) that the likelihood that the offspring of parents in the top decile will in adulthood attain the top decile is five times the likelihood that a child from the bottom decile will be similarly successful.

3.6 Nordic exceptionalism: Intergenerational mobility in schooling

Intergenerational transmission of years of schooling (measured by an approximation of the elasticity of offspring years of schooling with respect to parental schooling) is marginally and insignificantly less in the Nordic nations (on average) by comparison to the average of other advanced economies in our data set (Italy, USA, Switzerland, Flemish Belgium, Netherlands, New Zealand, and Great Britain). But our data set allows us to estimate the degree of intergenerational transmission of years of schooling by cohort, so we can test if the cohorts schooled after the implementation of the Nordic model exhibit a lesser intergenerational schooling elasticity than those schooled before (as we did in Figure 3.3 for the size distribution of years of schooling). Results are shown in Figure 3.6. As before we define the Nordic model cohorts as those all of whose members would have begun schooling after World War II. Analyzing our cohort data on intergenerational schooling elasticities for all of the advanced economies, we find that there is a small insignificant positive ”Nordic country” effect large and a significant ”Nordic model” effect \( t = -1.98 \) indicating that in the hypothetical absence of the Nordic model the degree of intergenerational schooling elasticity would have been a third higher. (Statistical details of regression are shown in 3.9.2. The pre Nordic-Nordic contrast is considerably greater if rather than elasticities approximated at the means of the two generations, we measure the estimated derivative of schooling of offspring with respect to schooling of parents. The negative Nordic model effect on the intergenerational transmission is about half the magnitude of the effect on the intergenerational elasticity and only marginally significant \( p < 0.157 \). We consider the differences between these measures in appendix 3.9.2, and explain why the correlation coefficient is uninformative for the questions we have asked here.)

This ”Nordic model effect” on intergenerational mobility appears also in a quite different data set on educational attainments over four generations in the Swedish city of Malmo. Lindahl et al. (2012) tracked changes in the persistence of social and economic status (measured by years of schooling) over multiple generations spanning a period during which Malmo and Sweden was transformed from the early stages of industrialization to a modern-service oriented economy and welfare state. In this data set the four generations’ average birth years were 1898 for the great grandparents, 1928 for the grandparents, 1956 for the parents and 1985 for the current generation. Despite Malmo being in the forefront of the social democratic movement early in the century, it seems unlikely that the grandparents’ generation felt the impact of the Nordic model during their formative years in school. The parents and current generation however were schooled in a society shaped by the SAP’s long unbroken
period in power in the four decades following the depth of the Great Depression.

Did the Swedish variant of the Nordic model significantly reduce the degree of intergenerational transmission of educational attainment? The intergenerational schooling elasticity for two generations (parents and offspring) fell to less than half of its pre-Nordic model values for the generation born in the 50s (compared to the generation born in the 20s). This is consistent with the evidence concerning three-generation intergenerational schooling elasticities (estimated by the effect of variations in years of schooling two generations back on the level of schooling attained by the generation in question and the ratio of the mean schooling levels of grandparents and grandchildren.) This three-generation elasticity from the great grandparents born in the 1890s is twice the three-generation coefficient for the grandparents born in the 1920s.

In Figure 3.7 we present these estimates. Looking at the detailed pattern of transmission coefficients for all possible pairs of intergenerational transmission (from grandmother to father, or great grandfather to mother, and so on) confirms these patterns. The Malmo data are consistent with the conclusion that the Nordic model increased educational mobility (reduced the intergenerational schooling elasticity) over most of the distribution of years of schooling, while sustaining a considerable degree of persistence among the most highly educated. This is a conclusion also consistent with the evidence in Figure 3.6 combined with remarkable intergenerational persistence of occupational and educational success of

Figure 3.6: Birth cohort analysis of intergenerational schooling transmission. The bars indicate the intergenerational schooling elasticity estimated at the means of the two generations before (grey) and after (black) the implementation of the Nordic model. Source: Hertz et al. (2007).
3.7 Nordic egalitarianism: a citizenship model

We conclude that in terms of economic and social success it matters less who your parents are in the Nordic economies. In this section we will see that one’s own wealth also appears to matter less.

To explore this hypothesis we would like to compare the distribution of wealth (as measured by some aggregate of material and human wealth, for example) and the distribution of well being. The latter would require an adequate measure of an individual’s or family’s well being including not only purchased goods and services but also the elements of a family’s livelihood that are acquired without purchase by dint of location or citizenship such as non-priced educational, health and personal security services or environmental amenities. Internationally comparable measures that capture at least some of these dimensions are provided in Aaberge and Langorgen (2010). They show that adding public services (school and health care) to households’ earnings, income inequality decreases in all of contemporary countries. But, Nordic countries are not exceptional in this reduction.

Stephen Durlauf (1999) distinguished between two inequality generating processes. In the standard process studied in economics one’s income (or other measure of one’s living standard) depends on one’s wealth (both material and human). But in what he called the
membership model what matters is the group or groups to which one belongs. We can use a variant of the membership model to understand the exceptional nature of Nordic egalitarianism, one in which the group to which one belongs is the entire nation, each member of which by dint of citizenship can lay claim to substantial resources.

Available data do not allow an entirely adequate estimate of the extent to which a citizenship model applies to the Nordic nations. The reason is that a substantial fraction of the goods and services that make up an individual’s standard of living are not measured comparably across nations, or in many cases not adequately measured at all. Examples include such difficult to measure aspects of well being as personal security and environmental conditions.

The closest approximation of a measure of the extent to which citizens’ living standards are independent of their wealth that is comparable across a significant number of economies is based on a comparison of the Gini coefficient for market income (as a proxy for the distribution of wealth, both human and material) and disposable income (as a proxy for living standards). This commonly used measure of tax and transfer redistribution is far from adequate, however. For the reason just mentioned disposable income is a poor proxy for living standards, especially in economies in which publically provided services constitute a significant fraction of citizens’ living standards. Moreover redistributive public policies have direct effects on the distribution of market incomes, as occur, for example when income tax rates affect labor supply through either incentive or Veblen effects (Oh et al. (2012), Prescott (2004)) or educational policies affect the distribution of human capital.

The available evidence is in Figure 3.8, where numbers at the top of the bars are the redistribution ratio ($\rho$) introduced in Section 3.2 and measured here as one minus the ratio of the Gini coefficient for disposable income to the Gini coefficient for market income. The average redistribution ratio for the Nordic economies is 0.45 and for the others 0.29 (the two means are significantly different at $p < 0.001$). The two East Asian economies (mean $\rho = 0.06$) differ markedly from the rest by the virtual absence of tax and transfer redistribution.

Calculated in this manner the redistribution ratio fails to capture an important Nordic model mechanism that mitigated the effect of wealth differences on differences in well being, namely, the compression of market income inequality through solidaristic wage bargaining and active labor market policies (Moene and Wallerstein (1997)). Were we able to measure these effects along with tax and transfer redistribution, the distinctiveness of the Nordic countries would almost certainly appear greater.

Is the substantial redistribution ratio characteristic of the Nordic economies exceptional in world historic perspective? For the vast majority of economic systems no such measurements are possible, but we do have data on the very considerable fraction of food acquired through one’s hunting or gathering activities that is distributed to others (Kaplan and Gurven (2005)) as well as analogous data from horticultural economies in the Amazon. With a bit of exaggeration we can imagine that in these small scale societies, some fraction of all foods acquired is placed in a common pot from which all members consume equally, while
the remainder is consumed by the immediate family of the individual who acquired the food (This ”common pot” system of distribution is recognizable in public economics as a linear tax followed by equal lump sum transfers.)

Using this simplification we can estimate the redistribution ratio. To exploit the available data - the average fraction of foods acquired that are allocated to consumption outside the immediate family - a linear version of the model in Section 3.2 is appropriate, and, as a result, the coefficient of variation of living standards and wealth rather than the variance of the logarithms of these quantities.

We are interested in inequalities in individual well being measured by food consumption \( Y_i \) among \( n \) members of a group \( (i = 1, \ldots, n) \) in which food may be acquired as a result of one’s own wealth measured by individual hunting and gathering returns \( (W_i) \) and, independently of \( W_i \), as a right to an equal portion of food from ”the common pot.” We consider the right to food simply as a consequence of membership in the group to be form of Durlauf’s associational (or relational) wealth similar to one’s position in a social network. We simplify by letting each member of the group derive the same level of well being, \( A \), from membership, so that we have \( Y_i = A + bW_i \) where \( b \) is the effect of variations in individual \( i \)’s wealth on her well being. We normalize the population mean well being, and set this equal to the mean wealth of the group so that \( \frac{Y}{n} = 1 = W \). Using these normalizations, our data on the average and marginal tax rate \( (1 - b) \) is an estimate of \( A \), that is, \( A = (1 - b) \).
Figure 3.9: The fraction of food consumed by the acquiring family and the implied redistribution ratio in hunter gatherer and horticultural populations. The fraction of food acquired by a family that is retained and consumed by the acquiring family is an estimate of \( b \) in the text immediately above, so the complement of the height of the bars, namely \( 1 - b = \rho \), is the redistribution ratio. The mean (of these values) of the foragers is 0.295 and of the horticulturalists is 0.643. The difference in means is significant at \( p < 0.001 \). Source: Gurven et al. (2002); Yora: Hill and Kaplan (1989); Aka: Bahuchet (1990, 1991); Hiwi: Gurven et al. (2000); Rakoiva, Krishiwi and Bisaasi (1986 and 1987): Hames (2000); Ye’kwana: Hames and McCabe (2007).

To determine the redistribution ratio, \( \rho \), from these data we use estimates of the coefficient of variation of wealth and living standards, \( c_W \) and \( c_Y \) respectively, with \( \rho = 1 - \left( \frac{c_Y}{c_W} \right) \). Because \( Y = 1 = W \) we have \( c_Y = \frac{\sigma_Y}{\sigma_Y} = \sigma_Y \) and \( c_W = \frac{\sigma_W}{\sigma_W} = \sigma_W \), and noting that \( \sigma_Y^2 = b^2 \sigma_W^2 \) we have \( c_Y = (b^2 \sigma_W^2)^{1/2} = b^2 \sigma_W \), so \( c_Y = bc_W \) and as a results \( \rho = 1 - b = A \). Thus the redistribution ratio is simply the fraction of one’s food that by dint of membership rights comes from the common pot.

In four forager and four horticultural communities ethnographers provide detailed measurement of the flow of foods by caloric value from those who acquire them to those who consume them. Based on this evidence, Figure 3.9 presents estimates of the fraction of the food acquired by an individual that is retained for consumption for his or her family, that is \( b \). The complement of this statistic is \( \rho \) itself; and as one can see there the redistribution ratio is substantial, especially in the foraging populations.

But like lump sum transfers in the public economics literature, the common pot is an abstraction; many transfers are bilateral, and a family can expect that those receiving transfers will reciprocate. To take account of this aspect of redistribution we define reciprocation as a return transfer expected as a result of the initial transfer (namely that would not have
occurred in its absence) above and beyond the amount that would have resulted from family ties, genetic relatedness, propinquity and other influences on sharing. The few studies providing data for such an estimate suggest that reciprocation in this narrow causal sense does exist in both forager and horticultural societies, but that it is quite modest (see appendix 3.9.5).

If we apply the average reciprocation rate from these to these data we find the average redistribution ratio for the foragers is 0.640 and 0.260 for the horticulturalists. These estimates are used in Figure 3.10 to compare the redistribution ratio across economic systems, illustrating a distinctive aspect of Nordic egalitarianism (and its affinity to hunter gatherers). We do not have data sufficient to estimate $b$ for farming and herding small scale economies, but ethnographic descriptions suggest that small scale farmers and herders retain a significantly greater portion of the returns to their wealth, and hence the redistribution ratio in these societies would be lower than the hunter gatherer populations, or in all likelihood the horticultural societies reported here, as well.

### 3.8 Conclusion

Given the heterogeneity of the set of economies and wealth types we have considered, the small and unrepresentative samples on which we have in some cases relied, and the lack of data sufficient to calibrate a complete model of the mechanisms that translate wealth in-
equalities into inequalities in living standards, we cannot claim precision for the quantitative assessments we have made.

But even with these caveats in mind we can suggest an answer to the question with which we began. In what respects are the Nordic countries exceptionally egalitarian? From the model in section 3.2 we know wealth inequalities may be limited either if the i) shocks to wealth in a given generation \((\sigma_\lambda)\) are modest or ii) the transmission of wealth across generations \((\beta)\) is limited; and that the contribution of inequalities in a particular type of wealth to inequality in living standards may be modest either because iii) the type of wealth is not very important in generating the flow of goods and services on which one’s living standards depends \((\alpha\) is small), or because even if it is important in production, iv) its ownership is only weakly related to one’s command of goods and services \((\tau\) is substantial relative to \(\alpha)\).

The egalitarianism of the forager economies in our data set derives from reasons ii, iii, and iv and probably from reason i as well. Among foragers, wealth is not very unequal because it is not highly transmitted across generations, and probably because the vast number of wild species exploited by foragers provides a kind of portfolio diversification against shocks. Moreover among foragers the only form of wealth that is observed to be highly unequally held in some societies, that is material, it is not very important in the production of goods and services, and the link between success in hunting and gathering (based on somatic and relational wealth) and one’s subsequent consumption is weakened by substantial redistribution within the group.

By contrast, the exceptional egalitarianism of the Nordic model appears to derive from the fourth mechanism - redistribution - and possibly from the second (limited intergenerational transmission). As in all advanced economies, material wealth makes an important contribution to production and neither material and nor human wealth are particularly equally held (at least not in world historic perspective). Evidence on the transmission of material wealth across generations is limited; a single estimate indicates a lesser degree of transmission in a Nordic nation (Denmark) than in the U.S.. But we just do not have the data allowing a generalization about material wealth transmission across generations in the Nordic economies. We do, however, have convincing evidence on the link between and one’s wealth (material and non material) and one’s standard of living (measured by the inverse of the redistribution ratio) and it is markedly weaker in the Nordics than in other economies, with the exception of some forager and horticultural economies and a handful of democratic capitalist nations exemplified by Belgium.
3.9 Appendix

3.9.1 Database composition

Description

The difference between this dataset and the pioneering compilation for the analysis income inequality in ancient societies used in Milanovic et al. (2011) is the object on which Gini coefficients are computed. While in Milanovic, Lindert and Williamson indexes are computed on national income aggregates distributed across a population through the construction of social tables, here Gini coefficients refer to distinct types of wealth held by households or households. We collected 63 coefficients computed on estimates of household wealth (such as cattle, livestock, housing, movables and immovable), 2 Gini coefficient computed on grave good values (averages of data from a total of 27 burial assemblages) and 24 coefficients computed on land. To make our data as comparable as possible, corrections have been implemented when raw data were reporting wealth owned by individuals rather than by households, when zero-wealth owners were omitted by original documents or when data referred to time intervals rather than single data point. Procedures for data correction are detailed in Fochesato and Bowles (2013a).

Sweden

Contemporary wealth distribution in Sweden has been object of several empirical researches producing, in one case, what appears to be an outlier. Discrepancies in measurement might be attributed to diverse sources used to estimate inequality. In Davies and Shorrocks (2000), when coefficients are computed on a market-valued wealth survey (called HINK, described in Lindh and Ohlsson (1998)) the Gini coefficient for 1985 net worth in Sweden is equal to 0.59. The average of the 17 other available estimates is 0.84 (0.04). Limits of this dataset, as also observed in Klevmarken (2006), are the absence of adjustment for purchase price differences and the possibility that the tails of the distribution are excluded from the survey. Subsequent studies, such as Sweden (2000), Klevmarken (2006), Sierminska et al. (2006) (based on the Luxembourg Wealth Survey) and Davies et al. (2012), have computed coefficients based on tax registers. In some cases, as in Sierminska et al. (2006), some of the data have been adjusted for market values, while in Sweden (2000), Klevmarken (2006) and Davies et al. (2012) no adjustment has been made. In all these cases, Gini coefficients on net worth are never less than 0.78, as shown in Table 3.9.1. Finally, in Flood and Klevmarken (2008), a complex procedure has been implemented to combine tax registers and wealth surveys and obtain complete and price fluctuation adjusted wealth distribution in Sweden. Resulting coefficients on net worth confirm the high estimates found by those authors using only tax registers. Table 3.9.1 shows the Luxembourg Wealth Survey (LWS) based coefficient used in this study and with the other estimates found in the above cited literature. The mean absolute difference between our estimate and the others is 0.07.
Table 3.9.1: **Gini coefficients for wealth distribution in contemporary Sweden.** All the estimates are computed on net worth (real and financial assets minus liabilities). *Computed on net worth minus house assets and liabilities with a procedure explained in Fochesato and Bowles (2013a). In bold is the estimate we included in our database. Sources: Davies and Shorrocks (2000), Sweden (2000), Klevmarken (2006), Sierminska et al. (2006), Davies et al. (2012), Flood and Klevmarken (2008), LWS (2012).

<table>
<thead>
<tr>
<th>Year</th>
<th>Gini coefficient</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>0.783</td>
<td>Sweden (2000)</td>
</tr>
<tr>
<td>1983</td>
<td>0.798</td>
<td>Sweden (2000)</td>
</tr>
<tr>
<td>1985</td>
<td>0.808</td>
<td>Sweden (2000)</td>
</tr>
<tr>
<td></td>
<td>0.590</td>
<td>Davies and Shorrocks (2000)</td>
</tr>
<tr>
<td>1988</td>
<td>0.831</td>
<td>Sweden (2000)</td>
</tr>
<tr>
<td>1990</td>
<td>0.838</td>
<td>Sweden (2000)</td>
</tr>
<tr>
<td>1992</td>
<td>0.865</td>
<td>Sweden (2000)</td>
</tr>
<tr>
<td>1997</td>
<td>0.855</td>
<td>Sweden (2000)</td>
</tr>
<tr>
<td>1999</td>
<td>0.860</td>
<td>Klevmarken (2006)</td>
</tr>
<tr>
<td></td>
<td>0.930</td>
<td>Flood and Klevmarken (2008)</td>
</tr>
<tr>
<td>2000</td>
<td>0.960</td>
<td>Flood and Klevmarken (2008)</td>
</tr>
<tr>
<td>2001</td>
<td>0.840</td>
<td>Klevmarken (2006)</td>
</tr>
<tr>
<td>2002</td>
<td>0.850</td>
<td>Klevmarken (2006)</td>
</tr>
<tr>
<td></td>
<td><strong>0.890</strong></td>
<td>LWS (2012) (our computation) and Sierminska et al. (2006)</td>
</tr>
<tr>
<td>2003</td>
<td>0.850</td>
<td>LWS (2012) (our computation) *</td>
</tr>
<tr>
<td>2012</td>
<td>0.800</td>
<td>Davies et al. (2012)</td>
</tr>
</tbody>
</table>

Table 3.9.2: **Welch’s t-test for average coefficient of variations of schooling performance in Nordic and other advanced countries.** Nordic countries include Norway, Denmark Finland and Sweden. Non-Nordic countries include Japan, Australia, Canada, United States, Austria, Belgium, Switzerland, France, United Kingdom, Italy, Netherlands, Germany. Data refer to year 2006. Source: Ferreira and Gignoux (2011)

<table>
<thead>
<tr>
<th>Test</th>
<th>Difference tested</th>
<th>Difference tested</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>mean(non-Nordic) - mean(Nordic)</td>
<td>0.024</td>
<td>1.59</td>
<td>0.090</td>
</tr>
<tr>
<td>Math</td>
<td>mean(non-Nordic) - mean(Nordic)</td>
<td>0.019</td>
<td>1.94</td>
<td>0.051</td>
</tr>
<tr>
<td>Science</td>
<td>mean(non-Nordic) - mean(Nordic)</td>
<td>0.017</td>
<td>1.61</td>
<td>0.088</td>
</tr>
<tr>
<td>All subjects</td>
<td>mean(non-Nordic) - mean(Nordic)</td>
<td>0.020</td>
<td>2.91</td>
<td>0.004</td>
</tr>
</tbody>
</table>

### 3.9.2 Schooling analysis

**Schooling performance from PISA tests scores**

Using PISA test scores of various dimensions of cognitive performance among 15 year olds (Ferreira and Gignoux (2011)), we are able to compare average coefficients of variation in Nordic countries to those of other advanced nations. Table 3.9.2 shows statistical details of the Welch’s t-test for the three subject matters for which data are available. Also, we merge results of the three tests and compare Nordic countries average score to the one of the other advanced economies (last row in Table 3.9.2). The grand mean for the coefficients of variation being compared here is 0.193, so the differences between the Nordic and non Nordic nations shown here are quite modest (about ten percent). Only Finland appears to have appreciably and consistently more equal academic achievement than the non Nordic nations.
Data origin

Gini coefficients of schooling attainment in contemporary societies have been computed on the dataset provided in Hertz et al. (2007). For each country, average years of schooling have been grouped according to the following 10-year birth cohorts: 1921-30 through 1971-80. For the 1921-30 birth cohort, missing countries are: Sri Lanka, East Timor, Nepal, Malaysia; Northern Ireland, New Zealand, Slovenia, Ukraine, Belgium, Switzerland, United Kingdom, Peru, Estonia, Hungary, Slovakia, Norway, Czech Republic, Denmark, Finland, Indonesia, Italy. Malaysia and Peru are missing for the 1971-80 birth cohort. For the following countries, birth cohorts with a small number of observations have been excluded: Switzerland 1921-30, USA 1921-30, Ireland 1921-30, Nicaragua 1921-30 and Philippines 1921-30.

Expected schooling inequality and schooling expansion

Two normalization equations have been used to establish the expected degree of schooling inequality and expected inter-cohort difference in schooling for a given level of average schooling. Because the Gini of years of schooling is statistically associated with the extent of schooling (Gini coefficients are very high when schooling is so rare that most individuals have no schooling at all), we study the deviation of a country’s Gini from that expected on the basis of its average level of schooling. To assess the effect of average years of schooling on education inequality in different political regimes, the following form has been used

\[ Gini = b_0 + b_1 \ln(S) \]  \hspace{1cm} (3.6)

where \( S \) is the average years of schooling during the analyzed period. Figure 3.9.1 shows that the Gini is approximately linear in the natural logarithm of schooling. Results of the regression with standard errors of estimate in parentheses are:

\[ Gini = 1.09 - 0.89 \ln(S) \pm (0.03) \]  \hspace{1cm} (3.7)

with coefficients estimated using OLS, both significant at 99%, number of observations equal to 38. Both the \( R^2 \) and the adjusted-\( R^2 \) are equal to 0.94.

An alternative equation including Nordic countries within observations (pre and post implementation of the Nordic model) and a dummy for Nordic model observations has been run

\[ Gini = b_0 + b_1 \ln(S) + b_2 \text{Nordic} \]  \hspace{1cm} (3.8)

where \( S \) is the average years of schooling during the analyzed period and \( \text{Nordic} \) is the
Figure 3.9.1: **Schooling inequality varies inversely with average schooling level.** (Equation (3.7).) Note: open dots are the Nordic nations (prior to and after the Nordic model’s implementation, not used in estimating the equation.)

dummy with value 1 if the observation refers to a Scandinavian country after the implementation of the Nordic model. Results of the regression are:

\[
Gini = 1.097 - 0.894 \ln(S) + 0.004 \ Nordic
\]

with coefficients estimated using OLS, \(b_0\) and \(b_1\) both significant at 99% while \(b_2\) being not statistically significant. Number of observations equal to 46 and standard errors in parenthesis. Both \(R^2\) and the adjusted-\(R^2\) are equal to 0.94.

To assess the effect of the initial average level of schooling on the variation of the level of schooling in the subsequent period, the following normalization regression has been used based on the natural logarithm of the difference between the country cohort’s level of schooling and 15 (the normalization is selected to achieve an approximately linear relation between schooling level and cohort difference in the in level of schooling.)

\[
(S_t - S_{t-1}) = b_0 + b_1 \ln(15 - S_{t-1})
\]

Equation (3.11) shows details of data used for the regression. The level of schooling predicts the cohort difference schooling with much less precision than is the case for schooling unequal-
ity; but given our transformation of average schooling the relation appears approximately linear. Results of the regression are

\[(S_t - S_{t-1}) = 0.11 - 1.26 \ln(15 - S_{t-1})\]

\[\begin{align*}
(0.14) & \quad (0.17)
\end{align*}\]

with coefficients estimated using OLS, \(b_1\) significant at 99%, number of observations equal to 156 and standard errors in parenthesis. The \(R^2\) is equal to 0.29 and the adjusted-\(R^2\) is equal to 0.27. Figure 3.9.2 shows observed values and regression line.

Also in this case, we have run an alternative equation including Scandinavian countries among the observations and a dummy variable for the Nordic model.

\[(S_t - S_{t-1}) = b_0 + b_1 \ln(15 - S_{t-1}) + b_2 \text{Nordic}\]

Results of the regression are

\[(S_t - S_{t-1}) = -0.05 - 1.24 \ln(15 - S_{t-1}) - 0.09 \text{Nordic}\]

\[\begin{align*}
(0.15) & \quad (0.18) & \quad (0.34)
\end{align*}\]

with coefficients estimated using OLS. Only \(b_1\) is significant at 99%. Number of observations is equal to 164 and standard errors are in parenthesis. The \(R^2\) is equal to 0.22 and the adjusted-\(R^2\) is 0.21.

We did not use the Lee and Barro (1997) data set as it does not permit us to implement the cohort analysis on which our comparison of the Nordic model cohort with previous cohorts and our analysis of schooling expansion (Figure 3.3) is based. But we can check our estimated normalization equation using the Barro Lee data (and the Gini coefficient estimated by Castello and Domenech (2002)) and find that it is virtually identical to that estimated using the Hertz et al data (equation (3.8)). Using the Barro Lee data as in our results reported here, the observed Gini coefficient for years of schooling for Denmark, Norway and Sweden is almost exactly what is expected for their levels of mean years of schooling. Finland, however, is somewhat (but not significantly) more egalitarian than predicted as a result of the seemingly anomalously much lower measured average years of schooling in Finland (by comparison to the other Nordics).

**Birth cohort analysis of intergenerational schooling transmission**

In order to check for Nordic model exceptionalism in intergenerational schooling transmission we have regressed the estimated intergenerational schooling elasticity (ISE) from on 5-year birth cohorts for USA, Netherlands, Ireland, Belgium, UK, Italy, Switzerland, Norway, Sweden, Denmark and Finland (n=112) on time and on two dummies for Scandinavian countries (before and after the adoption of the Nordic model). Based on our reading of the
Inter-cohort difference in schooling varies inversely with the mean level of schooling. (Equation (3.11).) Note: open dots are the Nordic nations (prior to and after the Nordic model's implementation; not used in estimating the equation.)

historical evidence children exposed to the Nordic models are those who would have begun schooling after the end of World War II, so the first "Nordic cohort" were born in 1940-1944. Results of the regression with standard errors of estimates in parentheses are

\[
ISE = 0.485 - 0.005 \text{ Year} + 0.025 \text{ Nordic}_{\text{country}} - 0.106 \text{ Nordic}_{\text{model}} \\
(0.01) \quad (0.0009) \quad (0.04) \quad (0.054) 
\]

with \text{ Year} having a value equal to the midpoint of the birth cohort of observation minus the midpoint of the first Nordic model birth cohort (1942). Coefficients are estimated with OLS. Estimates (not shown) using the 1945-1949 birth cohort as the first Nordic cohort give very similar results. Were we to use the regression coefficient (derivative of offspring schooling with respect to parental schooling) rather than the elasticity, the Nordic model effect would be considerably larger (relative to the mean estimates).

**Intergenerational derivatives, elasticities, correlations**

What is the appropriate measure of intergenerational transmission of wealth in a model of the dynamics of wealth inequality? Our model in section 3.2 shows that the intergenerational elasticity allows a simple representation of the stationary wealth distribution. But are there alternative measures? We would like a measure that captures "how much advantage is
passed on from parent to offspring” and that allows a parsimonious representation of the
dynamics of wealth inequality under the influence of intergenerational transmission.

Suppose that an individual’s wealth (measured in its own untransformed units) is \( W_i = A + BW'_i + \Lambda_i \) where the prime (′) indicates the previous generation and \( \Lambda_i \) is the error term. If we de-trend the data so that \( W = W' \) then we can express the variance of the stationary distribution as

\[
\sigma^2_W = \frac{\sigma^2_\Lambda}{(1 - B^2)}
\]  

and using the coefficient of variation as our measure of inequality in the stationary distribution, we have

\[
c_W = \frac{\sigma_W}{W}
\]

By contrast, the intergenerational correlation coefficient (\( \phi_{W,W'} \)) does not allow a representation of the stationary wealth distribution. This is because \( \phi_{W,W'} \) is \( B \) normalized by the ratio of the standard deviations of the wealth measure in the two generations:

\[
\phi_{W,W'} = B \frac{\sigma_{W'}}{\sigma_W}
\]

Thus \( \phi_{W,W'} \) measures intergenerational derivative (\( B \)) only for a population in which the degree of inequality is unchanging across generations (or more generally the derivative of the second generation wealth with respect to parental wealth when both measures have been normalized to have unit variance.)

If we would like to study changes in the intergenerational transmission of wealth as part of an investigation of changes wealth inequality then movements in the correlation coefficient are uninformative. The reason is that a decline in \( B \) is predicted to result in \( \sigma_{W'}/\sigma_W > 1 \) and this may also occur due to whatever policies reduced \( B \). So if the trend towards greater equality in the cross section (represented by \( \sigma_{W'}/\sigma_W > 1 \) is sufficiently great, the intergenerational correlation coefficient could increase, despite a fall in \( B \).

This is more than a hypothetical possibility. That this seemingly paradoxical result occurred in a large international comparative study is the major finding of the authors who produced our schooling data set, Hertz et al. (2007): there is a significant downward trend in the regression coefficients (\( B \)) and a slight (and insignificant) upward trend in the correlations (\( \phi_{W,W'} \), Figure 1). A similar pattern is evident in the correlations reported in Lindahl et al. (2012), namely a significant downward trend in \( B \), and no trend or possibly upward trend in \( \phi_{W,W'} \) (Table 3).

Consistent with our model in section 3.2 we have used intergenerational elasticities rather
than simply the derivative $B$. Our approximation of the elasticity at the means is

$$\beta = B \frac{W'}{W} \quad (3.18)$$

These "faux elasticities" are not the true elasticities that would be estimated from an equation using the natural logarithms of the wealth measures of the two generations, a procedure that is typically impossible with wealth measures (including years of schooling) due to the presence of individuals with zero wealth.

Comment. The extent of intergenerational transmission of wealth may be of interest in its own right (rather than as part of the explanation of stationary wealth inequality), for example in normative discussions of violations of equality of opportunity. For this purpose the measure one finds informative depends on the metric in which the advantage parents pass on to their children is to be measured. The educational advantages of those with well educated parents might be conceived of as the further learning associated with years of schooling, implying the use of $B$; or perhaps years of schooling relative to the general level of schooling in the population, in which case $\beta$ would be appropriate. Only if the advantage is conceived entirely relatively, that is, the passing on of ones position in a distribution, would $\phi_{W,W'}$ be appropriate.

3.9.3 The Redistribution ratio

Statistical differences across groups of societies

The redistribution ratio for contemporary advanced countries has been defined as $\rho = 1 - \left( \frac{\text{Gini}_{\text{disp}}}{\text{Gini}_{\text{mark}}} \right)$ where $\text{Gini}_{\text{mark}}$ is the Gini coefficient computed on market income and $\text{Gini}_{\text{disp}}$ is the Gini coefficient computed on disposable income. Welch’s t-test is used to check the difference of redistribution ratios among the following groups of societies: i) Four Nordic countries (Finland, Denmark, Norway and Sweden) and 11 contemporary advanced countries (Netherlands, Germany, Switzerland, Austria, Belgium, Spain, Italy, Canada, Australia, UK, US) in 2010; ii) The four Nordic countries and a group of 9 forager (Ache, Yora, Aka Pygmies, Hiwi) and horticultural (Rakoiva, Krishisiwa, Bisaasi 1986, Bisaasi 1987 and Ye’Kwana) small-scale societies; iii) Nordic countries and the 4 forager small-scales societies in point (ii); iv) Nordic countries and the 5 horticultural small-scales societies in point (ii). Table 3.9.3 shows results of Welch’s t-test.

The results show that the mean value of redistribution ratios in Nordic countries is statistically significantly higher (at the 99% confidence level) than the mean in non-Nordic contemporary countries and horticultural societies, rows (i) and (iv). Average ratios for Nordic countries are not statistically significantly higher than mean redistribution ratios for the whole set of small-scale societies or for the forager ones, rows (ii) and (iii).
Table 3.9.3: Welch’s t-test for average redistribution ratios across different societies.

<table>
<thead>
<tr>
<th>Test</th>
<th>Difference tested</th>
<th>Difference (3)</th>
<th>t (4)</th>
<th>p-value (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>mean(non-Nordic) - mean(Nordic)</td>
<td>-0.156</td>
<td>-4.30</td>
<td>0.0003</td>
</tr>
<tr>
<td>ii</td>
<td>mean(smaller scale) - mean(Nordic)</td>
<td>-0.018</td>
<td>-0.31</td>
<td>0.3787</td>
</tr>
<tr>
<td>iii</td>
<td>mean(forager) - mean(Nordic)</td>
<td>0.146</td>
<td>2.85</td>
<td>0.0261</td>
</tr>
<tr>
<td>iv</td>
<td>mean(horticultural) - mean(Nordic)</td>
<td>-0.151</td>
<td>-4.62</td>
<td>0.0019</td>
</tr>
</tbody>
</table>

Table 3.9.4: Income and wealth based redistribution ratios

<table>
<thead>
<tr>
<th>Country</th>
<th>Income based</th>
<th>Wealth based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>0.45</td>
<td>0.63</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.41</td>
<td>0.74</td>
</tr>
<tr>
<td>Norway</td>
<td>0.47</td>
<td>0.67</td>
</tr>
<tr>
<td>Germany</td>
<td>0.40</td>
<td>0.62</td>
</tr>
<tr>
<td>Italy</td>
<td>0.32</td>
<td>0.45</td>
</tr>
<tr>
<td>Canada</td>
<td>0.30</td>
<td>0.60</td>
</tr>
<tr>
<td>USA</td>
<td>0.22</td>
<td>0.56</td>
</tr>
<tr>
<td>Average</td>
<td>0.36</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Using a different concept of redistribution ratio

For 7 advanced countries, the redistribution ratio could also be defined as

\[
\rho = 1 - \left( \frac{Gini_{disp}}{Gini_{wealth}} \right)
\]

where the Gini on net worth \((Gini_{wealth})\) substitutes for the Gini on market income. New and old ratios are shown in Table 3.9.4.

Table 3.9.5 reports results of the Welch’s t-test when the two different ratios are used:

The results show that for both wealth and income based redistribution ratios, the mean value for non-Nordic countries is statistically significantly lower than the one of Nordic countries at 95% confidence interval.

3.9.4 Size effect on material wealth inequality comparisons

Because larger and more populous entities may be more heterogeneous with respect to both environmental (e.g. land quality) and individual differences (e.g. culture) affecting wealth, comparability across our estimates requires that possible size effects be accounted for. In Fochesato and Bowles (2013a), we explore these size effects. Gini coefficients estimated from larger entities are larger in our data set, but this appears to be entirely the result

Table 3.9.5: Welch’s t-test for income and wealth based redistribution ratios differences across contemporary countries.

<table>
<thead>
<tr>
<th>Red. ratio (1)</th>
<th>Difference tested</th>
<th>Difference (3)</th>
<th>t (4)</th>
<th>p-value (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wealth based</td>
<td>mean(non-Nordic) - mean(Nordic)</td>
<td>-0.120</td>
<td>-2.39</td>
<td>0.0243</td>
</tr>
<tr>
<td>Income based</td>
<td>mean(non-Nordic) - mean(Nordic)</td>
<td>-0.135</td>
<td>-3.34</td>
<td>0.0102</td>
</tr>
</tbody>
</table>
of the fact that estimates from larger entities are from economic systems associated with substantial inequalities, not from size per se. In three cases for which we have estimates of Gini coefficients from both lower level entities and the aggregate for these entities as a whole - late medieval Finland and two sites in pre-historic North America - there seems to be little effect of size beyond populations of a thousand. For late medieval Finland, the Gini coefficients for lower level population groups (such as parishes) average about 95% of the level of Gini coefficients of the higher level entities that they make up (such as districts).

3.9.5 Estimated redistribution ratio for hunter gathers and horticulturalists

To take account of reciprocated food sharing among horticulturalists and hunter-gatherers, we define \( r \), as the fraction of the quantity transferred from family \( A \) to family \( B \) that is reciprocated in transfers from \( B \) to \( A \) in the causal sense: the initial transfer from \( A \) to \( B \) per se is the cause of the return transfer rather than genetic relatedness, spatial proximity and other correlates of transfers. In this setup, the family now retains a fraction of its wealth equal to the part not contributed to others \( (b) \), plus the reciprocation by others of the family’s transfers \( r(1-b) \), and the amount consumed from the common pot is now the amount that families do not retain minus the amount that is reciprocated to other families (rather than going to the common pot) or \( (1-b)(1-r) \), so the individual’s well being can now be written

\[
Y_i = A^* + b^*W_i = (1-b)(1-r) + [b + r(1-b)]W_i
\]

Thus the redistribution ratio adjusted for reciprocation is

\[
\rho = 1 - b^* = 1 - [b + r(1-b)]
\]

The few studies providing data for an estimate of \( r \) suggest that reciprocation does exist but that it is quite modest. For Hiwi (Gurven et al. (2000), Table 7) and Ache forest foragers (Gurven et al. (2002) Table 4), Gurven and his co authors found reciprocation rates for all foods of 0.184 and zero respectively. For sedentary Ache horticulturalists (Gurven et al. (2002), Table 4) the reciprocation rate (also for all foods) was 0.27. These estimates are of course unlikely to be representative of the full range of foraging and horticultural populations. If we nonetheless applied the average of the two foraging reciprocation rates (0.092) to the foragers in the Figure 3.9 and the sedentary farming Ache rate (0.27) to the horticultural populations, the average effective tax rate \( (1-b) \) for the foraging populations would fall from 0.705 to 0.640 while that for horticulturalists would fall from 0.357 to 0.260. These are the numbers used in Figure 3.10.
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