ALTERNATIVE SCHEMES FOR HEALTH CARE EXPENDITURE: A POLITICAL ECONOMY STUDY ON OECD COUNTRIES

by

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DEDICATION

This is dedicated to Gigetto, Annamaria, Paolo and Sarah

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ABSTRACT

ALTERNATIVE SCHEMES FOR HEALTH CARE EXPENDITURE: A POLITICAL ECONOMY STUDY ON OECD COUNTRIES

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Starting in the late 1880's the OECD countries adopted several different mechanisms for subsidizing health care and broadening coverage. These include tax preferences, direct subsidies, mandated health insurance programs, and various government-financed single payer systems. In most cases, combinations of these systems have been used along with direct private purchases of health care. This dissertation attempts to explain why different systems and different system mixes have been adopted by democratic countries.

To that end, a model of the collective decision making is developed using tools from public choice, political economy, and economics. The model is used to characterize quasi-constitutional choices of health care systems. For the most part, the analysis focuses on selection of the dominant part of a nation's system. The model assumes that individuals' preferences include narrow self-interest and broader social values and

ideology. When the economic interests dominate, equal and healthy societies are predicted to select systems in which private insurance dominates. In unequal and risky societies, voters are predicted to adopt a national health service. In intermediate cases, mandated insurance programs are predicted. When broader ideological interests prevail, more or less equal and healthy societies may prefer adopting a national health service.

These predictions are tested using panel data on a sample of 21 OECD countries spanning from 1970 through 2007. The results show that income distributions, morbidity levels, and ideology all affect system choices.

CHAPTER 1

INTRODUCTION

1.1 Prologue

Spending on health care has increased dramatically during the twentieth century. This has occurred in both private and public sector insurance programs. For example, in 1960, the average expenditure on health care in OECD countries was 3.8 percent of GNP. During the next fifty years the fraction of GNP devoted to health care had more than doubled. In 2007, spending on health care within OECD countries averaged 8.6 percent of GDP.

Several factors affected the path of expenditures. First, economic growth increased personal income, which boosted the demand for health care as it does for all normal and superior goods. Second, the menu of health care options increased dramatically as technological innovation took place. Some of these innovations reduced costs, as with vaccinations and antibiotics, but the dominant effect was to make medicine a more labor and capital intensive industry. Third, there was an expansion of coverage as many countries in the OECD increased the size and scope of their health care programs.

Although the trend in health care expenditures as a share of GNP was similar in most OECD countries – because they were similarly affected by the effects of increased income, coverage, and technological advances – the extent of the expansion of the health

care sector varied according to the systems in place. In general, there was greater relative growth of the health care sector in countries that used private insurance systems (PHS) than those using mandated insurance (SHI) or national health care systems (NHS). This suggests that system choice is an important and neglected part of the explanation of national health care expenditures.

This dissertation analyzes the choice of health care systems using models from public choice and economics. The choices of interest are quasi-constitutional in nature, because countries rarely shift from one (dominant) health care subsidy and delivery system to another. This fact tends to make the analysis more complicated at the same time that it makes tests of the theory more difficult, because it implies that the sample of country system choices tend to be relatively small. In most cases, the structure of the health markets in individual OECD countries has been very stable. Overhauls do occasionally occur: As in the former soviet socialist republics in the 1960s and in the late 1990s. Significant reforms were also adopted in Italy and Spain in 1978, in Switzerland in 1996, in the Netherlands in 2006, and in the United States in 1965 and 2010. Modest reforms of the mix of private, social insurance, and direct government provision of health care are somewhat more commonplace, but have only modest effects on a nation's health care market.

The expenditures shown in Figure 1 suggest that some of the simpler electoral redistributive models of government expenditures are unlikely to explain either the choice of systems or their development through time (Tullock, 1959; Usher, 1977; Meltzer and Richard, 1981). The systems in which electoral pressures were the largest,

perhaps surprisingly, exhibited slower and less growth than the more private systems. The analysis below attempts to explain system choice and adjustment as a joint consequence of narrow economic interests, morbidity, and ideology.

1.2 Background

The best method of providing health care is a widely discussed topic these days. To a large extent, this policy debate has been stimulated by concern about the rising levels of expenditure due to technological advances and aging of the population. At the policy level, controversies also include the extent to which health care should be provided publicly, and how this should be done. Countries like Canada and the United Kingdom have been better than others at keeping health spending in check than many other countries. However, some would argue that they have done so by providing a low level of health service (Feldstein, 1995.) Other countries where the standards of health care services are high, such as the United States and Switzerland (until 1996), are criticized for their failure to assure that health care is available to all their citizens or residents – Cutler (1995; 2000); Cutler et al. (2000); Glied (2003); and Reinhardt et al. (2002; 2004).

Evidently, the public policies that determine how health care is provided have effects on both the cost of health care programs and the breadth of coverage. However, the combinations of mechanisms adopted to provide public health care have been not been extensively explored. The long-term fiscal problems associated with public and private health care systems suggests that it is critical to better understand both the effects of different forms of health care provision and the politics behind their adoption.

Among the OECD countries, payments for health care are made through different combinations of similar basic mechanisms. Payments normally rely, to varying degrees, on private insurance, compulsory statutory insurance, out-of-pocket payments and a single-payer national health service.

In most cases, one of the mechanisms dominates. These are supplemented with the others. For example, buying health service directly from providers and paying for it with out-of-pocket expenditure is a minor system in countries where a national health service or private insurance represent the major system. Private insurance also tends to be a minor system in such countries. An exception to that rule is the United States, where private and social insurance (Medicare and Medicaid) are more or less equally applied, although particular groups (middle class, poor, elderly) are mostly served by one of these mechanisms.

1.3 Aims

The dissertation develops a positive theory of the choice of health care systems. To do so, it explores the factors that led the OECD countries to adopt different architectures for the health care market. The argument is that self-interest and ideological motivations together with political institutions largely drive this process. The distribution of income and morbidity across the population, and their normative theories, produce the private demands for health care. In combination with a nation's political institutions, these determine national health care policies.

To provide a positive theory of the determination of health care policies is a difficult task. The models developed in this dissertation rely upon more or less conventional rational-choice models of behavior. The collective decision making that determines health care system is assumed to take place at a quasi-constitutional stage of voting in which voters decide which system to adopt from given options. The options considered are assumed to be various combinations of three basic mechanisms through which health care expenditure is financed within the OECD countries. These are, respectively, private insurance, social insurance, and a national health service. Once adopted, it is assumed that political support for the broad outlines of the policies is essentially constant. The health care system adopted can remain in place for a long time, unless factors that affect the political demand for health care services change in a major way. Insofar as these factors are more or less constant, votes at the quasi-constitutional stage occur only rarely.

Voters are assumed to have (a) different levels of income and morbidity, (b) to

have different ideas about the importance of equality and welfare of a society, and (c) to have rational expectations about the cost of health care under each available financing option. An extended model of self-interest is used because it seems evident that human preferences are not driven exclusively by narrow self-interest. Considerations regarding equality and welfare are very likely to affect people's decision about the way health care should be publicly provided. This is especially true given the large extent of the public share of health spending in many OECD countries.

It follows from these assumptions that each person's preferred public policies depend on their personal status – i.e., income and morbidity – and their ideas about the society. In democracies, the collective decision about which health system to adopt depends on the preferences of the majority of the citizens. As a first approximation, I assume that the median voter theorem can be used to characterize decisions. If true, different combinations of mechanisms to finance the health care expenditure among OECD nations reflect different narrow and broad interests for their median voters.

That the models developed in this dissertation focus on a constitutional stage is partly a result of the observed experience of health care systems. In most countries, the essential structure of the health care markets has been very stable. That is to say, one mechanism tends to be dominant for long periods of time. The number of major reforms implemented in the OECD countries since its inception in the late Nineteenth Century is extremely small.

This dissertation suggests that the underlying stability reflects a durable and stable political equilibrium, which may be partly a consequence of the health care institutions

adopted. Both the medical associations and the association of insurers have strongly opposed most reforms of national health care systems. Shifts in ideology are also fairly rare. The advent of socialism and communism in Europe occurred only once. Another reason for stability is that national income and morbidity distributions tend to change very slowly. Both the income distribution and the level of morbidity have not seen rapid change in any of the OECD countries.

The most plausible explanation for the long-term stability of the health systems is that these forces may have been at play at the same time. This may particularly true about the stability of the component, which plays the major role in the provision of health care – i.e., private insurance in the United States or Switzerland; social insurance in Austria or Germany; and national health service in Great Britain or Sweden.

If such stability is anticipated, a quasi-constitutional analysis is the appropriate one to use for modeling the determination of health care systems. Once the parties involved in the political process have attained an agreement about the system to adopt, they will likely try to maintain it in place as long as possible. Attempts to modify the new status quo are to be expected only if the interests of a large part of the population change.

Nonetheless, small changes in the combination of features used are possible and are occasionally adopted. In this sense, there are quasi-constitutional and "day-to-day" policy choices in the health care area. The former implies that the dominant mechanism of a nation's health care system tends to be stable through time. The later implies that whether it pays for 80 or 85 percent of all expenditures may be adjusted through time as

political equilibria regarding such details change through time. The difficulty of adopting large scale reforms of a nation's health care system, and its impact on the society, imply that health care systems are an example of a social contract.

1.4 Organization

The dissertation is organized as follows. Chapter 2 provides an overview of health care systems in the OECD countries. Chapter 3 provides a survey of the public choice and political economy research on public support for health care and on system choice. Chapter 4 develops an original model of health care system choice. Chapter 5 tests the model using data from OECD countries. Chapter 6 summarizes the contribution of this dissertation and suggests extensions.

CHAPTER 2

HEALTH CARE IN THE OECD COUNTRIES

2.1 Introduction

This chapter provides an overview of health care provision among OECD countries and a brief historical background.

The history of health care provision starts in the Middle Ages and evolved through a few main steps. The inception of health insurance in the Middle Ages is the first step. This occurred when the guilds of master craftsmen established health insurance to guarantee an income source for their members in case of accidents, death, or for their elderly. The extension of compulsory statutory health insurance on a vast scale is the second step. This occurred in the 1880s when Chancellor Otto von Bismarck established a compulsory health insurance program in Germany. Other European countries followed this example. The socialization of health care during the Twentieth Century is the third step. The socialization of health care financing took two different forms: Compulsory health insurance extended on a national scale and universal health care provided by the government.

Contemporary health expenditures in OECD countries are usually funded through more than one mechanism, although one scheme is normally far more important than the others. Secondary mechanisms generally supplement the primary mechanism, which

increases the level of expenditures for health services. In countries under regime of a national health service, private direct out-of-pocket payments supplement the level of health care provided by the government. In countries using social insurance, private insurance plans often supplement the level of insurance provided by the social funds. The composition of health expenditure thus varies from country to country though the highest share of expenditure remains dependent on the main scheme that is adopted.

The levels of expenditures vary as well but tend to be higher in countries relying on private insurance than in countries relying on social insurance or a national health service. These patterns are evident in the health expenditure data for the OECD countries between 1970 and 2007. The same data show some differences in terms of outcomes as well, with life expectancy and mortality in countries under regime of private insurance being respectively higher and lower than countries under different regimes. Combining these findings with the historical background leads us to wonder why different countries have adopted different health care schemes and if any common economic or political force has determined similar developments.

The remainder of the chapter is organized as follows. Section 2.2 presents a brief historical background of health care provision in Europe. Section 2.3 provides an overview of the main schemes for health care in 6 countries: Great Britain, Finland, Austria, Germany, Switzerland, and the United States. Section 2.4 provides an overview of the different levels and composition of health expenditures along with data on available health resources and life expectancy and mortality rates.

2.2 Historical Background

As shown previously, the history of health care provision in Europe begins in the Middle Ages with the guilds of farmers and master craftsmen providing support to their members in case of sickness, or death, and as a source of income to the aged. The support was based on voluntary contributions. In Austria, the name for these health insurance funds was "Ausgedinge." The benefit was a flat income paid to their guild-members when they retired. Over time, banks and private insurance associations developed as well as charities. The first statutory health insurance funds were established in Germany in 1883 and then in Austria in 1887. In both cases, the health insurance funds were established as self-governing structures providing cash and in-kind benefits or free medical treatments financed by proportional mandatory as well as voluntary contributions for both employees and employers. The funds were developed upon already existing voluntary and mandatory local schemes.

These funds laid the foundations for the health insurance funds still existing today. The funds were managed by assemblies and boards where both employees and employers were represented in a proportioned manner. The funds were free to choose the providers of health care services – i.e., physicians and professionals – and privately set the terms of their provision of health care. The role of the government was limited to setting a catalog of minimal services to be provided by each fund. Every fund was then free to extend the benefits further than what was established in the catalog.

Over time, the condition of mandatory health insurance was extended to new categories of workers and subjects. However, the funds for white-collar workers were

separated from those for blue-collar with a distinct set of benefits for the white-collar workers only. This was true for both Austria and Germany. During the period 1933-45, the fundamental structure of the statutory insurance was maintained though the governing of the health funds in Germany was changed and put under control of the National Socialist German Workers' Party. In Austria, the social funds were temporarily suspended while the German law came into force abolishing organizations of health insurance based on occupational groups and merging blue- and white-collar funds. After the Second World War, the Federal Republic of Germany and Austria resumed the prewar statutory insurance system based on sickness funds, while a state-operated system based on the British and Swedish models was introduced in the German Democratic Republic.

After World War II several European countries established a national health service. In many cases, this was part of other welfare initiatives like social security and education. Its establishment was inspired by the principle of collective responsibility of the state in providing a comprehensive health service to the entire population free at the point of use. It was also driven by the large lack of means and difficult economic situation for a large part of the society after the war and the Great Depression.

In spite of broad popular support, the medical profession opposed the creation of government-led health services in every country. Mainly, this was due to the loss of freedom such reform would have brought about for the physicians. In many cases, the reform was thus implemented by conceding large autonomy to both generalist and hospital physicians.

2.3 Main Schemes for Health Care - Overview

The health care systems of the OECD countries can be based on a national health service, statutory social health insurance, or voluntary private insurance. This section provides an overview of these schemes through specific examples: Great Britain and Finland for a national health service; Austria and Germany for social insurance; and Switzerland and the United States for private insurance.

Under a national health service, the government provides universal coverage purchasing health care services from public or private providers and making them free at the point of use. Income taxation represents the source of funds. General responsibilities of the government are to allocate available resources, to set price and reimbursement rates for health providers, and to regulate the health professions and the production of pharmaceuticals. Under social insurance, quasi-private non-profit social funds called "sickness funds" provide health insurance coverage to the population under a government mandate. Payroll taxes directly paid to the sickness funds are the main source of funding. The providers of health services typically remain independent, and the reimbursement rates are negotiated with the funds, individually or at a national level. Benefits and conditions of the insurance plans are set by the government, either specifically for one industry only or in broader terms for entire industries.

Under private insurance, health care is mostly provided by private for-profit insurers. This is usually considered as a regulated market for health care due to the government's control and regulation, although private insurance purchases are encouraged through tax preferences. Individuals and employers can freely buy health

insurance coverage from a variety of different private insurers offering packages whose characteristics are regulated to varying degrees by the relevant national government.

United Kingdom (England)

The English National Health Service was introduced in 1948 and implemented the principle of universal responsibility of the state in providing health care to the entire population free at the point of use. A major reform was adopted in 1973, integrating acute, community, and preventive services by 90 Area Health Authorities based on the same geographical area of the previously existing local authorities – the latter remained responsible for the provision of social services. The same reform also introduced 90 Family Practitioners Committees contracting the provision of health services with general practitioners, dentists, opticians, and pharmacists and it replaced the regional hospital boards with 14 Regional Health Authorities.

From 1948 to 1976, the allocation of resources was based on past allocations. After 1976, a new capitation formula based on the needs of each geographical area was introduced to attain a more equitable allocation of funds. This formula keeps in account size, age, sex, and levels of morbidity across the population.

A reform passed in 1982, merged the Regional Health Authorities and Area Health Authorities into 192 District Health Authorities. In 1991, the Thatcher government separated the responsibility of providing health services from the responsibility of purchasing health services. The first responsibility was assigned to the National Health Service Trusts through the management of private hospitals; the second

was assigned to the Health Authorities. General Practitioners remained independent providers contracting their fees and performances with the District Health Authorities. This reform aimed at strengthening the internal market for health services and so improving the resource allocation. The administration of funding remained centralized. After 1997, the District Health Authorities were replaced by Primary Care Trusts with the function of commissioning health services for their assigned local geographically defined population of about 340,000 people. In 2002, the Regional Health Authorities were replaced by 28 Strategic Health Agencies that were reduced to 10 in 2006. The role of these Agencies is managing the National Health Service in behalf of the Secretary of State – e.g. planning improvements and guaranteeing good quality of health services in local areas, and integrating national priorities into local health service plans.

The budget for health care consists of 2 main components. One component covers hospital and community health sectors and therefore expenditures for acute and community hospital services. The other component covers family health services and therefore expenditures for primary care. The allocation of funds to the Strategic Health Authorities is based on the said capitation formula, while the allocation of funds to the Primary Care Trusts is adjusted for local circumstances and historic allocations. General income taxation is the largest source of funds. In 2007, this amounted to 82 percent of the total expenditure on health care; something around 10 percent of the total health spending comes from national insurance contributions; and around 3 percent each comes from private out-of-pocket payments and insurance (source: OECD.)

Norway

The Norwegian health care system is based on a single payer national fully-tax funded scheme. It was established in 1967 as the National Insurance Scheme to guarantee that all people in Norway received a minimum of health care, regardless of income. Between 1969 and 2002, the 9 Norwegian counties were responsible for funding and managing the hospitals and providing specialized health care. After 2002, the central government took over this responsibility. The government manages all public hospitals, performing such functions as establishing a budget, the salary of medical and non-medical staff, and setting the reimbursement rates. The 431 local municipalities are responsible for all services under primary health care plus environmental health services, nursing homes and health care for people with mental disabilities. The country is divided into 5 regional health authorities that manage the hospitals and related services.

The regular general practitioners' scheme was introduced in 2001, giving individuals the right to choose one regular general practitioner who is responsible for providing primary care. The regular general practitioners act as gatekeepers for specialists and other services. The salary is fixed for both general practitioners and specialists but the latter can also receive a supplementary fee-for-service payment. Benefits include inpatient and outpatient care, diagnostic, specialists, etc.

Small co-payments are required for some treatments like (e.g.) outpatient, general treatment by a general practitioner. The choice of the physicians is limited. The patients are assigned to their local general practitioner and can switch only twice in a year and according to their priority on the waiting list. Opting-out from the national system is

allowed. In this case, health care can be paid for out-of-pocket. Private non-profit hospitals exist and act as an integrated part of the public health services. Private profit-making agencies have a subordinate role within the Norwegian health care system and were established primarily to complement publicly for dental care and plastic surgery.

Austria

The provision of health care in Austria through the use of insurance dates back to the Middle Ages, when a flat rate income was paid by farmers once they retired. Over time, it expanded to other occupational groups and then took the form of statutory-mandated coverage in 1887-8 following the German model of Bismarck's social program. At that time, two-thirds of the contributions were paid by employees and one-third by employers. Also, only a few groups of workers (e.g. farmers and miners) adopted it. New groups were created over time. Two major reforms occurred in 1947 and 1956: The first re-established self-governance of the health funds; the latter integrated health, pension, and work accident funds for white-collars and blue-collars.

The contemporary Austrian health system is based on mandatory health insurance, which covers almost 98 percent of the entire population. The federal government, the 9 Landers, and 21 Social Funds constitute the main entities of its organizational structure. The federal government is responsible for regulating the health system and enacting basic law governing hospitals. The Landers are responsible for implementing and enforcing specific legislation pertaining to the hospitals. The Social Funds administer the provision of health care through private hospitals and regulate the outpatient sector and the

rehabilitation sector negotiating with the Federation of Austrian Social Insurance Institutions and the chambers of physicians and pharmacists. In 2002, all Landers with the exception of Vienna privatized their hospitals. Outpatient care is offered by independent providers and providers contracted with the insurance funds. The choice is free, although the Funds reimburse 75 percent of the fee only.

Funding for the health care expenditures comes from 3 main sources: Health social funds; taxes; and private health insurance. The larger health insurance funds are organized by regions and occupational groups. Employers and employees share the payment of the contributions in equal proportions. The contribution rate varies between 7.1 and 9.1 percent of the contribution base, the variation being due to differences in the benefit packages. The health insurance funds provide health care both by paying third-party providers and providing services in kind. They can also provide cash benefits. Individuals cannot choose between different funds, nor can the health funds select their members by their level of risk. The competition between funds is limited therefore.

One quarter of the total health spending is funded by general taxation. This mainly funds inpatient care at hospitals. About one quarter of health spending is covered by private out-of-pocket payments. These are usually distinguished in direct and indirect co-sharing: The former refers to payment of fees or deductibles; the latter to the payment of services not provided by the health insurance coverage.

Germany

The German health care system is based on statutory insurance. Its origins go back to the

mutual-aid structure of the guilds that were already developed in the early 1840s. In 1849, health insurance was made mandatory for miners in Prussia. Its formal introduction on a larger scale occurred under Bismarck's welfare reforms enacted in 1883.

Today, self-regulated quasi-public corporations provide statutory insurance. These are groups of associations of sickness funds and associations of affiliated physicians. They self-regulate the funding and provision of health services on a regional basis. Their structure is that of non-profit self-governing organizations. Their assemblies are formed by representatives of the members with executive boards appointed by the assemblies. In 2004, 292 sickness funds covered about 72 millions of people and 49 private insurance funds covered about 7.1 millions of people.

The responsibilities of the federal government include setting in general terms social benefits and measures against diseases potentially threatening public safety, certifying physicians and other medical professions, and regulating pharmaceuticals and drugs. The Landers are responsible for the maintenance of hospitals' infrastructures using funds provided by the sickness funds. They are also responsible for more specific areas of legislation like (e.g.) public health services and environmental hygiene; health promotion, prevention and AIDS care; state-owned hospitals; hospital planning; supervision of health professions and their professional institutions; psychiatry and illegal drugs; pharmaceuticals and supervision of pharmacists and their profession.

Statutory health insurance, national taxes, and private funding are the main sources of funding for health expenditures. In 2003, they respectively covered 67.5

percent, 7.8 percent, and 20.6 percent of the total expenditure. Private funding in turn consisted of out-of-pocket payments by 12.2 percent and private insurance by 8.4 percent. The contributions for the health statutory insurance are based on earnings only. They are not based on risk. An equalization fund exists to compensate for differences in risk, to which every sickness funds is required to contribute about 13.5 percent of its total contributions. The contributions have been equally paid by employers and employees until 2005. After that, they were increased to 54 percent for employees. On average, contribution rates are approximately 14.2 percent of the employee's pretax earnings.

Until the early 1990s everyone was assigned to a sickness funds on a regional basis except high-income workers – i.e., so-called white-collars. Today, the choice over the sickness fund is free.

Switzerland

The Swiss health care system was introduced in 1911 after many unsuccessful attempts (since 1848). Its scheme was based on the German model. The law established the Federal Office of Social Insurance through which insurance funds were given the possibility to access federal subsidies under certain conditions. A certain variety of health care services had to be provided and the insured had to be given free choice to switch from fund to fund in case of change in residence or occupation, while the condition of compulsory insurance was left to the cantons. The law also imposed a limit of 10 percent on the difference in the contributions rates for men and women. Due to increasing financial imbalance, the system of subsidies was reformed in 1964 introducing direct

charges and co-payments.

Since 1996, all permanent residents have been legally obliged to buy health insurance. The premia are based on a community rating and cannot vary with individuals' risk profiles. They are audited by the Federal Office of Social Insurance and can be lowered when too high. The Swiss Confederation and the Cantons subsidize health insurance by using tax-financed allocations varying with people's income. Subsidies and therefore premia can vary across cantons within certain limits given by the Confederation.

Services not covered by the compulsory health insurance policies can be paid for by supplementary health insurance with risk-related premia or direct out-of-pocket payments. The most popular supplementary health insurance policies are those giving free choice of doctor and covering for superior inpatient accommodation.

The responsibilities of the federal government are limited to very general matters like (i.e.) control over possible communicable and widespread diseases; medical examinations and qualifications; statistical research; promotion of science, medical research and education; environmental protection; promotion of exercise and sports. The responsibilities of the Cantons are more specific. These range from licensing for health professions and market authorizations, to setting the schedule of the medical fees. The registered health insurance companies providing health insurance dominate the market for health insurance policies. These are usually regional, federal, religious or occupational-based. The non-registered insurance companies instead provide other types of insurance and have a small share in the market for supplementary health insurance

policies.

United States

The provision of health care in the United States is largely based on private insurance and two targeted social insurance systems (single payer systems) for the elderly (Medicare) and the poor (Medicaid). In addition to these two large social insurance programs, other programs provide benefits for children, the Children's Health Insurance Program (CHIP) and persons associated with the military in the present or past (Tricare.)

Health care facilities are mainly private, although some are owned by federal, state, county, and city governments. About 60 percent of hospitals are non-profit; 20 percent belongs to state/local government; the remainder is private. Doctors and hospitals are generally paid by private or social insurance plans, although direct payments are also possible.

Three-fifths of the population receives health insurance through their employers, because of tax preferences for this method of purchasing private insurance. The choice of medical facilities and physicians is normally limited by insurance companies. Health services provided outside an insurance company's network may be covered at a lower level or not covered at all. Hospitals' reimbursement rates are negotiated with the insurance programs. Reimbursement rates for government insurance programs are often set by law or regulation.

The federal government through the US Department of Health and Human Services oversees the federal agencies: (a) the Food and Drug Administration, which

certifies the safety of food, effectiveness of drugs and medical products; (b) the Centers for Disease Prevention, which deals with prevention of disease, premature death, and disability; (c) the Agency of Healthcare Research and Quality, which aims to improve the quality and effectiveness of health care for Americans; (d) the Agency Toxic Substances and Disease Registry, which regulates hazardous spills of toxic substances; and (e) the National Institutes of Health, which conducts medical research. The states are responsible for the licensure of health care providers and testing-approval of pharmaceutical products and medical devices certified through the Food and Drug Administration.

The states administer and partially fund the Medicaid system. They also regulate the private health insurance market by imposing laws that require that health insurance companies cover certain procedures and through financial regulation to assure that insurers have sufficient reserves to meet their obligations to their subscribers.

The 2010 reform of the health care system (Patient Protection and Affordable Care Act) mandates the purchase of health insurance by most citizens and facilitates the access for blue collar (moderate-income) people by subsidizing insurance premia and broadening eligibility for Medicaid benefits (a single payer social insurance program for low-income persons). Funding for these subsidies comes from general tax revenues and earmarked taxes on high-income beneficiaries of Medicare (a program for the elderly), on indoor tanning, and the penalties paid by citizens not obtaining health insurance.

2.4 Health Expenditures, Health Resources, and Mortality Rates

This section provides a different overview of health care provision across the OECD countries by comparing levels/composition of health expenditures, available resources for health care, and life expectations and mortality rates.

The OECD database breaks the health care expenditure into 6 shares, each referring to a specific source of funding. The shares are: 1) Government spending, excluding social security; 2) expenditure through social security programs or (i.e.) compulsory social health insurance; 3) private out-of-pocket payments; 4) private health insurance; 5) non-profit private institutions like (e.g.) charities or aid agencies providing goods and services to households free or at non-economically significant prices; and 6) expenditures made by corporations producing goods and services other than health insurance. Table 2.1 reports the average value for each share over the period 2000-7. The largest share (underlined) varies from country to country. In some cases, it represents the government share like for England or Canada. In cases like France or Germany it corresponds to social security or compulsory health insurance. In the case of Switzerland and the United States it relates to private insurance.

These data further confirm that private insurance, social insurance, and national health service are the 3 major mechanisms adopted to fund health expenditures among OECD countries. Going forward, the acronyms NHS, SHI, and PHI shall be used when referring to the group of countries respectively adopting National Health Service, Social Health Insurance, and Private Health Insurance as the major mechanism. Table 2.2 lists a sample of OECD countries distinguished by the highest share of expenditures. The

bottom of the table reports those where the health care system was overhauled after 1970. The former socialist countries went from a national health service back to a social insurance system in the early 1990s; Italy and Spain switched from social insurance to a national health service in 1978; the Netherlands switched from social insurance to private insurance in 2006; and the United States started the transition towards social insurance in 2010.

This classification of countries based on the mechanism used to fund the highest share of health expenditures is crucial for this study. Health expenditures, available health resources, and mortality rates are analyzed by group of countries under the same regime of funding. The goal is to shed some light on the possible effects of adopting different funding mechanisms.

Table 2.3 reports the levels and growth rates of total expenditures on health care in 2007 for countries under regime of a national health service. The average level of expenditures for this group is 8.95 percent of GDP; the growth rate 3.81 percent. Z1 and Z2 measure the standard deviations between the expenditure level of each country and the average levels respectively for all OECD countries and for the sub-group of countries under the same regime. The average Z1 of -0.71 and the coefficient of variation of 0.12 indicate that the levels of expenditures are very similar across countries. Table 2.4 reports the corresponding data for countries under regime of social insurance further distinguishing by 3 sub-groups. The first sub-group consists of European countries that adopted social insurance in the 1880s, also referred to by SHI* – i.e., Austria, Belgium, France, Germany, and the Netherlands.

Table 2.1 - Composition of Health Care Expenditures (Average 2000-7)

	Government Spending*	Social Insurance	Out-of-Pocket	Private Insurance	Corp	Non-Profit Institutions
Australia	66.7	0.0	18.7	7.9	0.0	6.7
Austria	31.2	44.8	15.9	4.8	1.4	1.8
Belgium	12.4	62.3	20.0	4.6	0.6	0.0
Canada	68.7	1.4	14.9	12.4	0.0	2.5
Czech Republic	9.4	79.4	10.6	0.2	1.3	0.3
Denmark	80.8	0.0	15.0	1.5	0.1	0.0
Estonia	10.9	65.8	21.1	0.1	0.0	2.1
Finland	58.5	14.5	20.6	2.3	1.5	2.7
France	4.9	74.3	6.9	12.9	0.1	0.9
Germany	9.7	68.3	12.3	8.8	0.4	0.4
Hungary	11.9	59.4	24.8	0.9	2.2	1.3
Iceland	54.8	26.8	17.6	0.0	1.4	0.0
Ireland	75.7	0.7	15.0	7.2	0.0	1.4
Italy	75.0	0.1	21.6	0.9	3.9	0.0
Japan	16.0	64.4	15.7	1.7	…	1.0
Korea	11.4	40.2	39.5	3.9	0.6	4.4
Luxembourg	17.3	72.8	6.7	1.6	1.6	0.0
Mexico	16.0	29.0	51.9	3.1	0.0	0.0
Netherlands	4.2	65.8	7.8	15.1	4.9	3.5
New Zealand	72.9	4.7	16.2	5.5	0.7	0.0
Norway	69.4	14.1	15.7	0.0	0.0	0.8
Poland	11.3	58.9	26.8	0.6	0.9	2.7
Portugal	71.3	0.9	22.4	3.8	1.3	0.8
Slovak Republic	6.4	73.5	17.2	0.0	2.9	5.6
Slovenia	5.0	67.2	12.3	13.0	0.0	2.5
Spain	65.5	5.6	22.7	5.1	0.9	0.4
Sweden	82.3	0.0	15.9	0.1	0.2	1.9
Switzerland	16.7	0.0	31.5	50.70	0.9	0.0
Turkey	28.7	39.9	21.8	0.0	9.6	0.0
United Kingdom	80.8	0.0	12.5	1.4	4.7	3.5
United States	31.3	13.1	13.2	35.0	3.5	3.9

Note: * Excluding expenditures through social security; *Data Source*: OECD (stats.oecd.org)

Table 2.2 - Health Care Expenditure Funding Mechanisms in OECD

	NHS	SHI	PHI
	Australia	Austria	Switzerland
	Canada	Belgium	United States
	Denmark	France	
	Finland	Germany	
	New Zealand	Netherlands	
	Norway		
	Sweden		
	United Kingdom		
1970-8	Czech Republic	Italy	
	Hungary	Spain	
	Poland		
	Slovak Republic		
1978	Italy		
	Spain		
1989		Czech Republic	
		Hungary	
		Poland	
		Slovak Republic	
2006			Netherlands
2010		United States	

Note: NHS National Health Service; SHI Social Health Insurance; PHI Private Health Insurance; *Source*: Author's calculation on OECD data

The second group consists of the former socialist republics. They were under regime of social insurance until the advent of Communism; they moved to a regime of national health services at that time, then switched back to social insurance when the Berlin Wall fell in the 1990s. The third group consists of non-European countries plus Luxembourg, the second smallest economy among OECD countries after Iceland.

The data indicate that the average level of health expenditure among the European countries traditionally under social insurance (SHI*) is higher than the average level among countries under regime of a national health service (NHS). The average level of expenditure is 10.3 percent of GDP in the first group and only 8.7 percent of GDP for the second group. Table 2.5 reports the data about Switzerland and the United States. The level of expenditure for health care in these countries is higher than in all other countries. The average for the group is 13.2 percent of GDP. It is probably worthwhile to point out that most of it comes solely from the United States with a level equal to 15.8 percent of GDP. Such differences in the level of expenditures between countries under different regimes are not a recent development. Figure 2.1 shows that these were considerable for most of the period 1970 through 2006 and increased over time. The time trends of health expenditures for Switzerland and the United States was 0.30, whereas it was respectively 0.09 and 0.13 for countries respectively under a national health service and social insurance.

Table 2.3 - Health Care Expenditures under a National Health Service (2007)

	Health Expenditure (% GDP)	Growth Rate (%)	Z1	Z2
Australia	8.5	5.82	-0.78	-0.15
Canada	10.1	4.28	0.03	1.35
Denmark	9.7	2.98	-0.18	0.98
Finland	8.2	3.31	-0.94	-0.43
Greece	9.7	4.56	-0.18	0.98
Iceland	9.1	6.59	-0.48	0.42
Ireland	7.5	2.32	-1.29	-1.09
Italy	8.7	-1.18	-0.68	0.04
Mexico	5.8	5.73	-2.15	-2.68
New Zealand	9.1	2.92	-0.48	0.42
Norway	8.9	8.07	-0.58	0.23
Spain	8.4	4.13	-0.84	-0.24
Sweden	9.1	3.87	-0.48	0.42
United Kingdom	8.4	1.91	-0.84	-0.24
Average NHS	8.66	3.95	-0.71	
Coefficient of Variation	0.12			
Time Trend 1970-2007	0.09			

Note: Level indicated in % GDP; growth rate indicated in percent; Z1 and Z2 measure the standardized levels of expenditures with respect to the average for the entire group of OECD countries and the subgroup of countries under national health service; *Data Source*: OECD (stats.oecd.org)

Table 2.4 - Health Care Expenditures under Social Health Insurance (2007)

	Health Expenditure (% GDP)	Growth Rate (%)	Z1	Z2
Austria	10.3	3.61	0.13	1.11
Belgium	10	8.88	-0.03	0.95
France	11	2.45	0.48	1.49
Germany	10.4	1.26	0.18	1.17
Netherlands	9.7	4.16	-0.18	-0.71
Czech Republic	6.8	3.5	-1.65	-0.76
Hungary	7.4	-9.49	-1.34	-0.44
Poland	6.4	11.86	-1.85	-0.97
Slovak Republic	7.7	14.77	-1.19	-0.28
Japan	8.1	1.55	-0.99	-0.06
Korea	6.3	8.07	-1.9	-1.03
Turkey	6	5.75	-2.05	-1.19
Average SHI*	10.28	4.07	0.12	
Average SHI	8.34	4.7	-0.87	
Coefficient of Variation	0.35			
Time Trend 1970-2007	0.13			

Note: SHI* group is given by Austria, Belgium, France, Germany, and the Netherlands; Z1 and Z2 measure the standardized levels of expenditures with respect to the average for the entire group of OECD countries and the subgroup of countries under national health service; *Data Source*: OECD (stats.oecd.org)

Table 2.5 - Health Care Expenditures under Private Health Insurance (2007)

	Health Expenditure (% GDP)	Growth Rate (%)	Z1	Z2
Switzerland	10.6	3.5	0.28	-0.43
United States	15.7	3.35	2.89	1.14
Average PHI	13.15	3.42		
Time Trend 1970-2007	0.20			

Note: Level indicated in % GDP; Real growth rate is indicated in percent; Z1 lev is the standardized level of expenditure in % of GDP w.r.t. the entire group of OECD countries; Z2 lev refers to the standardized level of expenditure in % of GDP w.r.t. the subgroup of countries under private health service; Data Source: OECD (stats.oecd.org)

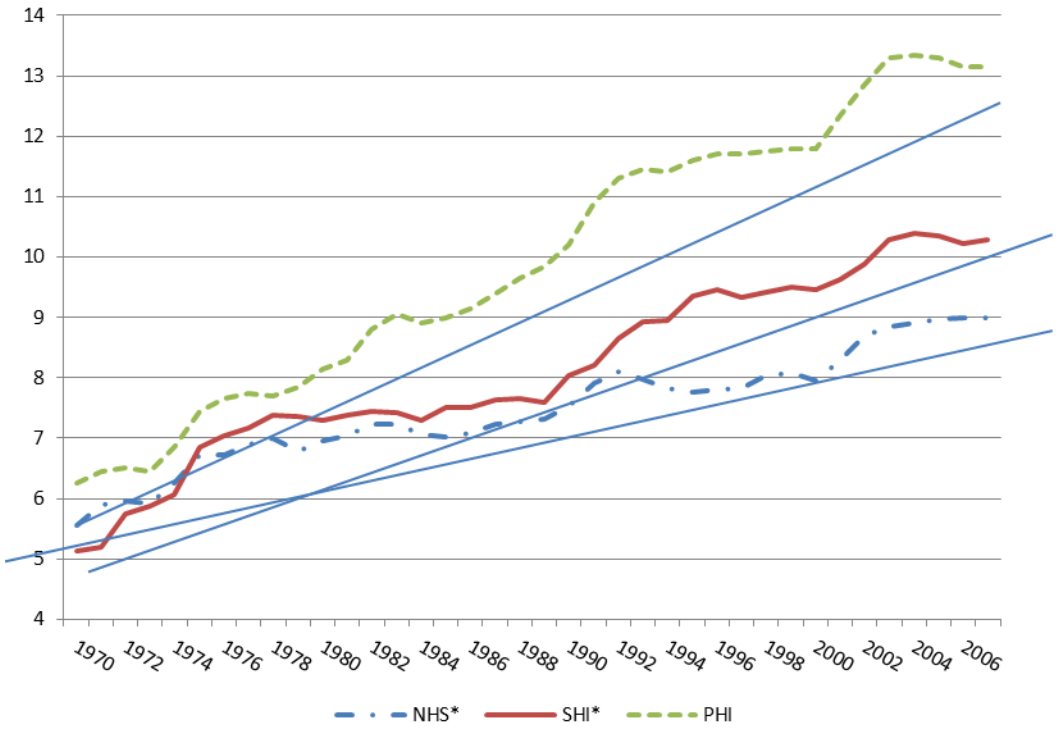

Figure 2.1 - Total Health Expenditures, % GDP - Data Source: OECD

Comparing the available health resources gives some further insights about the differences between countries under different regimes of funding. The analyzed resources are (a) the number of practicing physicians per 1,000 people; (b) the number of general hospital beds per 1,000 people; (c) the number of hospital beds for acute care; (d) the number of MRI per 1,000 and (e) the number of CT per 1,000. The intensity of use of health resources is considered as well by the following variables: (i) the number of doctor consultations per capita; (ii) the rate of hospital discharge for all causes per 100,000 people; and (iii) the average length of stay in days for acute care, all conditions. Data and definitions come from the OECD on-line database (stats.oecd.org.) Table 2.6 ranks all OECD countries by the number of hospital beds and practicing physicians in 2006; Table 2.7 reports the ranking based on intensity of use. Countries adopting social health insurance tend to outperform the others in both available health resources and use of them. This seems further confirmed by ordinary least squares tests conducted using each variable in turn as dependent variable Y and two dummies for different groups of countries as independent variables:

$$Y = \alpha_0 + \alpha_1 \, NHS^* + \alpha_2 \, PHI + \mu \qquad (2.1)$$

NHS* refers to countries traditionally under national health service: Australia, Canada, Denmark, Finland, New Zealand, Norway, Sweden, and the United Kingdom. PHI refers to the United States and Switzerland adopting mainly private insurance. The rest of the

sample consists of European countries traditionally under social insurance: Austria, Belgium, France, Germany, and the Netherlands. The time-horizon goes between 1970 and 2006. Table 2.8 and Table 2.9 report the results of these tests. The estimates indicate that in countries under regime of social insurance: (a) the number of doctor consultation is higher than in both, countries adopting national health service and (even more) countries adopting private insurance; (b) the length of treatments for acute conditions is higher than in countries adopting national health service; and (c) the density of hospital beds is higher than in all other countries while the density of practicing physicians is lower than in countries adopting private insurance. Finally, the availability of technological devices is larger in countries under private insurance than both countries under social insurance and countries under national health service.

Table 2.6 - Health Care Resources in OECD (2006)

	Hospital Beds per 1,000 population		*Practicing physicians, per 1,000 population*
Japan	14	Greece	5.35
Korea	8.5	Belgium	4.02
Germany	8.3	Switzerland	3.85
Hungary	7.9	Netherlands	3.82
Austria	7.6	Norway	3.75
Czech Republic	7.4	Italy	3.69
France	7.2	Iceland	3.68
Finland	7	Austria	3.66
Belgium	6.7	Spain	3.63
Slovak Republic	6.7	Sweden	3.58
Poland	6.5	Czech Republic	3.57
Luxembourg	5.7	Germany	3.45
Ireland	5.3	Portugal	3.42
Greece	4.8	France	3.39
Netherlands	4.5	Denmark	3.17
Italy	4	Slovak Republic (1)	3.06
Australia	3.9	Hungary	3.04
Denmark	3.6	Finland	2.95
Norway	3.6	Ireland	2.93
United Kingdom	3.6	Australia	2.81
Portugal	3.5	Luxembourg	2.73
Switzerland	3.5	United Kingdom	2.44
Canada	3.4	United States	2.42
Spain	3.3	New Zealand	2.28
United States	3.2	Poland	2.18
Turkey	2.7	Canada	2.15
Mexico	1.7	Japan	2.09
Iceland	..	Mexico	1.92
New Zealand	..	Korea	1.69
Sweden	..	Turkey	1.43

Note: (1) Data for Slovak Republic are from 2004; *Data Source*: OECD (stats.oecd.org)

Table 2.7 - Use of Health Car e Resources in OECD (2006)

	Average length of stay for acute care (in days)		*Hospital discharge rates (per 100,000)*		*Number of doctor consultations per capita*
Japan	19.20	France	28440	Japan	13.6
Korea	10.60	Austria	27765	Czech Repub.	13
Switzerland	8.20	Hungary	22644	Hungary	12.9
Germany	7.90	Germany	22040	Korea	11.8
Czech Repub.	7.80	Czech Republic	20390	Slovak Repub.	11.3
Luxembourg	7.60	Slovak Republic	19942	Spain	8.1
United King.	7.50	Finland	19621	Belgium	7.5
Canada	7.30	Greece	18791	Denmark	7.5
Belgium	7.20	Poland	18429	Germany	7.4
Slovak Repub.	7.20	Norway	17687	Italy	7
Portugal	6.90	Belgium	17374	Austria	6.7
Italy	6.70	Denmark	17074	Poland	6.6
Netherlands	6.60	Luxembourg	16862	France	6.4
Spain	6.60	Sweden	16248	Iceland	6.3
Hungary	6.40	Australia	16238	Australia	6.1
Poland	6.10	Switzerland	16103	Luxembourg	6
Australia	5.90	Iceland	16005	Canada	5.8
Ireland	5.90	Italy	13887	Netherlands	5.6
New Zealand	5.90	Ireland	13768	United King.	5.1
Austria	5.80	New Zealand	13304	Turkey	4.6
United States	5.60	Korea	13216	Finland	4.3
Greece	5.60	United States	12632	Portugal	3.9
Iceland	5.50	United Kingdom	12604	United States	3.8
France	5.40	Spain	10724	Switzerland	3.4
Turkey	5.20	Netherlands	10689	Sweden	2.8
Norway	5.00	Japan	10550	Mexico	2.5
Finland	4.70	Portugal	10365	Greece	..
Sweden	4.60	Turkey	8451	Ireland	..
Mexico	3.90	Canada	8429	New Zealand	..
Denmark	3.50	Mexico	5486	Norway	..

Note: Data on length of stay for Denmark and Greece are from 2005, for Korea are from 2003, for New Zealand from 2004, and Turkey from 2002; Data on discharge rates for Austria, Greece, Japan, and Korea are from 2005 and for Turkey are from 2004: Data on doctor consultation for Denmark, Italy, Korea, Mexico are from 2004, for Slovak Republic from 2005, and for Switzerland from 2002 *Data Source*: OECD (stats.oecd.org)

Table 2.8 - Health Care Resources under Different Regimes (1970-2007)

	Practicing Physicians	Hospital Beds Acute Cure	Hospital Beds	MRI	CT
NHS*	-0.50*	-2.52*	-1.09*	-1.05**	-3.99*
	(.07)	(.21)	(.13)	(.61)	(1.42)
PHI	0.02	-2.81*	-0.98*	10.89*	7.57*
	(.11)	(.26)	(.17)	(1.02)	(2.56)
Constant	2.62*	8.20*	5.31*	4.84*	14.69*
	(.05)	(.16)	(.10)	(.47)	(1.15)
R-squared	0.13	0.36	0.15	0.45	0.12
Observations	445	308	390	180	200

Data Source: OECD (stats.oecd.org)

Table 2.9 - Use of Health Care Resources under Different Regimes (1970-2007)

	Inpatient Length of Stay[(1)] (days)	Hospital Discharge Rate	# of Doctor Consultations
NHS*	-2.13*	-2439.08*	-1.58*
	(.30)	(714.22)	(.13)
PHI	-0.27	-5162.22*	-2.51*
	(.40)	(1207.56)	(.37)
Constant	9.49*	18542.27*	6.27*
	(.23)	(535.19)	(.10)
R-squared	0.13	0.09	0.31
Observations	389	227	365

Note: [(1)] stay for acute treatments; * statistically significant at 5% level; ** statistically significant at 10* level; *Data Source*: OECD (stats.oecd.org)

Finally, I compare life expectancy and mortality rates. A caveat is in order before proceeding further. To relate structure and resources of health care systems to people's morbidity is difficult. If any causal relationship exists, it may run both ways. The level of health care provided could affect life expectancies and mortality rates, and certain expectation of life or mortality rates may affect the level of resources made available. Therefore, the following comparison of estimates just aims at integrating the overview of different health systems.

Table 2.10 reports the 5-year average estimates of life expectancy at 65 for male and female between 1970 and 2006. The means characterized by an asterisk (*) result to be statistically significant different in a t-test. According to the values in Table 2.10, life expectancy at 65 in Switzerland and the United States (PHI) is higher than in countries under national health service (NHS) and even higher than in countries under social insurance (SHI). These differences are statistically significant for most of the period from 1970 through 2006.

The 3 groups of countries also seem to differ in terms of mortality. Table 2.11 reports the 5-year average mortality rates due to cancer, cerebrovascular diseases, respiratory diseases, and diabetes. The same notation of Table 2.10 applies with the asterisk (*) indicating means that are statistically different from those of other countries in a t-test. The mortality rates in the United States and Switzerland are lower than in countries under different regimes for all causes, excluding diabetes, and such differences are statistically significant in most of the considered time-horizon.

Table 2.10 - Life Expectancy at 65 under Different Regimes (1970-2007)

	NHS	SHI	PHI
Female			
1970-9	16.84*	16.27*	17.54*
1980-9	18.08 **	17.81*	18.86*
1990-9	18.98 ***	19.22*	19.72*
2000-6	20.09	20.24	20.36
Male			
1970-9	13.29*	12.74*	13.71*
1980-9	14.07*	13.79*	14.73*
1990-9	15.21 ***	15.08*	15.87*
2000-6	16.78 **	16.49*	17.11*

Note: The mean of each group is compared with those of the other two groups by a w-tail t-test; * Statistically different from the means of other groups at 5%; ** Statistically different from the mean of SHI at 10% and statistically different from PHI at 5%; *** Statistically different from the mean of the group PHI at 5%; *Data Source*: OECD (stats.oecd.org)

Table 2.11 - Mortality Rates under Different Regimes (1970-2007)

	NHS	SHI	PHI
Cancer			
1970-9	187.2*	205.5*	185.2
1980-9	188.5*	202.5*	186.4
1990-9	181.2*	189.0*	175.1**
2000-7	164.8	168.6*	152.8*
Cerebrovascular diseases			
1970-9	117.2*	129.5*	98.2*
1980-9	84.7*	94.0*	63.4*
1990-9	65.2	64.7*	45.1*
2000-7	49.4*	43.6	34.1*
Respiratory diseases			
1970-9	79.4*	63.1*	53.7*
1980-9	67.7*	49.8	48.7*
1990-9	61.4*	47.4	52.4*
2000-7	49.1*	39.6	----
Diabetes			
1970-9	13.2*	18.5	19.4*
1980-9	11.1*	13.3*	15.0*
1990-9	11.5*	13.5	16.7*
2000-7	11.5*	16.2	15.7*

Note: The mean of each group is compared with those of the other two groups by a w-tail t-test; * Statistically different from the means of other groups at 5%; ** Statistically different from the mean of NHS at 10% and statistically different from SHI at 5%; *** Statistically different from the mean of the group PHI at 5%; *Data Source*: OECD (stats.oecd.org)

Comparing these last results with the differences between groups of countries in terms of health resources and expenditures leads to the following hypothesis therefore: Can the adoption of different health funding mechanisms be due to collective choice, driven in turn by the different preferences or expectations of people in terms of health outcomes and expenditures?

2.5 Conclusions

The provision of health care started in the Middle Ages with private health insurance established by the guilds of farmers and craftsmen as protection against unexpected sickness or to provide a source of income for the elderly. It evolved through the statutory insurance programs established in the 1880s starting with Germany. In the Twentieth Century, many countries adopted national health services and expanded coverage of their social health insurance. By the late Twentieth Century, universal taxpayer-funded health care was the norm, rather than the exception, in the OECD countries.

Today, the OECD countries provide health care through 3 main schemes based on national health service as in England and Finland; social insurance as in Austria and Germany; and private insurance as in Switzerland and the United States. A country's main health care payment system is normally combined with other mechanisms. The socialized health care systems also include provisions for private insurance. The private insurance-based systems also include social insurance systems for subsets of their populations. Health care expenditures within all OECD countries have increased significantly as a fraction of national income between 1970 and 2007. However, growth in expenditures as a fraction of GDP has been faster, and expenditures larger, in countries where private insurance systems pay most health care bills. Private insurance systems tend to spend more than those adopting the other schemes without obtaining substantially better results in terms of life expectancy or mortality rates.

Why different countries have adopted different systems for financing and paying

for health care is taken up in Chapters 4 and 5 of the dissertation. The next chapter provides an overview of the economics literature on health care expenditures and the very small political economy literature covering system choice.

CHAPTER 3

HEALTH CARE IN THE LITERATURE OF ECONOMICS

3.1 Introduction (overview)

What motivates people's demand for health insurance? Why is the provision of it heavily regulated? And why is a private good like health care publicly provided in several countries?

The microeconomic theory of consumer's choice under uncertainty provides an answer to the first question. On average, individuals tend to be risk-averse – i.e., they tend to prefer a low-value certain outcome to a high-value but uncertain outcome. Consequently, people buy insurance against the possibility of a bad health status as they similarly buy insurance for any other uncertain bad event.

The economic rationale for heavily regulating the market for health insurance is to obtain an optimal allocation of resources. Arrow (1963) argues that an unregulated market is unlikely to generate a Pareto-optimal allocation for several reasons. Various informational asymmetries among insurers and insured are among the most important of these.

Insurers normally do not know exactly what an individual's health risks are, and therefore average the insurance price over low- and high-risk persons. In cases in which individuals know whether they are high- or low-risk types, this may induce individuals

with low-risk profiles to leave the market or force the insurers to charge a lower price and/or to provide less insurance than they would if they could perfectly associate persons with risk type. Indeed, some forms of insurance may not be offered for sale.

In such cases, forcing the purchase of health insurance may generate Pareto-improvements. In addition to economic efficiency concerns, government interventions into health care markets may also be motivated by redistributive lobbies representing health care providers or the poor, and/or by electoral pressures if voters are motivated by altruism or fairness norms. Several public choice and political economy studies show that such concerns can induce a government to adopt either a private, public, or a mixed public-private system of health care provision depending on the initial distribution of health risks, income, and tastes (risk-aversion and norms) across the population.

This chapter presents a brief review of these key contributions. Section 3.2 reviews the main principles of the consumer's choice under uncertainty. Section 3.3 explains the effects of asymmetric information on the market of health insurance. Section 3.4 illustrates the forces at play in the political process with respect to the subsidization or provision of a private good such as health care. Section 3.5 reviews a number of contributions from the literature of public choice and political economy about the provision of health care. Section 3.6 reviews some empirical contributions to the relationship between aggregate income and total health expenditures among OECD countries. Section 3.7 discusses arguments about the possible effects of ideology and social values on choice of the health care systems. Section 3.8 outlines some hypotheses and conclusions about the properties of health care systems and their adoption.

3.2 Private Demand for Health Insurance

This section reviews the theoretical foundations of the microeconomic theory regarding the consumer's choice under uncertainty and follows Varian's illustrative mathematics [1].

The occurrence of illnesses is a random event. The choice over the means to provide health care is thus made in a situation of uncertainty. In this case, the consumer's behavior can differ whether he (she) is risk-averse, risk-loving, or risk-neutral. Modelling choice under uncertainty is a standard part of graduate texts of microeconomics [2]. The analysis is built on Von Neumann's and Morgenstern's theory of expected utility [3]. According to this theory, the average utility generated by an uncertain event can be expressed as a weighted sum of the utility associated with various possible outcomes and the probability with which those outcomes occur. In the two-possibility case, the probability of event 1 can be denoted as π, and the probability of event 2 as $(1- \pi)$. If the utility of event 1 is U_1 and event 2 is U_2, then the expected utility is:

$$E(U) = \pi U_1 + (1-\pi) U_2 \qquad (3.1)$$

The alternative events represent a gamble with different outcomes, w_1 with probability π and w_2 with probability $(1-\pi)$. In much of the literature, the events are various money prizes. In the case of health, the event can be thought of as the consumer's wealth after

subtracting the cost of health care when sick or healthy. The utility gained in each event is a function of the wealth, $U_1 = U(w_1)$ and $U_2 = U(w_2)$. The utility function characterizing the behavior of a risk-averse person is concave, as illustrated in Figure 3.1. X is the certainty equivalent level of wealth – i.e., the amount generating the same utility of the expected value of the gamble. In this case, the expected utility of the gamble, $\pi U_1 + (1-\pi) U_2$, is smaller than the utility of the expected value of the gamble, $U[\pi w_1 + (1-\pi) w_2]$, and so is the amount X. Risk-averse individuals are thus more willing to accept X with certainty rather than taking the gamble.

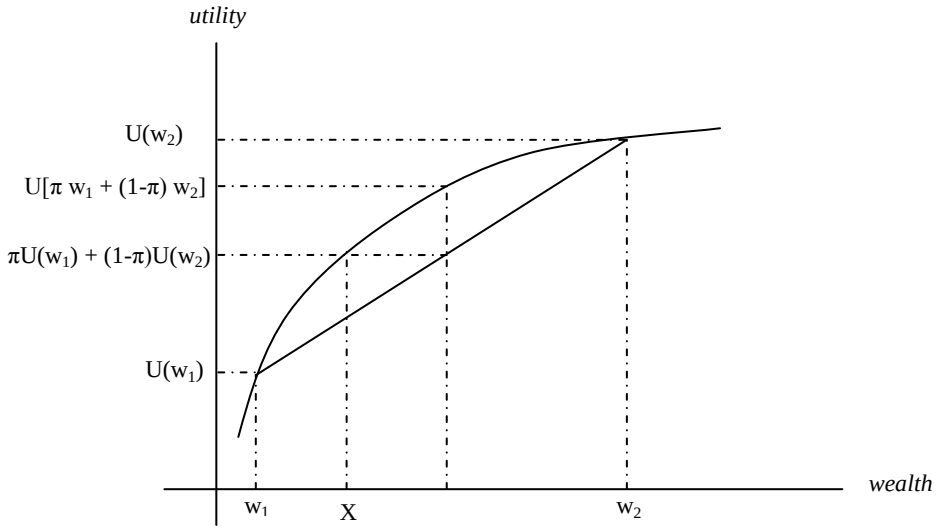

Figure 3.1

Persons regarded by economists to be risk-seekers have convex utility functions, as is illustrated in Figure 3.2. They prefer to gamble rather than accept an amount less

than the expected value of the stochastic process. Note that X is larger than the average outcome in this case, and no market for insurance is possible. Similarly, for risk-neutral individuals, the utility function is linear. In this case, the amount X is equal to the expected value of the gamble ($X= \pi w_1 + (1-\pi) w_2$) and they are thus indifferent between the gamble and the certainty equivalent. Again, the provision of insurance cannot be profitable.

Thus, if we are interested in positive demands for health insurance, we have to limit ourselves to the conventional case in which utility functions are strictly concave. In the case of risk-aversion, the difference between the expected value of the gamble, $\pi w_1 + (1-\pi) w_2$, and X represents the maximum amount that individuals are willing to pay to avoid the risk of w_1.

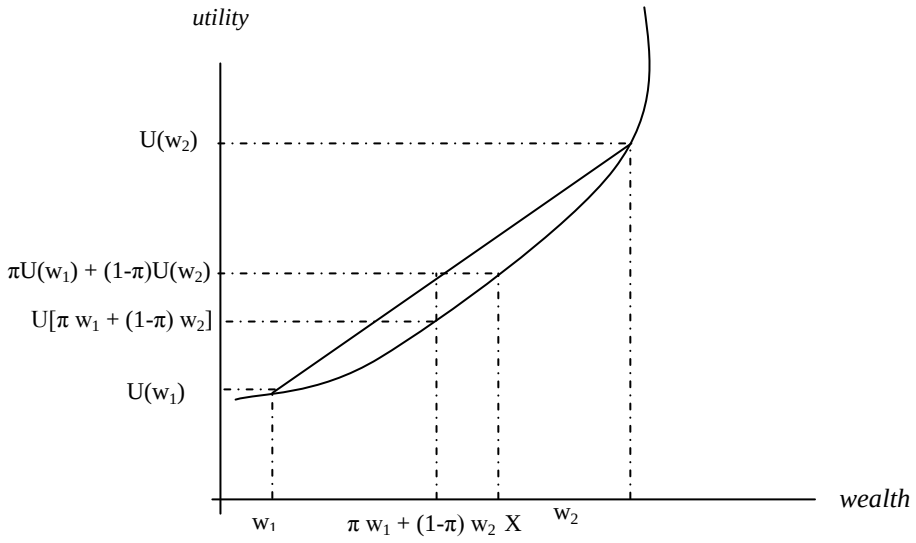

Figure 3.2

In the case of health care, this amount represents the largest insurance premium that risk-averse individuals are willing to pay to insurers to avoid downside health risks. How much health insurance are risk-averse individuals willing to buy?

Let *W* be the wealth associated with being healthy and *W-L* be that associated with being sick. Suppose that reimbursement amount *q* can be purchased for price *p* per unit. A typical risk-averse person's demand for insurance (demand for *q*) can be obtained by finding the quantity of insurance *q* that maximizes expected utility:

$$\max \pi U(W - L - pq + q) + (1-\pi) U(W - pq) \qquad (3.2)$$

Differentiating with respect to *q* and setting the result equal to zero yields a first order condition that describes that quantity. The ideal amount of insurance, *q**, satisfies:

$$\frac{U'[W-L+(1-p)q*]}{u'[W-pq*]} = \frac{1-\pi}{\pi}\frac{p}{(1-p)} \qquad (3.3)$$

If the insured gets sick, the insurer profits pq – q; otherwise, he (she) profits pq. The expected profit for the insurer is thus:

$$\pi (pq-q) + (1-\pi) p q \qquad (3.4)$$

In a perfectly competitive market, the profit is zero. According to (3.4) the price charged at equilibrium is equal to π. This is the actuarially fair price for insurance. Plugging this price into (2.3) yields:

$$u' [W-L+(1-\pi)q^*] = u' (W-\pi q^*) \qquad (3.5)$$

If the individual is strictly risk-averse or $U'' < 0$, this condition implies that

$$W-L+(1-\pi)q^* = W-\pi q^* \qquad (3.6)$$

In a competitive market for health insurance, an individual is charged the actuarially fair price and thus buys full insurance – i.e., $q^* = L$.

The effect of a change in the probability of contracting a disease depends on people's risk-aversion. Standard measures of risk-aversion are the Arrow-Pratt absolute and relative constants of risk-aversion:

$$R = - u''(C) / u'(C); \quad \rho = - C\, u''(C) / u'(C) \qquad (3.7)$$

An increase in risk-aversion corresponds to an increase in the curvature of the graph in Figure 3.1. In turn, this implies a decrease in the amount X. Therefore, as risk-aversion rises, an individual is willing to pay a higher price for health insurance. Deriving the (3.5) with respect to π obtains the (3.8):

$$\frac{\partial q*}{\partial \pi} = \frac{U''(W-L-(1-\pi)q*)-U''(W-\pi q*)}{\pi U''(W-L+(1-\pi)q*)+(1-\pi)U''(W-\pi q*)} > 0 \qquad (3.8)$$

Indicating that a risk-averse individual is likely to buy a larger quantity of insurance when the probability of getting sick increases.

3.3 Public Demand for Health Insurance

The optimal quantity of health insurance q* from (3.8) does not guarantee a Pareto-optimal allocation of resources in cases in which at least some persons can purchase insurance at other than the actuarially fair price. Asymmetric information, moral hazard and adverse selection, imply that many persons will pay more or less than the actuarially fair price for their insurance. Pauly (1974) was among the first to note such problems, and his approach to the moral hazard problem is explained and illustrated in this subsection of the dissertation. The mathematics used to analyze this problem is also based on Pauly (1974).

In some cases, a person's behavior can affect the probability of getting sick without affecting their insurance premiums. Having a good diet or practicing sport activities can be examples of such a behavior. Preventive health care is costly (e.g. has an opportunity cost) and can be expressed by its cost, z. Suppose that the probability of being sick, π, increases with z and diminishing marginal returns – i.e., $\pi = \pi(z)$; $\pi' < 0$; and $\pi'' > 0$. Assume also that P is the price of insurance and is not necessarily equal to πq. Expected utility is now:

$$\max \quad (1-\pi(z))\, U(W-P-z) + \pi(z)\, U(W-L-P+q-z) \qquad (3.9)$$

For a given amount of insurance, the utility maximizing level of health-risk decreasing behavior can be found by differentiating (3.9) with respect to z, which yields:

$$(1-\pi)\, U'(W-P-z) + \pi\, U'(W-z-P+q-L) = \qquad (3.10)$$

$$= [U(W-z-P+q-L) - U(W-P-z)]\, \partial\pi/\partial z$$

Because insurers cannot easily observe the insured's behavior, a change in z is unlikely to affect the price of insurance – i.e., $\partial P/\partial z = 0$. Consequently, the level of preventive care z is likely to fall as the quantity of insurance increases – i.e., $\partial z/\partial q \leq 0$.

These assumptions are crucial to analyzing the effects of moral hazard since the insured's behavior is distorted by his (her) idea of the insurance price being insensitive to his (her) conduct. Differentiating (3.09) under the assumption that prices change and the quantity of insurance also increases yields:

$$\frac{\partial \pi}{\partial z}\frac{\partial z}{\partial q}[U(2) - U(1)] + \pi U'(2) = \left(\frac{\partial P}{\partial q} + \frac{\partial z}{\partial q}\right)[\pi U'(2) + (1-\pi)U'(1)] \qquad (3.11)$$

Substituting (3.10) into the (3.11) yields:

$$\frac{\partial \pi}{\partial z}\frac{\partial z}{\partial q}[U(2) - U(1)] + \pi U'(2) = \left(\frac{\partial P}{\partial q} + \frac{\partial z}{\partial q}\right)[U(2) + U(1)]\frac{\partial \pi}{\partial q} \qquad (3.12)$$

The (3.12) gives the optimal insurance price in a competitive market under the effect of moral hazard. This can more precisely be expressed as in (3.13):

$$\frac{\partial P}{\partial q} = \frac{\pi U'(2)}{(1-\pi)U'(1) + \pi U'(2)} \qquad (3.13)$$

If the quantity of insurance q* is bought at fair price, πq*, solving (3.9) obtains:

$$\frac{\partial \pi}{\partial q}\{[U(1)-U(2)]+q[\pi U'(2)+(1-\pi)U'(1)]\}=-\left(\pi+\frac{\partial \pi}{\partial q}\right)[\pi U'(2)+(1-\pi)U'(1)]+\pi U'(2) \quad (3.14)$$

Plugging (3.10) into (3.14) yields:

$$\pi+q\frac{\partial \pi}{\partial q}=\frac{\pi U'(2)}{(1-\pi)U'(1)+\pi U'(2)} \quad (3.15)$$

Combining (3.15) and (3.13) obtains another expression for the schedule of the optimal insurance prices in a competitive market:

$$\frac{\partial P}{\partial q}=\pi+q\frac{\partial \pi}{\partial q} \quad (3.16)$$

However, the price is likely to differ from this. Being unable to distinguish between insured, insurers likely charge the same price per unit of insurance bought, p = P/q. The price maintains the equilibrium between premia paid by insured and benefits paid by insurers as long as the following holds true:

$$\sum P_i=\sum \pi_i q_i \quad (3.17)$$

Because every insured is charged the same price, everyone is likely to buy the same quantity of insurance and the expression above can be rewritten as:

$$p = \frac{\sum \pi_i q_i}{\sum q_i} \tag{3.18}$$

According to (3.18) insurers charge the fair price – i.e., $p = \pi$ [4]. However, (3.16) implies that the fair price is below the optimal level for values of q where $\partial\pi/\partial q$ is negative. This implies that in a competitive market, insurance is overproduced because everyone is charged the fair price regardless of moral hazard and so buys full insurance. For this reason, regulation imposing a minimum purchase of insurance, q*, and circulation of information about further marginal purchases can generate Pareto improvements. If insurers know the quantity of additional purchase of insurance on top of q*, they can charge different prices according to it – i.e., at the margin, the price for a unit of insurance above q* would equal the cost of preventive care for the insured.

Informational asymmetries between insured and insurers also produce adverse selection. Ignoring the risk differentials between individuals, insurers are forced to average the price over all insured. Low-risk individuals may see themselves being charged excessively and thus decide to exit the market. This would leave the insurers with an adverse selection of prospect insured. This argument is more clearly illustrated below.

To simplify, assume that 2 types of individuals exist, low-risk individuals and high-risk individuals. The first ones are characterized by π^L and the second ones by π^H with $\pi^L < \pi^H$. In a competitive market, insurers would charge $p^L = \pi^L$ and $p^H = \pi^H$ to low-risk and high-risk individuals respectively, were they able to distinguish between the two. However, in many cases insurance companies cannot do so. They therefore charge the same price p^E given by:

$$p^E = \frac{\sum \pi^G q^G + \sum \pi^B q^B}{\sum q^G + \sum q^B} \qquad (3.19)$$

At equilibrium, low-risk individuals are overpaying for insurance while high-risk individuals are underpaying for it.

Whether low-risk individuals will purchase insurance at this price depends on their degree of risk-aversion. In some cases, low-risk individuals may not purchase insurance, which reduces the pool of insured to high-risk individuals only. This may be a stable equilibrium. The same logic implies that in cases in which multiple-risk classes exist, health insurance markets may collapse as more and more relatively lower-risk individuals leave the market, as in Akerlof's (1970) classic analysis of markets for "lemons." [5]

In cases in which the average risk is such that most people would purchase insurance, imposing compulsory purchase of insurance can make a super majority of persons better off, while making a few very low-risk individuals worse off (because they

pay more for the insurance than their reservation price.)

3.4 Public Demand for Health Care

Such market failures in the health insurance market can provide the political support necessary to press for socializing the provision of health insurance.

Another possible political rationale for government intervention in health insurance markets occurs when publically-provided health insurance or health services are subsidized for a subset of a nation's electorate. For example, progressive taxation tends to lower the tax-price of health insurance for persons with below-average income if they have average health risks. In such cases, a majority of the electorate may benefit, at least in the short run, from tax-financed health care. For reasons similar to those of the low-risk persons in the previous analysis, high-income individuals would pay a higher than market price and would prefer a private system to a public system funded with progressive (or proportional) taxes. If uniform levels of coverage are provided, individuals with below-average risks and below-average income may also prefer private to public provision.

When a majority benefits from socialization of health insurance, public choice analysis predicts that it will be adopted, as it has been in most OECD countries.

Usher (1977) provides one of the first public choice models of the electoral demand for "medical services." His analysis is not focused on health insurance, per se, but applies to electoral support for the public provision of any private service. The implications of his approach for health insurance and health care are developed below. (For the remainder of this section, the term health care is used to denote both health insurance and health services.)

Assume that 2 goods are produced, health care, h, and a general consumption good, y. Every individual is able to produce a quantity h of health care, h, and y of the second good with a limit given by his production possibility curve, n:

$$n = ph + qx \tag{3.20}$$

p and q are the unit prices of health care and the second good. The productivity of each individual depends on his (her) skill and is distributed across the population according to a function $f(n,\beta)$. The parameter β indicates the taste for consumption of health care. The sum of the production possibility over all individual gives the production possibility frontier of the entire society:

$$p\,H + q\,Y = \iint n\, f(n,\beta)\, dn\, d\beta \tag{3.21}$$

H and Y are total outputs of the entire population. Every individual is characterized by the same utility function:

$$U = h^{\beta}\, y^{1-\beta}, \qquad 0 \leq \beta \leq 1 \tag{3.22}$$

The society decides whether to socialize the production of health care by majority rule. If socialization is approved, every individual is provided with a uniform level h*. Every individual is likely therefore to vote in favor of socialization as long as the utility gained

under this regime U^S is greater than the utility gained under market production of health care U^M – i.e., $U^S > U^M$.

Under a free market regime, the optimal quantities of h and y for each individual are the following:

$$\hat{h} = (\beta n)/p; \qquad \hat{y} = (1-\beta)n/q \tag{3.23}$$

Substituting these quantities in (3.22) obtains:

$$U^M = (\beta)^{\beta} (1-\beta)^{1-\beta} [1/p]^{\beta} [1/q]^{1-\beta} n \tag{3.24}$$

Under regime of socialization, the utility function is:

$$U^S = (h^*)^{\beta} (y)^{1-\beta} \tag{3.25}$$

Funding for socialized health care comes from taxation. If t is a flat marginal tax rate imposed on every individual, his (her) disposable income becomes (1-t)n and his (her) consumption of the second good is:

$$y = (1-t)n/q \tag{3.26}$$

The level of taxation is given by equalizing tax revenue and total cost of health care provision:

$$t = ph^*/N \tag{3.27}$$

N is the average income or skill level given by:

$$N \iint f(n,\beta)\, dn\, d\beta = \iint n\, f(n,\beta)\, dn\, d\beta \tag{3.28}$$

Combining (3.24) and (3.25) obtains the following expression:

$$\frac{U^S}{U^M} = \left[\left(\frac{t}{\beta}\right)^{\beta}\left(\frac{1-t}{1-\beta}\right)^{1-\beta}\right]\left(\frac{N}{n}\right)^{\beta} \tag{3.29}$$

Each individual is in favor of socialization as long as (3.29) is greater than one. This expression is made of 2 parts. One is taste-dependent; one is income-dependent. Individuals with income below average or $N/n > 1$ tend to be in favor of socialization. This is likely to occur in every society as income distribution tends to be rightly skewed. Individuals with stronger preferences for socialization than average tend to be in favor too. This depends on the value of β related to the value of t. The latter reflects the average preference of the society because it amounts to the economic resources globally allocated on health care. A graphic expression of (3.29) can be obtained by imposing its value equal to one.

Figure 3.3 is drawn from Usher (1977). The plot illustrates the levels of income

and tastes where some individuals are in favor and others are against socialization using n_0 as minimum level of income and β_L and β_H as low and high extremes of the taste distribution. Socialization is likely when income distribution is non-uniform – i.e., n_0 is far from N – and the spectrum of all possible tastes is relatively small. Individuals in favor of socialization are characterized by values of n and β within the rectangle ABCD, while individuals against socialization are characterized by values of n and β above the tract BC and within the interval β_L and β_H. Therefore, socialization tends to be more likely when the spectrum of income distribution n_0-N is large and the spectrum of tastes β_L-β_H is small.

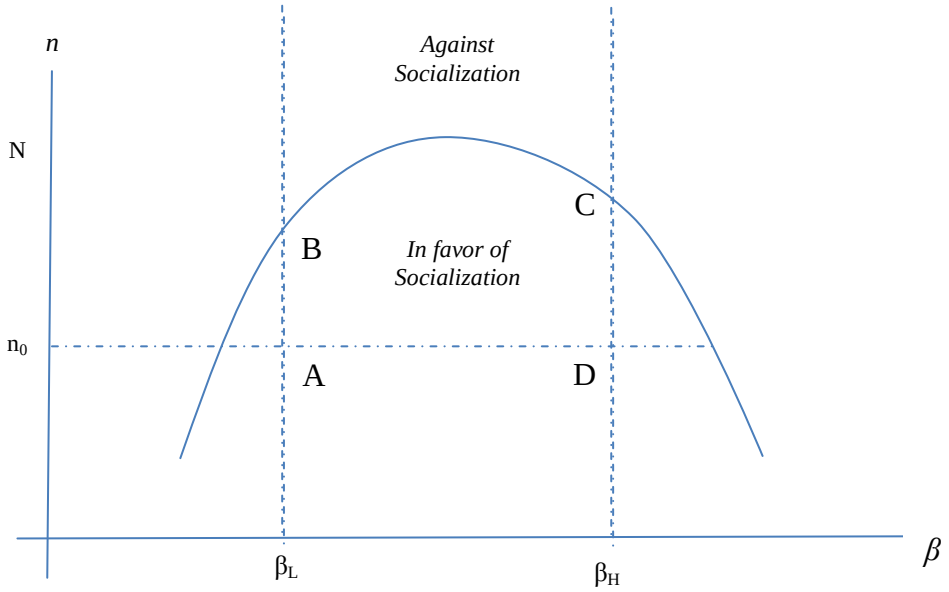

Figure 3.3

3.5 Electoral Models for Public Health Care

A number of other papers have analyzed the politics of health care system choice directly. Many are from the literature of public choice or political economy and focus on the political equilibria that can generate a mixed public-private provision of health insurance or health care. Most public choice studies on the market for health care are built on the analytical frameworks of Arrow (1963) and Pauly (1974). Indeed, Pauly (1974) includes a short analysis of political equilibrium. Public choice and political economy studies further explore and develop the Arrow, Pauly, and redistributive rationales. This section reviews some of the main contributions of that literature.

A common argument of public choice or political economy is that public programs providing private goods like public pension programs or public health programs may be due to a large population of low-income individuals that can vote on it. Public programs transfer economic resources from high-income individuals to low-income individuals. For this reason, socialization is likely adopted, if the option comes to be voted upon since the income distribution tends to be rightly skewed in most societies [6]. Usher (1977), as noted above, develops this argument in a model where individuals have different income and different elasticity of consumption.

The hypothesis that the median voter's preferences determine social insurance expenditures is tested in Congleton and Shughart (1990) through an overlapping generation model of the demand for social security in which the individuals have the same utility function but face different income and time constraints. Their empirical results show that a change in the median voter's constraints can produce a change in the

level of public expenditures.

Other majority coalitions are also possible. For example, tails-against-the-middle may be equilibrium as well. Such equilibria are analyzed in Epple and Romano (1996b). In their analysis, the median-income voter is pivotal only when no individuals chose private insurance. In other cases, voters with income below median are pivotal and the dual public-private regime emerges with a public provision below the preferred level of the median-income voter. In this case, majority support for mixed public-private systems is formed by low- and high-income individuals who may prefer a redistributive public program with a public provision smaller than that preferred by middle-income individuals. The Usher, Congleton and Shughart, and Epple and Romano analyses are general models of the public provision of any private good.

Other models focus more narrowly on the public provision of health care and attempt to explain why and how different mixes of private and public provisions may emerge. These papers are clearly important, because the OECD countries adopt different mixes of public and private provision of health care and health insurance. Public and private provision of health care may coexist because a public provision only is unlikely to be Pareto-optimal. Some individuals are likely willing to buy a larger quantity of health care than the public level; others are likely willing to buy a smaller quantity. Maintaining a mix of public and private funding can thus be a Pareto improvement.

Breyer (1995) analyzes this possibility in a model in which health care can be publicly provided through 2 regimes. The first allows for supplemental purchase of private insurance ("weak rationing"); the second does not ("strong rationing.") The size

of the public level of insurance is set through vote by individuals of different incomes and different tastes – i.e., different elasticity in consumption. Individuals are distinguished by income and taste over health care. To attain a political equilibrium under the second arrangement is possible only when individuals with median income have also median taste. To attain a political equilibrium under the first arrangement is easier as different levels of consumption are allowed by the mix of public-private insurance.

The coexistence of public and private health care can also be explained as a political equilibrium of the tails-against-the-middle, as in the Epple and Romano (1996b) analysis. As long as public and private health care coexist, a relatively low level of public provision may be optimal for both poor and rich individuals because both prefer a low level of taxation. The former can more easily afford it and still enjoy the public provision of health care. The latter can supplement the public provision with private care.

Models of public health care provision in which such equilibria exist are developed in Gouveia (1997) and Anderberg (1999). Gouveia (1997) finds that a mixed regime of private-public funding for health care can be a stable equilibrium where the median voter's income is below the median and the level of public provision is led by the distribution of income and preferences. Anderberg (1999) finds that the equilibrium of tails-against-the-middle can be attained when the information about risk-heterogeneity is private. When this information is public, the regime preferred by the median voter is more likely adopted instead of the mixed regime.

The mixed public-private regime can be an equilibrium with a level of public provision above the preferred level for high- and middle-income individuals, if the demand for health care is inelastic. In this case, unlike the above models, low-income individuals are more likely to buy supplemental insurance than high- and middle-income individuals. Jacob and Lundin (2005) arrive at this slightly different conclusion by developing a similar model where the utility of consumption is inelastic by assumption.

The existence of public provision of health care may also be explained as an ex-ante constitutional choice of the population. The political process may aggregate the different preferences of individuals with different income and morbidity over public and private arrangements. The adoption of a private or public regime may thus depend on the distributions of income and morbidity. This argument is developed in Kifmann (2005) where individuals can vote on 3 options: A private risk-based scheme; a public flat-tax scheme; and a public income-proportional tax scheme. The scheme can be adopted by unanimous majority only, and when the public scheme is adopted, the amount of health care provision is determined by voting under majority rule.

Several self-interest based public choice hypotheses have been tested using panel data from 24 OECD countries beginning with Gouveia (1996).

3.6 Estimates of the Effects of Income on Health care Demand

Breyer (1995) and Gouveia (1997) predict that higher income can lead to larger consumption of health care. As the pivotal voters get richer, they may push the political equilibrium towards higher levels of public health expenditures. In reality, this can occur as long as health care is a superior good. Whether reality matches this prediction is thus an empirical question. However, the tests conducted so far have found no completely robust results.

Several empirical tests were conducted on OECD countries between the 1970s and 1990s supporting the hypothesis that health care is a luxury good or income elasticity is greater than one: Newhouse (1977); Milne and Molana (1991); Getzen and Poullier (1991); and Gerdtham et al. (1992). Other tests found the opposite. Hitiris and Posnett (1992) found that the income elasticity of demand for health care is only about one while Parkin et al. (1987) showed that income elasticity is lower than one. Di Matteo (2003) showed that income elasticity varies across the population and is not above one in every case, using non-parametric estimation methods.

More recently, the focus shifted on the time-series properties of health expenditures and GDP. This line of research tests for unit roots and co-integration between health care expenditures and GDP. The results are inconclusive and not very robust as to the choice of the testing methodology. Hansen and King (1996) find no co-integration between health expenditures and GDP for all OECD countries except Iceland. They apply an Engle–Granger 2-step method and test the residuals from the co-integrating regression with the Augmented Dickey-Fuller (ADF) test. They conclude for

spurious results of tests based on GDP and health expenditures. Roberts (1999) finds no conclusive evidence about the existence of co-integration either basing on country-to-country co-integration tests. Blomqvist and Carter (1997) find no stationarity but can reject the null hypothesis of no-cointegration using the Phillips–Perron test for the second step. Similar results are found in Gerdtham and Lothgren (2000; 2002) and Okunade and Karakus (2001). On the other hand, McCoskey and Selden (1998) reject the null hypothesis of unit roots for health expenditures and GDP. Similar results are obtained more recently in Jewell et al. (2003) and Carrion-i-Silvestre (2005). The latter considers the possibility of structural breaks in the time series finding that health expenditures and GDP are stationary around up to 5 structural breaks for 20 OECD countries. This is perhaps the latest twist in the debate.

Other factors were considered as potential drivers of health expenditures. Ageing in the population; extent of public funding; real prices; and technological change are examples. Di Matteo and Di Matteo (1998) and Grossman (1972) find some support for ageing of the population. Hartwig (2007) and Okunade et al. (2004) find some support for the positive effect of real prices while Gerdtham et al. (1992) doesn't. Several pointed to technological progress like Newhouse (1992); Okunade and Murthy (2002); Dregen and Reimers (2005). Overall, the empirical tests indicate that none of these other factors are as robust as the link between income and public health care expenditures.

3.7 Sociology and Ideology as Factors in the Size of Social Insurance Programs

The previous section showed that high-income individuals may likely be against the public provision of health care, while low-income individuals may likely to be in favor of it. The rationale behind it was based on individuals' self-interest. However, they may be driven by non-selfish motivations as well. This section briefly discusses why ideology and social values may also affect demands for the public provision of health care.

There are several normative principles that can be used to justify the public provision of health care services. A society providing the conditions to maintain individuals' capability of health functioning [7]; moral concern for others; collective responsibility; and justice requiring equal opportunity and equal distribution of resources [8].

According to Alesina et al. (2001), the strength of these principles differs across different societies. They argue that social and political factors can explain the differences between the United States and Europe in the welfare state better than economic factors can.

The idea of sharing costs and benefits with others is the foundation of any public program. Other things being equal, a weak attitude about sharing reduces voter willingness to be in favor of large public programs. Alesina et al. (2001) argue that the United States is more culturally and ethnically fragmented than Europe and tends to reduce willingness to share. This difference is reflected and reinforced by the democratic institutions of the United States such as the federal constitution and the electoral system based on plurality. They argue that passing legislation in favor of large public program is

more difficult in the U.S. system than in parliamentary republics elected under proportional rule.

The American exceptionalism [9] may be another behavioral factor motivating people's attitude against large public programs. Individuals driven by this idea may believe that social safety nets represent an incentive for lazy individuals to become lazier. These individuals may be considered as cheating the system and stealing from honest people. To some extent, this idea comes from an ethical conception of work rooted in the religious traditions of Protestantism [10]. In Europe, the idea that poverty is the result of unfortunate conditions, rather than individual choices, may be more widely held and motivate broader support for social insurance programs such as health care.

Another normative basis for supporting universal health care is provided by theories of social justice that favor an equal distribution of resources. The latter represents a core principle of the leftist parties' ideologies. A national health service is consistent with this principle: It universalizes health benefits funded through progressive taxation and gives control over the health care system to a representative central government.

Insofar as this ideological argument for social insurance programs holds, it suggests that a national health service would be implemented and/or expanded in countries and at times when left-of-center parties formed governments. Navarro (1989) makes this argument focusing not only on the role of leftist parties but also on the role of labor unions. Adopting a national health service was possible only in countries where both leftist parties and labor unions were sufficiently strong to beat the political

opposition of the capitalists [11].

In Navarro's analysis, opponents to universal and uniform health benefits were attempting to weaken the labor unions by fueling inequalities among blue-collar workers. In European countries, the unions were larger and more powerful than in the United States. This was due to the type of unions – mostly, industrial unions in Europe vs. farmers' and crafters' unions in U.S. – and the racial and religious differences within the unions to a larger extent in the U.S.

On similar lines, Freeman (2000) points to the political strength of the leftist parties in Sweden, Great Britain, Italy, and West Germany as the main driver of increased health care socialization between the 1950's and 1970's.

The influence of ideology and people values on health policies is also stressed in Jacobs (1993). He focuses on the reform of the health care market in the United States arguing that ambivalent feelings about a national health program among people slowed the reform. Although many Americans are in favor of a tax-funded program providing health care to the entire population, they are skeptical about the role of the government and the possible inefficiencies stemming from it. The ambivalence of people's ideas and preferences created room for special interest groups to induce policymakers to maintain the status quo.

Ruger (2007) argues that ideological reasons prevented the creation of a national health care program in United States. Her point is that reforming the public provision of health care involves the interest of the entire society and therefore requires a social agreement. This cannot be attained without a bulk of shared values that allow sufficient

stability and social unity. Ideological differences across different classes fueled the existence of different positions on the reform. She points out that a consensus on the principle of universal health care exists but is not supported by a widely shared principle. As a consequence of it, the vision about how to achieve the goal of universal health care and provide economic resources for it remains unclear.

3.8 Conclusions: Hypotheses about Health Systems

Arrow (1963) and Pauly (1974) showed that an unregulated market for health care cannot lead to a Pareto-optimal allocation of resources. This is the basis of the economics literature on health care. Different lines of research developed from here.

The public choice and political economy line of research focuses on the political process and provides different self-interest based electoral rationales about the adoption of private, public, or mixed public-private regimes. Some contributions assume that insurance can be used to pay for health care but not direct payments – Breyer (1995) and Anderberg (1999). Others make no specific assumption about whether health services are paid for through insurance or direct payments – Usher (1977); Gouveia (1996, 1997). Such assumptions probably follow from the focus of analysis, whether on the political equilibrium of a mixed private-public option or on the effects of uncertainty and asymmetric information.

In reality, the funding mechanisms adopted among OECD countries are more complicated than the public-private choices analyzed. Individuals can privately pay through either insurance or direct out-of-pocket payments. Public funds can be used to pay for government-run facilities; to pay non-profit social funds; to subsidize health insurance; and to fund private providers of health services. This implies that the options available for a policy-maker are broader than what usually assumed.

In this sense, it can be argued that the public choice literature has neglected several important margins of choice. Studies like those above cannot answer such questions about the particular combination of mechanisms to fund health expenditures

adopted in one country. Nor do they address whether the use of different mechanisms induce different levels of expenditure.

Looking into the history of health care provision may help to formulate some hypothesis. Three crucial steps are easy to recognize: The creation of private insurance in the Middle Ages; the establishment of social insurance in central Europe, in the late 1880s; and the establishment of a national health service, in some cases after World War II. Each step coincides with the adoption of a different mechanism to fund health expenditures. Private insurance gives protection against an uncertain bad event and is thus the most natural mechanism to adopt for a single individual. Social insurance allows a more efficient way to share the risk within a society and at the same time facilitates the political equilibrium between rich and poor individuals. A national health service takes social insurance a step farther: It guarantees universal coverage and strengthens the income redistribution by shifting from payroll taxation to income taxation.

Every funding mechanism, or combination of mechanisms, redistributes risk and income in a different manner across individuals. Some individuals can benefit from it more than others can. This makes it plausible that ordinary day-to-day politics may play central roles in the mix of public and private programs observed in a given country at a given time.

CHAPTER 4

CHOOSING AMONG HEALTH CARE SYSTEMS: A MODEL

4.1 Introduction

This chapter focuses on the choice of mechanisms to fund health expenditures, elaborating a model based on narrow self-interest and an extended model that incorporates the effects of shifts in ideology and social values. Among OECD countries, health expenditures are funded through 4 main mechanisms: Private health insurance; private out-of-pocket payments; social health insurance; and a national health service.

Although the shares of expenditures covered by each mechanism vary from country to country, as noted above, the OECD countries can be classified into 3 groups based on the mechanism that covers the highest share. Countries where the national health service covers the highest share represent one group – Canada, Finland, and the United Kingdom are examples. Countries where social insurance or health insurance provided by s.c. "Sickness Funds" [1] covers the highest share like (e.g.) Austria, France and Germany represent another group. Finally, Switzerland and the United States, where the larger share is covered by private insurance represent the third group during most of the period of interest. Table 2.1 in Chapter 2 reports the data on average share of health expenditure across OECD countries within the period 2000-7.

This chapter attempts to answer the following question: Why are different

regimes of funding for health care adopted in different countries? The history of health care provision suggests that special-groups interests, political ideology, or historical events like wars may all have influenced the health care system choice. This chapter argues that selection of health care service is a political choice; and within democracies, politicians may rationally choose the regime that best advances the interest of a majority of their respective electorates. As a consequence, both self-interest and ideology can play a role and different regimes are simply due to different majorities.

The analysis of this chapter uses the strong form of the Median Voter theorem (MVT) [2]. According to the MVT, the political process converges towards the median voter's preferred policy. In a multi-dimensional policy choice setting, this requires the assumption that voter preferences are symmetrically distributed around a subset of pivotal voters at the multi-dimensional median. In this case, changes in the health funding regime occur when the median voter's preferences or constraints change.

The funding mechanisms for health expenditures have never been selected by general vote. However, transformations of health care systems are often associated with political shifts, with health expenditures being increasingly socialized when the leftist parties have strengthened. Of course, this is not always the case. In 1878, a conservative German government established a regime of social insurance covering the entire population of workers. This indirectly gave German Social Democrats a foothold in the public administration through local health bureaus administered by committees where the workers had the largest representation [3]. The national health service was established in the United Kingdom in 1948, after the victory of the Labour Party in the 1945 political

elections [4] and while the political pressure for a welfare state were influenced by the ideas of the Beveridge Report [5]. Italy switched from social insurance to a national health service in 1978, when the leftist parties held about 48% of the seats in the Parliament – i.e., the Communist Party held about 34.3%; the Socialist Party held 9.6%; and the Social Democrats held 3.7% [6]. All these cases suggest that elections and electoral considerations play important roles in health care system choices.

Two models of system choice are developed, one based on narrow self-interest and another based on extended interests. That the results can be expressed in terms of the income and morbidity distributions allows these predictions to be tested, which is undertaken in the next chapter. If voters are motivated entirely by self-interest, their preferred method of health care finance is determined by their income and morbidity. The analysis developed below suggests that the median voter's preferences for a national health service should strengthen when his (her) income falls below average and morbidity rises above average because under this regime he (she) can share the likely high cost of health care with the entire society. His (her) preferences for private insurance increases in the opposite case and for the opposite reason – in such cases, he (she) would not want to share the cost of health care of others. His (her) preferences for social insurance should be stronger in intermediate cases.

If ideology and social values also enter the median voter's preferences, then he (she) will be more or less willing to bear the cost of health spending for other individuals, according to the ideology internalized. For example, a left or more egalitarian ideology would strengthen his (her) preferences for a national health service or social insurance

even when his (her) income and morbidity are respectively above and below average. Such tendencies occur as long as the socialization of health care finance reduces insurance or service prices in a manner that indirectly redistributes from low- to high-morbidity and from low- to high-income individuals.

The chapter is organized as follows. The next section develops the general assumptions of the model. Section 3 discusses the different regimes of funding for health expenditures. Section 4 explains the political and economic equilibria. Section 5 illustrates the extended version of the model. Section 6 concludes.

4.2 General Assumptions

The model includes 3 different institutional alternatives, representing the health funding regimes in use among the OECD countries. Individuals are characterized by different levels of income and morbidity. Their utility depends on consumption of health care and other goods and services. In the extended version of the model, utility also depends on ideology and social values. The models are solved in two steps. First, the optimal level of health care provision is calculated for each voter. Second, the optimal levels of funding are determined for the median voter. The regime adopted is determined by relative sizes of the groups of voter types.

Each country is assumed to be populated by individuals with similar tastes and risk-aversion, but with different distributions of private income and health risks (morbidity). Morbidity corresponds to the probability of contracting a disease. To simplify the analysis, assume that only two states of health are possible: Healthy or sick. An individual i's probability of being healthy is $1- \pi_i$; the probability of being sick is π_i. The average probability of being sick in the country of interest is denoted without the individual subscript, as π. Similarly, an individual's personal income is denoted as $y_{i,}$ and the average income in the country in which "i" lives as y.

Utility is represented with a separable function in ordinary consumption and health care: $U = u(C) + v(H)$. The expected utility for every economic agent is a convex combination of utility gained under the two states, healthy and sick, $U^e = (1- \pi_i)\, U(W) + (\pi_i)\, U(S)$ [7]. Suppose that H is the cost of treating illness when sick and that no health care expenditures are required when well. The maximum consumption of other goods

and services is thus equal to $C_s = y_i - H$ when sick and $C_h = y_i$ when healthy.

4.3 Benefits and Costs under Different Settings

For the purposes of this dissertation, it is assumed that health care costs, H, are paid for through some combination of private insurance, H_P, social insurance, H_S, and direct government health care services, H_G. If a person is indifferent among methods of health care finance and the services provided are identical, he or she will simply prefer the system that is least expensive for him or her. That is to say, only relative costs will affect voter preferences.

In this case, voter preferences will all be "corner solutions," insofar as one service is cheaper than another. For example, if the private insurance is perfectly priced, individual i will pay $\pi_i H$ for complete coverage. If social insurance programs and/or direct government provision are paid for via taxes, then the average tax paid, ty, must equal the average (expected) payout for complete coverage, πH. This balanced budget assumption implies that $t = \pi/y\ H$. Public insurance or direct health care services thus cost individual i, $\pi/y\ H\ y_i$. Individuals will prefer public tax-financed health care whenever $\pi_i H > \pi/y\ H\ y_i$, which implies that:

$$\pi_i / y_i > \pi/y \qquad (4.1)$$

Voters will prefer public health care if their risk to income ratio is greater than average. This may occur either because risks are greater than average or because income is less than average. In such cases, equivalent private health care is more expensive than tax-financed health care.

A similar conclusion holds if some additional mark up or imprecision, Δ_P, is introduced into private markets. Price distortions from informational asymmetries, additional administrative costs, and profit margins tend to make private insurance more expensive for individual voters [8]. Suppose that the market price for i's insurance is equal to $\Delta_P \pi_i H$ with $\Delta_p > 1$. In such cases, additional voters will favor tax-financed insurance, because the condition, $\Delta_P \pi_i H > \pi / y H y_i$ will be satisfied by more voters in a given income and morbidity distribution.

The choice among public health care systems is similarly driven by costs. If social insurance and government-provided health care are equally effective, and thus cost the same amount to provide service level H, voters favoring tax-financed health care will be indifferent between the two methods of producing health care services. If one of these methods of producing health care services (private or government) is believed to be more efficient (less costly) than the other, that system of health care delivery will be preferred by all voters favoring tax-financed health care. Difference of opinion on the relative cost of the two services, or in national circumstances, can produce voters that prefer one or the other service, but not combinations of the two services.

If the system choice reflects median voter preferences and those preferences are narrow ones, each voter will prefer a single system, and so there will be a single system in place, namely the one preferred by the median voter, the voter with median income and health risks. Such a system would tend to be stable, to the extent that the median voter was not "nearly" indifferent among systems. In such cases, only relatively large changes in median voter income or morbidity would induce changes among systems.

If, however, the various health care systems provide somewhat different services or advance somewhat different social goals for voters, this sharp conclusion may change. In such cases, combinations of services may be preferred to pure systems. Chapter 2 suggests that most OECD countries use combinations of systems, which suggests that such differences may affect voter choices. The remainder of this chapter focuses on considerations that may induce voters to prefer combinations of private insurance, social insurance, and direct government provision of health care services to pure systems of finance and production.

4.3.1 The Demand for Private Insurance Revisited

Even under completely private systems, health expenditures may not be entirely covered by purchases of health insurance. Voters can pay for their health care through purchases of insurance, H_P, and by additional out-of-pocket payments, F. The latter refers not only to co-payments and deductibles imposed by health insurance companies but also to health services not covered by insurance plans.

Suppose that voters have a separable, iso-elastic, utility function in which ordinary consumption and types of health care services enter as separate goods [8]. Such functions are often assumed in studies of social insurance programs [9].

$$U = C^z + (H_P)^a + (F)^b \qquad (4.2)$$

(with $1 > z, a, x > 0$.) [10] The voter will pay for insurance whether she is sick or not, but

will only have to pay out-of-pocket expenditures if she is sick. When healthy, she consumes: $C_H = y_i - \Delta_P \pi_i H_P$ and when sick, she consumes: $C_S = y_i - \Delta_P \pi_i H_P - F$. Again assume that the total health care cost, H, will be covered, which implies that $H = H_P + F$, or $F = H - H_P$. Substituting, allows the voter's expected utility can be represented as:

$$U^e = (1-\pi_i) [C_H]^z + \pi_i [(C_S)^z + (H_P)^a + (H-H_P)^b] \qquad (4.3)$$

Health care expenditure benefits accrue only when sick. Differentiating with respect to private insurance protection, H_P, produces a first order condition that characterizes the voter's demand for private insurance.

$$- (1-\pi_i) z (C_H)^{z-1} \Delta_P \pi_i + \pi_i [z (C_S)^{z-1}(1-\Delta_P\pi_i) + a (H_P)^{a-1} - b(H-H_P)^{b-1}] = 0; \qquad (4.4)$$

The concavity of the utility function assures that a unique H_P^* exists that will satisfy equation 4.4. Although no closed form solution for H_P^* exists, a broad range of values for the exponents, income, health risks, insurance prices produce intermediate solutions in which the individual purchases less than complete insurance. For example, in the case in which private insurance is efficiently priced, $\Delta_p = 1$, voters are risk-neutral, $z = 1$, and $a = b$, the voter will purchase insurance to cover only half of her health risk and pay the other half out-of-pocket.

In other cases, the implicit function differentiation rule can be applied to equation (4.4) to determine how insurance demand varies with voter income and morbidity. Given

the concavity of the utility function, the qualitative effect of an increase in income or morbidity is determined by derivatives of 4.4 with respect to personal income and probability of illness.

The quantity of insurance purchased, H_P^*, falls with income if:

$$- (1-\pi_i)\, z\, (z-1)\, (C_h)^{z-2}\, (\Delta_p \pi_i) + z\, (z-1)\, \pi_i\, (C_S)^{z-2}\, (1-\Delta_p \pi_i) < 0 \quad (4.5)$$

Which is satisfied whenever:

$$(1- \pi_i)\, \Delta_p\, \pi_i\, (C_H)^{z-2} < \pi_i\, (1-\Delta_p \pi_i)\, (C_S)^{z-2} \qquad (4.6)$$

Note that condition (4.6) holds whenever insurance is reasonably and efficiently priced, because $C_H > C_S$ and $(z-2) < 0$. Voters tend to self-insure as income increases, because diminishing marginal utility implies that the uninsured risk becomes less important at the margin as income increases.

Similarly, the quantity of insurance purchased at the margin increases with morbidity if the derivative of equation (4.4) with respect to π_i is greater than zero. That derivate is:

$$z(C_H)^{z-1}\Delta_p\pi_i - (1-\pi_i)\, z\, (C_H)^{z-1}\, \Delta_p + z(C_S)^{z-1}(1-\Delta_p\pi_i) \qquad (4.7)$$
$$+ a(H_P)^{a-1} - b(H-H_P)^{b-1} - \pi_i\Delta_P\, z\, (C_S)^{z-1}$$

In the case in which private insurance is more or less efficiently priced, this can be written as the following after collecting terms:

$$(1-2\pi_i)\, z\, [(C_S)^{z-1} - (C_H)^{z-1}] + [a(H_P)^{a-1} - (b)(H-H_P)^{b-1}] \qquad (4.8)$$

which unfortunately cannot be signed without making further assumptions. For $\pi_i < 0.5$ the first term is positive because $1 > z$ and $C_s < C_h$. The last term will be greater than zero if $a > b$, which will imply that $H_P > (H-H_P)$. In this range, an increase in health risk leads to a greater purchase of health insurance.

The ambiguity arises for two somewhat different reasons. First, insurance prices are assumed to, more or less, efficiently account for individual risk, so insurance prices rise as personal health risks increase. A second source of ambiguity arises in the high-risk range, if health needs (H) are great. In that range, persons may not be able to afford to purchase very much insurance, and, consequently, will tend to become uninsured risk-takers because of the household budget constraint. The latter cases are, of course, often used to make a fairness case for public provision or subsidization of health care insurance and/or health care.

4.3.2 Choosing Between Private and Socialized Health Insurance

Under a regime of (compulsory) social health insurance, each individual receives a fixed quantity of health insurance coverage, H_S, from non-profit social funds. This can be supplemented by voluntary private health insurance, H_P, provided by for-profit insurers.

The first is funded through a flat payroll tax rate t. The second is funded by the premium indicated in the above.

Funding H_S through taxes involves a collective decision process. This case requires a broader analysis than the case of private health insurance. For the moment, it is assumed that a typical or pivotal voter exists and determines the level of H_S. This assumption makes the model tractable and helps define the relationship between optimal level of health expenditure and income/morbidity for a typical agent. The latter is in line with the aim of analyzing how changes in income and morbidity can affect the optimal levels of health care.

To further simplify, assume that social insurance is provided by a single non-profit social fund [11] and that the fund is self-financing. In this case, the total cost of social health insurance payouts must equal total contributions. Using y and π for average income and morbidity respectively, the budget constraint of the social health fund can be expressed as below:

$$t\, y = \Delta_S\, \pi\, H_S \qquad (4.9)$$

which implies:

$$t = \Delta_S\, \pi/y\, H_S \qquad (4.10)$$

where Δ_S represents the overhead and administrative costs of the social insurance system.

For a well-managed fund, Δ_S is approximately 1. Equation (4.9) characterizes the payroll tax that balances the budget of the social fund.

Voter i's payment for social insurance H_S is $t\, y_i = \Delta_S\, \pi/y\, y_i\, H_S$. Note that funding health care through a proportional tax on income implies that persons of the same risk pay different prices for insurance depending on their income. The lower a person's income, the lower is his or her tax price. The absence of a personal risk parameter in this price, π_i, also implies that insurance costs do not reflect personal risks. Only average risks are taken into account. A person of average income with above average risk pays a lower price for social insurance than he or she would for private insurance.

As a consequence, Δ_S may include distortionary effects similar to those induced by asymmetric information in private markets. For example, the moral hazard problem may be larger in social insurance systems than in private systems, although economies of scale in admission and tax collection imply that this effect may be offset by reduced administrative costs. If so, the insurance mark-up for social insurance systems may be smaller than for private insurance, $\Delta_S < \Delta_P$. The latter provides an efficiency rationale for shifting from private to social insurance schemes.

Because both funding mechanisms are based on insurance, the insurance premiums paid for both private and social health insurance are paid whether a person is well or sick. It is assumed that some public-private combination of full insurance is purchased, in which case the amount of income for consumption of other goods/service available when healthy is the same amount that is available when sick:

$$C_S = C_H = (1 - \Delta_S \pi/y\ H_S)\ y_i - \Delta_P \pi_i H_P \qquad (4.11)$$

Assuming that health care services are somewhat different under private and social insurance, expected utility can be represented as:

$$U_i = (C_i)^z + \pi_i (H_P)^a + \pi_i (H_S)^b \qquad (4.12)$$

$$\text{with} \quad 0 < z < 1;\ 0 < a < 1;\ 0 < b < 1;$$

Under the above assumptions, personal assumption, C_i, is characterized as in equation (4.11) and $H_p = H\text{-}H_s$. Substituting these into (4.12) and differentiating with respect to H_S yields a first order condition describing voter i's demand for socialized health care. H_S^* satisfies:

$$z\ (C_i)^{z-1}\ [\Delta_P \pi_i - \Delta_S \pi/y\ y_i] - a\ \pi_i (H\text{-}H_S)^{a-1} + b\ \pi_i (H_S)^{b-1} = 0 \qquad (4.13)$$

Optimal private health care, H_P^*, is simply $H\text{-}H_s^*$. The assumption that social insurance and private insurance-funded health care are different goods in the minds of consumers causes most consumers to prefer combinations of the two programs to pure forms of either program.

Equation (4.13) implies that the optimal level of social insurance, H_S*, for low-income and high-morbidity individuals is higher than for high-income and low-morbidity individuals, because they pay a lower (tax) price for social insurance than for private

insurance. An increase in the marginal cost of private care relative to socialized health care tends to increase the demand for socialized health care. Similarly, an increase in the markup, Δ_P, for private insurance relative to social insurance also tends to encourage a larger purchase of social insurance. Conversely, the preferred level of privately purchased insurance, H_P^* is higher for high-income individuals than for low-income individuals, other things being equal, because they pay a higher price for social insurance than for private insurance. Demonstrations and limits of these conclusions are developed in the Appendix.

4.3.3 The Demand for a National Health Service

A similar approach can be used to analyze choices among all three systems. Under a composite system, health care needs (H) are satisfied through a combination of private and social insurance and directly-provided services by the government. For the purposes of this section of the dissertation, it is assumed that both social insurance and government health services are funded through a proportional tax on income sufficient to cover the average payouts of the insurance program and national health care system. Because national health care systems are relatively large, the average payouts, H_S and H_G, reflect the average probability of being sick, π. The balanced budget rule requires:

$$t\, y = \pi\, (\Delta_S\, H_S + \Delta_G\, H_G) \qquad (4.14)$$

Which implies:

$$t = \pi/y\ (\Delta_S H_S + \Delta_G H_G) \qquad (4.15)$$

Where Δ_s and Δ_G again represent the overhead, administrative, and moral hazard costs induced by the programs.

Taxes and private insurance premiums are again assumed to be paid whether one is well or sick, which again implies that there is a single private budget constraint. Any out-of-pocket expenditure paid by individuals is treated as part of the private insurance program to simplify the analysis.

$$C_S = C_H = (1\text{-}t)y_i - \Delta_P \pi_i H_P \qquad (4.16)$$

or

$$C_i = [1 - (\Delta_S H_S + \Delta_G H_G)\ \pi/y]y_i - \Delta_P \pi_i H_P \qquad (4.17)$$

As in the previous case for social insurance, the ideal provision of health care benefits for a typical voter, G, is the focus of analysis. This approach keeps the model tractable and allows us to characterize the relationship between optimal level of health provision and a voter's income and morbidity.

Voters are again assumed to regard each of the health care systems to be somewhat different goods:

$$U_i = (C_i)^z + \pi_i (H_P)^a + \pi_i (H_S)^b + \pi_i (H_G)^c \qquad (4.18)$$

with $0 < z < 1; 0 < a < 1; 0 < b < 1; 0 < c < 1;$

In the case of a national health service, the voter's optimization problem becomes:

$$\max_{H_P,H_S,H_G} \quad U = (C_i)^z + \pi_i (H_P)^a + \pi_i (H_S)^b + \pi_i (H_G)^c \qquad (4.19)$$

$$\text{s.t.} \quad C_i = [1 - (\Delta_S H_S + \Delta_G H_G)\, \pi/y] y_i - \Delta_P \pi_i H_P;$$

$$H = H_P + H_S + H_G;$$

Substituting for C_i and using the need constraint to express private insurance as the residual of the tax-financed health care systems, $H_P = H\text{-}H_S\text{-}H_G$, allows the demand for social insurance and government-provided health care services be characterized with two first order conditions:

$$z (C_i)^{z-1} [(-\Delta_S \pi/y) y_i + \Delta_P \pi_i] - a \pi_i (H\text{-}H_S\text{-}H_G)^{a-1} + b \pi_i (H_S)^{b-1} = 0 \qquad (4.20)$$

$$z (C_i)^{z-1} [(-\Delta_G \pi/y) y_i + \Delta_P \pi_i] - a \pi_i (H\text{-}H_S\text{-}H_G)^{a-1} + c \pi_i (H_G)^{c-1} = 0 \qquad (4.21)$$

The implications of (4.20) and (4.21) are very similar to those of equation (4.13). The marginal cost of taxpayer-financed health insurance and health care relative to private insurance tends to fall as income falls and as morbidity increases. Low-income and high-morbidity individuals are likely to prefer a relatively higher level of public health spending than preferred by high-income and low-morbidity individuals. See the Appendix for demonstrations of these comparative static results.

The assumption that health care services differ in the minds of voters again plays an important role in generating intermediate equilibria. This effect is generated by the assumption of diminishing marginal returns for all three health care systems. In the case in which a=b=c=1, the services are perfect substitutes for each other and will vote in favor of their least cost service, which is determined by their health risk and income relative to the average and by the relative administrative costs of the various programs. In that case, a voter favoring tax-financed health care (a person with below average income and above average risk) would favor a social insurance system if $\Delta_S < \Delta_G$ and would favor direct government provision, if the choice between social insurance and direct government provision if $\Delta_S > \Delta_G$.

The exponents can also be given an ideological interpretation. For example, a person with left-of-center ideological beliefs might tend to have preferences with exponents c > b > a. His or her preferred health care system will differ systematically from those of a more pragmatic voter for whom c=b=a=1, and a right-of-center voter for whom c<b<a. In the absence of cost differences, a left-of-center voter would prefer a relatively large government medical service, and a right-of-center voter would prefer a relatively larger private insurance sector. A pragmatist with average income and health risk would be indifferent among systems. The exponents can also be interpreted as indicating various levels of risk-aversion, which may also differ among the three systems as a consequence of ideological considerations or assessments of the average quality of services.

4.4 Economic and Political Equilibria

Use of the above results to describe a nation's health care system requires assumptions about the distributions of income and morbidity, especially those that determine the relative locations of the means and medians of the distributions. The median voter model implies that the median voter gets the system that he or she wants. Moreover, the composition of the system is predicted to change as the median voter's circumstances change.

The health care systems choices modeled above suggest that the median voter's health care system choice depends partly on whether the three types of systems are regarded to be perfect substitutes for one another. In such cases, the median voter will tend to prefer a pure system based on his or her own personal cost. When the systems are regarded to be different in significant ways or to advance different health care ends, intermediate combinations of the systems tend to be chosen, and will be adjusted at the margin as the median voter's circumstances change. These differences may be "real" in the sense that different goals or health care needs are being addressed or they may reflect ideological considerations that are better advanced through particular health care systems.

To get a better sense of how changes in the median voter's circumstances and preferences affect his or her preferred health care system, a series of numerical experiments are developed below for specific parameterizations of the three system model choice developed in 4.3.3. The utility values associated with different combinations of social insurance and health care systems are reported in a series of tables for the case in which voters are relatively risk-averse ($z = 0.5$) and there is no ideological

preference among health care systems (a=b=c=0.8) or cost differences among the programs ($\Delta_P = \Delta_S = \Delta_G = 1$). The average income in the society is assumed to be 20 and the average risk is assumed to be 0.25.

Table 4.4.1 explores the case in which the median voter is extremely poor (1/4 average income) and has very high medical risks (2x average morbidity). Note that this voter's highest utility level occurs when nearly all services are tax-financed (9 of the 10 units needed). Even with diminishing marginal returns, his or her costs savings of the public service dominate. However, because of the assumed parity of the three health systems, he or she prefers an evenly mixed system of social insurance and direct government services. The latter is a consequence of the parity of the health care systems and their diminishing marginal returns. (The discrete values shown do not allow the exactly even split implied by the mathematics in this case.)

Table 4.4.1 Utility under Different Combinations of Social Insurance Hs & Government Expenditures, H_G – High Risk, π=0.5; Low Income, y=5; Health Need, H=10; Constant Preferences, a=b=c=0.8

$H_S \backslash H_G$	1	2	3	4	5	6	7	8	9	10
0	3.15	4.06	4.44	4.72	4.94	5.10	5.23	5.33	5.38	5.38	5.25
1	4.06	4.57	4.89	5.12	5.31	5.45	5.55	5.61	5.62	5.49	
2	4.44	4.89	5.16	5.37	5.52	5.64	5.71	5.73	5.60		
3	4.72	5.12	5.37	5.54	5.67	5.76	5.78	5.67			
4	4.94	5.31	5.52	5.67	5.77	<u>5.81</u>	5.70				
5	5.10	5.45	5.64	5.76	<u>5.81</u>	5.72					
6	5.23	5.55	5.71	5.78	5.70						
7	5.33	5.61	5.73	5.67							
8	5.38	5.62	5.60								
9	5.38	5.49									
10	5.25										

Note: Highest values are underlined; *Data Source*: Author's calculation

Table 4.4.2 explores the case in which the median voter has twenty-five percent less than average income (y=15) and has twenty percent higher than average medical risks (0.3). Note that this voter's highest utility level also requires nearly all services to be tax-financed (8 of the 10 units needed). Even with diminishing marginal returns, his or her costs savings of the public service dominate. However, because of the assumed parity of the three health systems, he or she prefers an evenly mixed system of social insurance and direct government services. The latter is a consequence of the parity of the health care systems and diminishing marginal equal returns from each.

Table 4.4.2 Utility under Different Combinations of Social Insurance Hs & Government Expenditures, H_G – Moderately High Risk, π=0.3; Moderately Low Income, y=15; Health Need H=10; Constant Preferences, a=b=c=0.8

$H_S \backslash H_G$	0	1	2	3	4	5	6	7	8	9	10
0	5.36	5.52	5.60	5.66	5.70	5.72	5.73	5.72	5.70	5.65	5.52
1	5.52	5.68	5.76	5.81	5.84	5.86	5.86	5.84	5.79	5.66	
2	5.60	5.76	5.83	5.88	5.90	5.91	5.89	5.85	5.73		
3	5.66	5.81	5.88	5.91	<u>5.93</u>	5.92	5.89	5.77			
4	5.70	5.84	5.90	<u>5.93</u>	<u>5.93</u>	5.90	5.79				
5	5.72	5.86	5.91	5.92	5.90	5.80					
6	5.73	5.86	5.89	5.89	5.79						
7	5.72	5.84	5.85	5.77							
8	5.70	5.79	5.73								
9	5.65	5.66									
10	5.52										

Note: Highest values are underlined; *Data Source*: Author's calculation

Table 4.4.3 explores the case in which the median voter has twenty-five percent greater than average income (15) and has twenty percent lower than average medical risks (0.3). Note that this voter's highest utility level requires a more or less even

division of health care services among the three systems. 6 of the 10 units needed are provided by tax-payer financed systems (3 in each) and 4 by the private insurance (and out-of-pocket payments). Diminishing marginal returns and the parity of the health care systems clearly drive this balanced result, his or her costs savings of the public service dominate.

Table 4.4.3 Utility under Different Combinations of Social Insurance Hs & Government Expenditures, H_G – Moderately Low Risk, π=0.2; Moderately High Income, y=25; Health Need H=10; Constant Preferences, a=b=c=0.8

$H_S \backslash H_G$ g	0	1	2	3	4	5	6	7	8	9	10
0	6.06	6.14	6.18	6.19	6.19	6.19	6.17	6.14	6.10	6.05	5.94
1	6.14	6.23	6.26	6.27	6.27	6.26	6.23	6.20	6.14	6.04	
2	6.18	6.26	6.28	<u>6.29</u>	<u>6.29</u>	6.27	6.24	6.19	6.08		
3	6.19	6.27	<u>6.29</u>	<u>6.29</u>	6.28	6.26	6.21	6.11			
4	6.19	6.27	6.28	6.28	6.26	6.22	6.12				
5	6.19	6.26	6.27	6.26	6.22	6.13					
6	6.17	6.23	6.24	6.21	6.12						
7	6.14	6.20	6.19	6.11							
8	6.11	6.14	6.08								
9	6.05	6.04									
10	5.94										

Note: Highest values are underlined; *Data Source*: Author's calculation

Table 4.4.4 explores the case in which the median voter has well above average income and well below average risks. Such a median would require very uneven turnout in elections or suffrage limits of the sort common in Europe prior to the Twentieth Century. Note that this voter's highest utility level requires a relatively small tax-financed health care sector. Only 2 of the 10 units needed are provided by tax-payer-financed systems (1 from each) and 8 through private insurance (and out-of-pocket payments). Diminishing marginal returns and the parity of the health care systems

clearly drive this balanced result.

Table 4.4.4 Utility under Different Combinations of Social Insurance Hs & Government Expenditures, H_G – Very Low Risk, π=0.1; Very High Income, y=40; Health Need H=10; Constant Preferences, a=b=c=0.8

$H_S \backslash H_G$	0	1	2	3	4	5	6	7	8	9	10
0	6.88	6.89	6.88	6.86	6.84	6.81	6.77	6.73	6.69	6.63	6.55
1	6.89	<u>6.91</u>	6.90	6.88	6.85	6.82	6.78	6.73	6.68	6.60	
2	6.88	6.90	6.88	6.86	6.83	6.79	6.75	6.70	6.62		
3	6.86	6.88	6.86	6.83	6.80	6.76	6.71	6.63			
4	6.84	6.85	6.83	6.80	6.76	6.72	6.64				
5	6.81	6.82	6.79	6.76	6.72	6.64					
6	6.77	6.78	6.75	6.71	6.64						
7	6.73	6.73	6.70	6.63							
8	6.69	6.68	6.62								
9	6.63	6.60									
10	6.55										

Note: Highest values are underlined; *Data Source*: Author's calculation

Overall these results suggest that, in the absence of ideological or cost difference, a decrease in median voter income relative to the mean or an increase in the median health risk relative to the mean tend to encourage larger social insurance programs and government programs.

The next effect to be explored is the ideological one. Suppose that the median voter in the second case (with moderately lower income and moderately higher health risks) has a "small" ideologically-based absolute preference for government provided programs (with a=0.7, b=0.8, and c=0.9). This difference ends the parity of the tax-financed systems and produces a system with a very large national health care system, a small social insurance sector, and no private sector. Note that the assumed preference is not huge, but the effect on the composition of services was very substantial, with the national health care system providing 8 of the 10 units of service and the social insurance

system providing the remainder. A stronger preference for national health care systems would produce larger programs. Qualitatively similar effects would occur when there are systematic cost differences among the systems – See Table 4.4.5.

Table 4.4.5 Utility under Different Combinations of Social Insurance Hs & Government Expenditures, H_G – Moderately High Risk, π=0.3; Moderately Low Income, y=15; Health Need H=10; Ideology-driven Preferences, a=0.7; b=0.8; c=0.9

$H_S \backslash H_G$ g	0	1	2	3	4	5	6	7	8	9	10
0	4.97	5.18	5.34	5.49	5.62	5.75	5.86	5.95	6.03	6.07	6.01
1	5.18	5.38	5.54	5.69	5.81	5.93	6.03	6.11	6.16	<u>6.09</u>	
2	5.30	5.51	5.66	5.80	5.92	6.02	6.11	6.16	<u>6.09</u>		
3	5.41	5.60	5.75	5.88	5.99	6.08	6.13	6.07			
4	5.49	5.68	5.82	5.94	6.03	6.09	6.04				
5	5.56	5.74	5.87	5.97	6.04	5.99					
6	5.61	5.78	5.90	5.97	5.93						
7	5.65	5.80	5.89	5.85							
8	5.66	5.79	5.77								
9	5.65	5.66									
10	5.52										

Note: Highest values are underlined; *Data Source*: Author's calculation

The preferences of different individuals are summarized in Table 4.4.6. Individuals with income below average likely prefer the regime of national health service to the other two regimes regardless of their morbidity level. Individuals with income above average are likely to prefer the regime of private insurance unless their level of morbidity is particularly high (or distortionary effects due to asymmetric information are particularly large.) All individuals are here assumed to vote according to their preferences.

Table 4.4.6 – Preferences over different health funding regimes

	Morbidity below average	Morbidity above average
Income above average	PHI	PHI / SHI
Income below average	SHI / NHS	NHS

The possibility of ideological or expressive voting will also affect the system observed. Ideological voting can have a significant effect on the mix of systems preferred at all levels of income and morbidity.

4.5 Extension of the Model: Ideology and Social Values

There are other ways to incorporate ideology and social values into the model developed above. For example, building on Congleton and Bose (2010) and Alesina et al. (2001) the model can be extended to account for particular ideological theories. For example, an ideology or norm may imply that particular levels of health care support should be provided. Individuals may have different ideas about fairness and equality that can lead to different approaches in terms of redistribution across societies (Alesina et al, 2001.) Individuals with a strong pro-welfare attitude might be inclined to vote in favor of a highly redistributive health programs. Individuals animated by a strong ethical sense of work might be inclined to vote against them.

This may be particularly important today, given the considerable size of health expenditure covered by public programs among OECD. In 2006, the average share of health expenditures covered by public spending among OECD countries was 6.4 percent of GDP and 72.2 percent of total health expenditure (source: OECD.) The debate about the long-term sustainability of public health programs is ongoing in many countries [12].

4.5.1 Norms and Health Care Choice

The main assumptions of the model remain unchanged. The economy is populated by individuals with income y and morbidity π. Health expenditure can be funded under 3 alternative regimes. Under regime of a national health service, a uniform level of health care, H_G, is funded by a flat income-tax. Under a regime of social insurance, a uniform level of health insurance, H_s, is funded by a payroll-tax. In both cases, it is assumed that

private insurance, H_P, can be used to provide supplemental insurance. The effects of norms with preferences for specific levels of each of the systems can be incorporated by modifying the optimization problem characterized by equation (4.16). The utility function can be modified to include the effects of fairness or ideological norms by adding the weighted quadratic terms $\Psi[\alpha (H_G-G^*)^2]$ and $\Psi[(1-\alpha) (H_S-S^*)^2]$ to the utility functions used above. G* and S* represent the normatively ideal level of benefits from the respective tax-financed programs. Parameter å provides an index of the relative importance of the two norms. Parameter $\Psi < 0$ provides an index of the relative importance of "ordinary" and "normative" sources of utility. Public funding above or below the normatively ideal levels generates disutility in this specification.

4.5.2 Economic and Political Equilibria

For example, an extended formulation of the optimizing problem for choosing a composite health care system is the following:

$$\max_{\{H_P,H_S,H_G\}} \quad U = (C_i)^z + [(H_P)^a + (H_S)^b + (H_G)^c] + \qquad (4.22)$$
$$+ \Psi[\alpha (H_G-G^*)^2 + (1-\alpha) (H_S- S^*)^2]$$

s.t. $C_i = [1 - (\Delta_S H_S + \Delta_G H_G)\, \pi/y]y_i - \Delta_P \pi_i H_P$; $H = H_P + H_S + H_G$;

The first order conditions now yield:

$$a\,\pi_i\,(H\text{-}H_S\text{-}H_G)^{a-1} - b\pi_i\,(H_S)^{b-1} - 2\Psi\,(1\text{-}å)\,(H_S - S^*) = z\,(C_i)^{z-1}\,[\Delta_P\,\pi_i - \Delta_S\,\pi/y\,y_i] \qquad (4.23)$$

$$a\,\pi_i\,(H\text{-}H_S\text{-}H_G)^{a-1} - c\,\pi_i\,(H_G)^{c-1} - 2\,\Psi\,å\,(H_G - G^*) = z\,(C_i)^{z-1}\,[\Delta_P\,\pi_i - \Delta_G\,\pi/y\,y_i] \qquad (4.24)$$

Note that when service levels are initially below G* or S*, there is now an additional marginal benefit to expanding that service relative to equations (4.20) and (4.21) above. When service levels are initially above G* or S* there is an additional subjective marginal cost to further expansion of tax-financed health care programs.

It is clear that changes in the median voter's norms can induce changes in the size and composition of health care systems. Congleton and Bose (2010) found that shifts in ideology favoring larger welfare states played an important role in the great expansion of OECD social insurance programs (the welfare state) between 1960 and 1985.

4.6 Conclusions

This chapter has provided a provisional answer to the question: Why are different regimes of funding for health expenditures in use in different OECD countries?

The answer is built on a public choice or political economy approach, following the Median Voter model. This takes the form of a model of static optimization where voters are characterized by different income and morbidity, and different social values and ideology. Given those factors, they determine their personal ideal health care systems and vote on the health care regime to be adopted, or they vote on the representative who will, in turn, vote on such systems. The strong versions of the median voter theorem is assumed to apply, in which case the regime adopted will reflect the median voter's preferences and circumstances. In the above models, the median voter was characterized as the voter with median income and morbidity, for given social norms and system costs. The regime adopted is thus determined by the distributions of income and morbidity, and also by social values and cost differences among health care systems.

The model predicts that private insurance is likely to be the largest component of a nation's health care regime when the median voter's income is well above average income and median morbidity is low relative to the average. A larger national health service is adopted as median voter income falls and/or median health risks rise. Similarly, a larger social insurance program is adopted when median income falls and/or median health risks increase. In cases in which median income is below average and health risks are above average, relatively great use of tax-financed health care systems are predicted, other things being equal. Ideological preferences for a national health service

(or generally lower costs) can cause a national health care program to be adopted rather than a social insurance program. These predictions are tested using data from the OECD in Chapter 5 of the dissertation.

CHAPTER 5

EMPIRICAL ANALYSIS

5.1 Introduction

Chapter 4 suggests that the mechanisms in place to fund health expenditures reflect the rational choice and thus the preferences of the median voter (or other moderate pivotal voters). [1] This chapter provides empirical evidence in support of that hypothesis.

The discussion is structured in 3 parts. The first part explores the possible relationship between the shares of health expenditures covered by different mechanisms on one side – i.e, government expenditures, social insurance, private insurance, and private out-of-pocket payments – and income, morbidity, and ideology on the other side, testing for the effects produced by changes in the latter variables on the former ones. The second part shows the results obtained from testing how changes in income, morbidity, and ideology may affect the odds of choosing the different health funding regimes adopted among the OECD countries. The third part analyzes the differences between countries under various health funding regimes in terms of health expenditures, outcomes, and income distribution.

The main hypotheses formulated in Chapter 4 are summarized in terms of voters' preferences – see Table 4.4.6. Multiple factors can drive preferences over different mechanisms. Self-interest as well as social values or ideology can be among the stronger

drivers. Individuals can benefit directly from the mechanisms in place that funds the health expenditures. Alternatively, they can benefit indirectly because the entire society benefits from the national health care system. Both possibilities are consistent with the analysis of Chapter 4, but these can be treated as separate hypotheses for the purposes of statistical tests of the theory. The extent to which ideas regarding social equality and fairness affect decisions about public health programs is an important issue in its own right, and plays a role in the continuing debate about health care and the long-term implications of high spending [2].

If self-interest prevails and decisions are based on relative costs for the pivotal voter, a highly redistributive mechanism like (i.e.) a national health service is likely to be adopted when income and morbidity are uniformly distributed, while a less redistributive mechanism like private insurance may be adopted if the median voter has above average income and/or below average morbidity. This prediction can change, if social equality becomes a stronger value or if the idea that the government should take on the responsibility for providing health care for indigent people strengthens. In the latter case, high-income, low-morbidity individuals may prefer a method of health care delivery that produces more or less uniform health care, as with national health care systems and mandatory insurance programs.

The empirical results developed below provide some evidence that both private interest and ideology (or social norms) affect the choice of funding mechanisms and also the level of expenditures. The variables reflecting self-interest are (median) income, income distribution, and morbidity. Income is measured by GDP per-capita, which is a

measure of mean income. The use of median income would be more appropriate for the purpose of this research. However, no sufficiently consistent time-series data are available yet for the countries and the time-horizon in question. The income distribution is approximated by the Gini coefficient, a standard measure used in many similar studies [3]. Morbidity refers to the relative incidence of a disease, or the speed (frequency) with which an event or circumstance occurs per unit of time, population, or other standards of comparison [4]. Life expectancy, mortality due to cancer, cerebrovascular and respiratory diseases are used as proxy for morbidity therefore, as well as cancer incidence – i.e., cancer incidence measures the number of new cases of cancer registered per 100,000 individuals within a year.

Two sets of variables are used to estimate the impact of ideology and/or social values on the choice of the health funding mechanisms and the expenditure. One is given by the Kim-Fording Right-Left index and the shares of votes and parliament/cabinet seats gained by the parties in political elections. The other is given by several variables from the World Social Values Survey regarding people's attitude pro/against business and their idea of the government actively entering the economic life of a society. The Kim-Fording Right-Left index provides a measure of political ideology for the median voter based on the votes gained by the political parties during elections based on ideological statements present in the party manifestos [5]. The World Social Values Survey is a large survey conducted internationally to assess people's values and beliefs about main topics like trust, faith, family, God, success in life, the role of the government, etc. People's

beliefs about the ethical importance of work and the economic role of the government in the society are the variables of interest.

The direction of causality is clear. Changes of the health care funding mechanisms or changes in the level/composition of health expenditures are unlikely to affect any of these variables. On one hand, the public health spending is too small for a change in the funding mechanism or in the composition/level of expenditures to affect mean income/income distribution or to shift ideology and social values – i.e., in 2006, the level of public expenditures on health care among OECD countries was about 7.2 percent of GDP on average with a standard deviation 0.8 (source: OECD). On the other hand, environment and diet seem to be the most plausible causes of cancer; not the mechanisms to fund the health expenditure or the level/composition of it [6]. This allows the use of reduced form models for estimating the effect of changes in income, morbidity, and ideology on the choice health care system.

This chapter is organized in six sections. Section 5.2 describes the data. Section 5.3 explores the possible relationship between income, morbidity, and ideology and the shares of health expenditures covered by different funding mechanisms. Section 5.4 reports the results of tests about the odds of adopting different funding regimes based on a multinomial logit model. Section 5.5 analyzes some statistically significant differences across countries adopting different funding regimes. Section 5.6 concludes.

5.2 Data

The dataset for this study is built by merging data extracted from several different sources: The OECD on-line dataset; the UNU-WIDER World Income Inequality Dataset; the Kim-Fording dataset; the Comparative Welfare States Dataset; and the World Value Survey [7]. The data range from 1970 to 2006. 17 country members of the OECD constitute the sample: Australia; Austria; Belgium; Canada; Denmark; Finland; France; Germany; Italy; the Netherlands; New Zealand; Norway; Spain; Sweden; Switzerland; the United Kingdom; and the United States.

The data extracted from the OECD dataset regard GDP and GDP per-capita (GDPpc); total and per-capita health expenditure, (THE) and (THEpc). The relative percentage shares of total health expenditure (GSHARE; SISHARE; PISHARE; and OFPSHARE) are calculated in percents. From this dataset also come the number of deaths per 100,000 respectively due to cancer (CANCD), cerebrovascular diseases (CBVSD), respiratory diseases (RSSD), and diabetes (DBD); the number of hospital beds (HBD) and hospital beds for acute cures (ACBD) available per 1,000 in the population; the number of practicing physicians per 1,000 in the population (PPD); the consumption of alcohol in liters per population above 15 (ALC); the consumption of tobacco in the percentage of adult population who are daily smokers (TBC2); and the number of available MRI and CT scanners per 1,000 in the population (MRI and CT.) Data on the fraction of population above 65 (POP65) are from the same data set. The summary statistics for these data are below:

Table 5.1 – Summary Statistics for OECD Data

Variable	Obs	Mean	Std Dev.	Min	Max
GDP[1]	544	896997.3	1685364	6794.226	1.33e+07
GDPpc[1]	555	22523.66	5399.568	12236.94	39681.25
THE[2]	534	8.012172	1.85155	3.9	15.5
THEpc[1]	534	1557.101	1111.361	143	6931
GSHARE	480	48.08875	30.11751	1.97	90.94
SISHARE	258	35.27128	25.61322	.86	72.81
PISHARE	376	8.029335	7.703211	.09	33.37
OFSHARE	354	15.09387	5.898316	6.29	35.74
NGOSHARE	230	1.843826	1.700056	.05	7.02
CPSHARE	165	3.129212	1.973278	0	7.37
CANCD	542	183.2423	21.23566	128.4	226.5
CBVSD	542	81.5274	33.16369	27.4	175.4
RSSD	542	59.12122	21.02102	24.1	154.6
DBD	542	13.72463	4.798156	5	31.9
ACBD	390	4.632564	1.22709	2.2	8.7
HBD	308	6.457468	2.060306	3.2	11.1
PPD	445	2.359371	.7153378	.94	4.02
ALC	542	10.60756	3.075735	4.6	20.8
TBC2	469	30.49842	8.194833	14.5	59
MRI	180	5.38	5.195565	.1	26.6
CT	200	12.875	9.67879	.2	56
POP65	555	13.64577	2.287763	7.9	19.5

Note: (1) Measured in USD at purchasing power parity; (2) measured in percent of GDP (%); *Data Source*: OECD (stats.oecd.org)

The estimates of the Gini coefficient come from the UNU-WIDER Income Inequality Dataset. This dataset collects estimates of income distribution for developed and developing countries from a number of different national and international sources [8]. The main statistics are in Table 5.2:

Table 5.2 – Summary Statistics for Gini Coefficients

Variable	Obs	Mean	Std Dev.	Min	Max
GINI1	405	31.38	5.97	18.5	54.7

Data source: UNU-WIDER World Income Inequality Dataset (wider.unu.edu/research/Database/en_GB/database)

The Kim-Fording dataset contains data regarding political ideology for political parties of

25 countries and the results in elections held over the period 1945-2000. The Kim-Fording Right-Left index (here called Kim-Fording index) provides a measure of political ideology based on the number of political statements present in the political parties' manifestos and the results in the elections for the same parties. An upward change in the KF index represents therefore a strengthening of the leftist ideology in terms of both proposed political ideas and representation in the parliament. The summary statistics are reported in Table 5.3:

Table 5.3 – Summary Statistics for the Kim-Fording Right-Left Index

Variable	Obs	Mean	Std Dev.	Min	Max
F Index	472	54.01	11.88	19.41	89.36

Data Source: Kim-Fording Dataset (mailer.fsu.edu/~hkim/dataset.htm)

The shares of votes and seats gained in parliament and cabinet by the left parties in political elections (LEFTVOT; LEFTSEAT; and LEFTCAB) are from the Comparative Welfare States Dataset.

Table 5.4 – Summary Statistics for Data on Political Results

Variable	Obs	Mean	Std Dev.	Min	Max
LEFTVOT	465	37.22	13.44	0	56.5
LEFTSEAT	465	38.33	15.59	0	68.4
LEFTCAB |	465	0.40	0.40	0	1

Data Source: Comparative Welfare States Dataset (www.lisproject.org/publications/welfaredata/welfareaccess.htm)

The World Value Survey is a large survey about social and political values conducted

The World Value Survey is a large survey about social and political values conducted across 87 countries by five waves – i.e., 1981-4; 1989-93; 1994-9; 1999-2004; and 2005-7. Four variables of interest are extracted from it: ETHOS, regarding the ethical idea of work; PROBUSINESS1 and PROBUSINESS2, regarding people's attitude pro-against business; and PROCOMPETITION, regarding people's attitude about competition. The score of the variable ETHOS is given by the average score of 5 variables. These are reported in Table 5.5 along with the question corresponding to each variable.

Table 5.5 – Ethos of Work: WVS Variables and Questions

V83 - Q:	*"Which point on this scale most clearly describes how much weight you place on work (including housework and schoolwork), as compared with leisure or recreation?"*
A:	1.*"It's leisure that makes life worth living, not work" … 5."Work is what makes life worth living, not leisure…"*
V97* - Q:	*"To fully develop your talents, you need to have a job?"*
A:	1.Strongly disagree … 5.Strongly agree
V98* - Q:	*"It is humiliating to receive money without having to work for it?"*
A:	1.Strongly disagree … 5.Strongly agree
V99* (Q)	*"People who don't work turn lazy;"*
(A)	1.Strongly disagree … 5.Strongly agree
V100* (Q)	*"Work is a duty towards society?"* and
(A)	1. Strongly disagree … 5. Strongly agree
V102* (Q)	*"Work should always come first, even if it means less spare time."*
(A)	1. Strongly disagree … 5. Strongly agree

Note: The answers corresponding to V97-V102 originally range between 1 and 5, 1 meaning "strongly-agree" and 5 meaning "disagree." The original score has been inverted to obtain a variable meaning

stronger sense of ethical work when the score rises; *Source*: Ronald Inglehart et al. "World Values Surveys and European Values Surveys, 1999-2001, User Guide and Codebook" *University of Michigan, Institute for Social Research*

The possible scores of ETHOS range between 1 and 5, 1 meaning a weak ethical sense of work and 5 indicating a strong ethical sense of work. The scores of the variables PROBUSINESS1, PROBUSINESS2, and PROCOMPETITION range between 1 and 10 with 1 referring to a weak attitude and 10 referring to a strong attitude in favor of free-business and free-market. These are reported in Table 5.6. Table 5.7 reports the main statistics for each variable.

Table 5.6 – Pro-business Attitude: WVS Variables and Questions

(Q)	*"…Now I'd like you to tell me your views on various issues. How would you place your views on this scale? …"*
PROBUSINESS-1	
(A)	*"1.Government ownership of business and industry business should be increased … 10. Private ownership of business and industry should be increased"*
PROBUSINESS-2	
(A)	"1. The government should take more responsibility to ensure that everyone is provided with… 10. People should take more responsibility to provide for them-selves"
PROCOMP	
(A)	"1. Competition is harmful. It brings out the worst in people … 1. Competition is good. It stimulates people to work hard and develop new ideas"

Note: The variable PROBUS1, PROBUS2, and PROCOMP are based on the original variables v142-v144 with opposed ranges of scores to obtain score increasing with stronger attitude in favor of free-business; *Source*: Ronald Inglehart et al. "World Values Surveys and European Values Surveys, 1999-2001, User Guide and Codebook" *University of Michigan, Institute for Social Research*

Table 5.7 – Summary Statistics for WVS Variables

Variable	Obs	Mean	Std Dev.	Min	Max
ETHOS	54573	3.41	0.97	1	5
PROBUSINESS1	26346	6.71	2.26	1	10
PROBUSINESS2	30052	5.86	2.66	1	10

Data Source: World Values Survey (www.worldvaluesurvey.org)

Data about cancer incidence are collected from different sources. A large part of it comes from the International Agency for Research on Cancer (IARC); some come from the World Health Organization, Office for Europe (data.euro.who.int/hfadb/). Some data for Australia come from the Australian Cancer Institute (cancerinstitute.org.au) and the data about the US come from the SEER National Cancer Institute, National Institutes of Health (seer.cancer.gov.) Table 5.8 reports the summary statistics about cancer incidence for men (CIM) and women (CIF) expressed as number of new cases of cancer registered per year per 100,000 in the population:

Table 5.8 – Summary Statistics for Data on Cancer Incidence

Variable	Obs	Mean	Std. Dev.	Min	Max
CIF	394	375.39	76.36	162.37	534.2
CIM	396	442.73	80.60	221.2	660.45

Note: Cancer incidence is measured by the number of new cases per 100,000 ; *Data source*: International Agency for Research on Cancer (http://www.iarc.fr/); World Health Organization, Office for Europe (http://data.euro.who.int/hfadb); Australian Cancer Institute (cancerinstitute.org.au); and SEER National Cancer Institute, National Institutes of Health (seer.cancer.gov.)

5.3 Health Care Funding and Possible Effects of Income, Morbidity, and Ideology

The main hypotheses formulated in Chapter 4 can be summarized as follows: (1) Higher income-inequality may lead to a larger use of private insurance; while lower income-inequality may lead to a larger use of social insurance and national health service; (2) A lower level of morbidity may lead to larger use of private insurance; while a higher morbidity may lead to larger use of social insurance and national health service; and (3) A stronger leftist ideology or pro-welfare social values may lead to a larger use of social insurance and national health service; while stronger beliefs about the ethical sense of work may lead to a larger use of private insurance (see Table 4.4.6 and equations 4.5-8, 4.13, and 4.20-21.)

This section analyzes these hypotheses in two ways. First, it presents a series of scatter plots comparing the shares of health expenditures covered by different mechanisms against the proxies for income inequality, morbidity, and social values. Second, it reports the results obtained from estimating linear versions of the hypothesized relationships with generalized least squares.

5.3.1 Scatter Plot Analysis

A series of scatter plots based on a sample of 17 OECD countries over the period between 1970 and 2007 can provide a prima-facie evidence about the possible relationship between the shares of health expenditures covered by different funding mechanisms, on one side, and income inequality, morbidity, and ideology, on the other side.

Figure 5.1 plots the average public share of health expenditures against the Gini coefficient – i.e., the higher value of which means a relatively less equal income distribution. This chart shows that countries characterized by a relatively more uniform income distribution than others tend to cover a larger share of health expenditures by public provision.

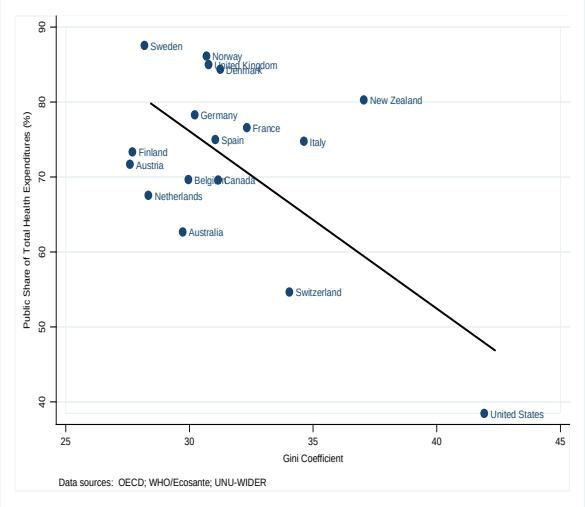

Figure 5.1 – Public Health Expenditure vs. Inequality

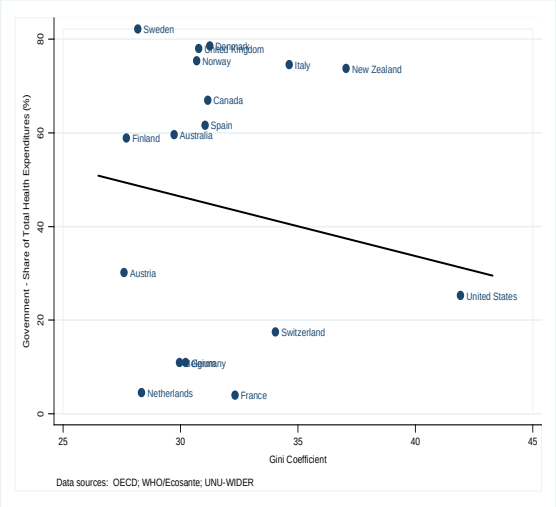

Figure 5.2 – Gov't Health Expenditures vs. Inequality

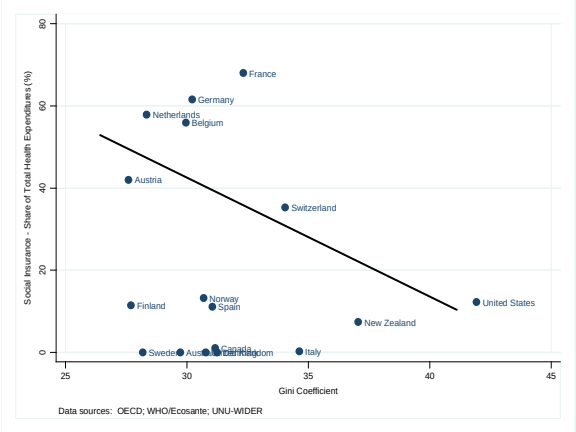

Figure 5.3 - Social Health Insurance vs. Inequality

Figure 5.2 and Figure 5.3 show that such relationship between income inequality and public funding for health care applies in the case of both tax-funded mechanisms – i.e., national health services and social insurance. [9]

Figure 5.4 and Figure 5.5 plot the average Gini coefficients against the average shares of health expenditures covered by private insurance and private out-of-pocket payments. These charts show that countries covering larger shares of health expenditures by privately funded mechanisms tend to be characterized by relatively less uniform distributions of income.

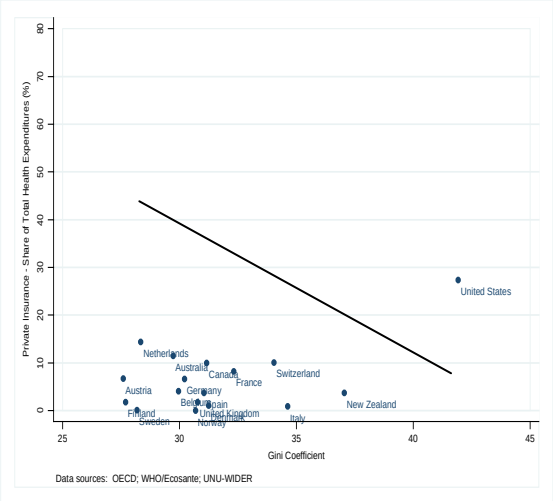

Figure 5.4 – Private Health Expenditure vs. Inequality

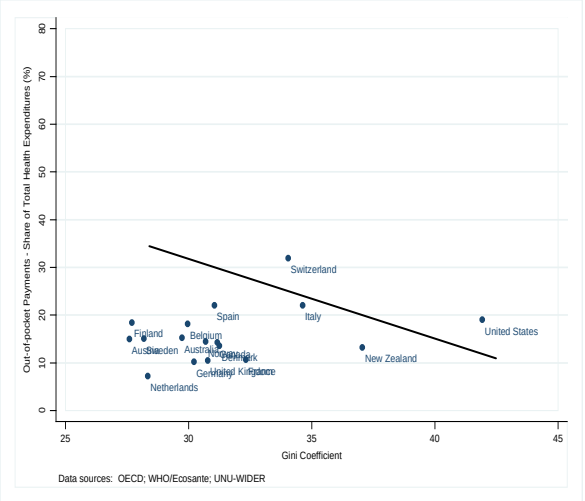

Figure 5.5 Out-of-Pocket Payments vs. Inequality

The charts in Figure 5.6 through 5.17 plot the average mortality rates for cancer, cerebrovascular and respiratory diseases against the average shares of health expenditures covered by different funding mechanisms. Figures 5.6-5.8 show that the share of health expenditures covered by national health services tends to be larger for relatively higher mortality for each of the 3 indicators. The charts of Figure 5.9 and 5.10 are very similar:

The higher the level of mortality rate due to cancer and cerebrovascular diseases, the higher the share of health expenditures covered by social insurance.

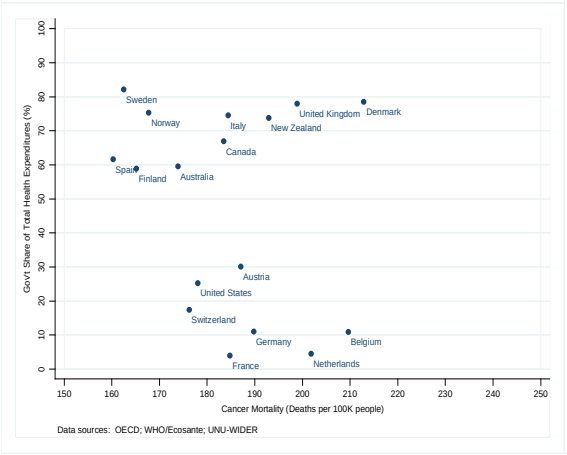

Figure 5.6 - Gov't Health Expenditures vs. Mortality (C)

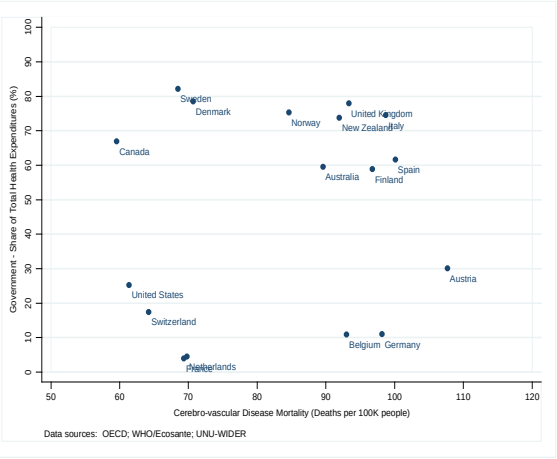

Figure 5.7 – Gov't Health Expenditures vs. Mortality

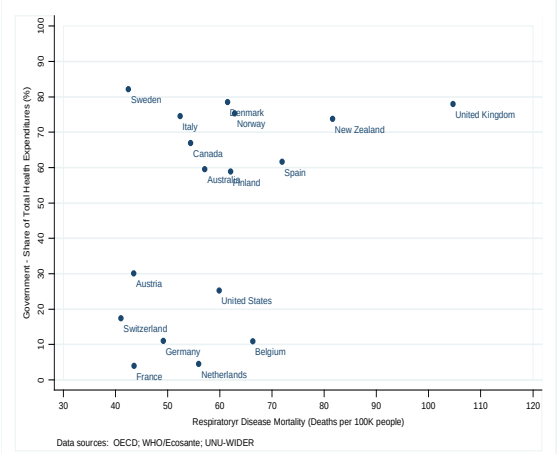

Figure 5.8 – Gov't Expenditures vs. Mortality (RD)

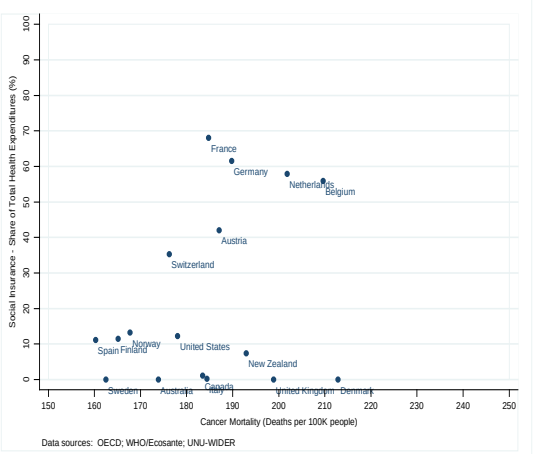

Figure 5.9 – Social Health Insurance vs. Mortality (C)

Figure 5.11 shows that mortality due to respiratory diseases and share of health expenditures covered by social insurance are negatively related instead. According to

Figures 5.12-5.14 the use of private insurance tends to be relatively lower in countries where the mortality rate due to each considered disease tends to be higher.

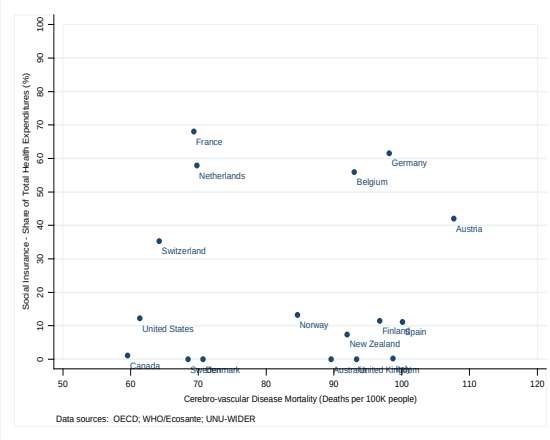

Figure 5.10 - Social Health Insurance vs Mortality (CVD)

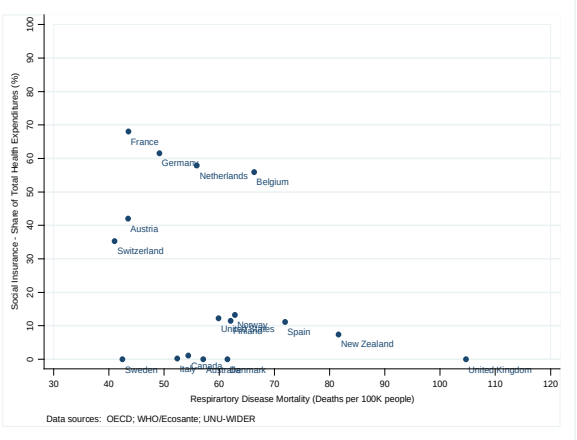

Figure 5.11 - Social Health Insurance vs. Mortality (RD)

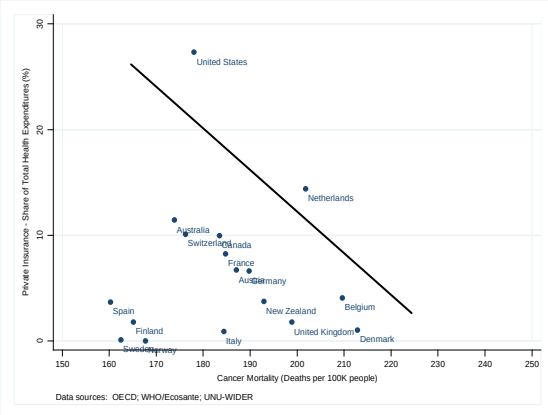

Figure 5.12 – Private Health Insurance vs. Mortality (C)

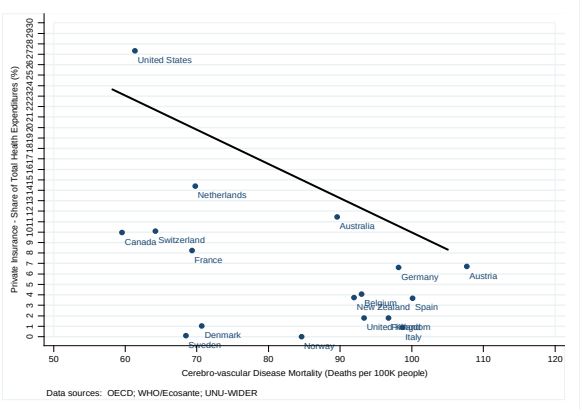

Figure 5.13 - Private Health Insurance vs. Mortality (CVD)

The charts in Figures 5.15-5.17 look very similar to those in Figures 5.12-5.14 showing that the share of health expenditures covered by private out-of-pocket payments tends to be relatively smaller in countries where the mortality rates tend to be higher. Figures 5.18-5.20 plot the shares of health expenditures respectively covered by public

funding as well as by government and social insurance against the Kim-Fording Right-Left index.

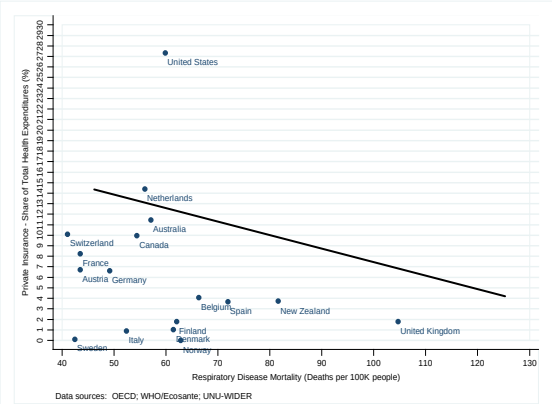

Figure 5.14 – Private Health Insurance vs. Mortality (RD)

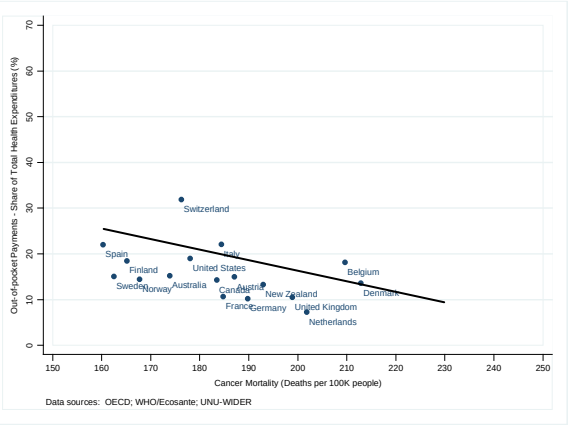

Figure 5.15 Out-of-Pocket Payments vs. Mortality (C)

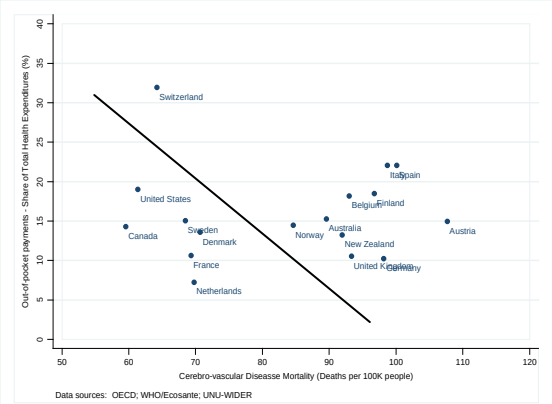

Figure 5.16 – Out-of-Pocket vs. Mortality (CVD)

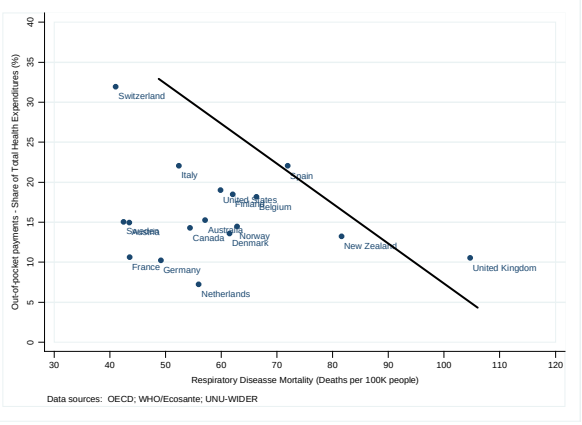

Figure 5.17 - Out-of-pocket Payments vs. Mortality (RD)

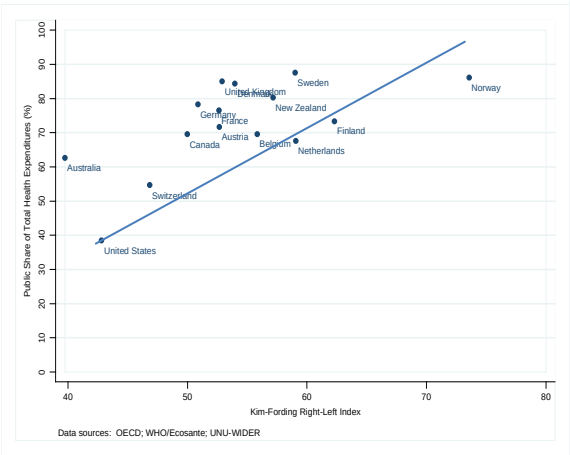

Figure 5.18 – Public Expenditures vs Kim-Fording Index

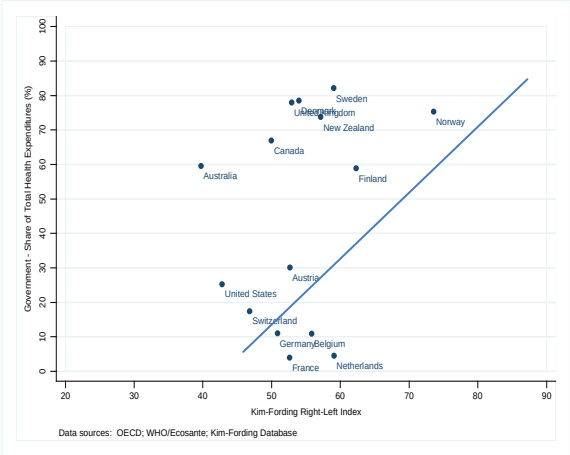

Figure 5.19 - Gov't Expenditures vs. Kim-Fording Index

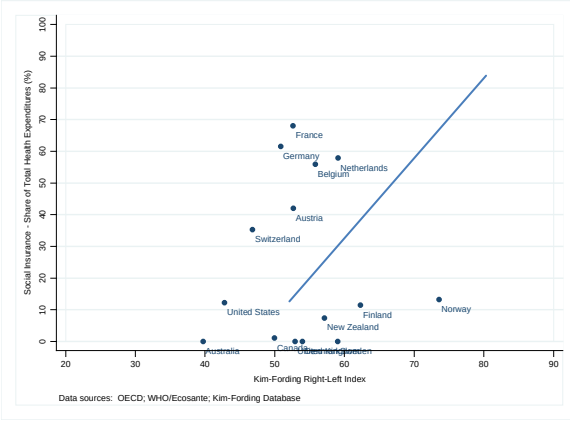

Figure 5.20 – Social Insurance vs. Kim-Fording Index

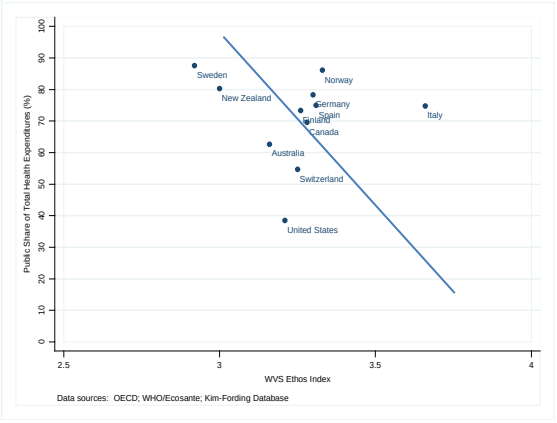

Figure 5.21 - Public Expenditures vs. WVS Ethos Index

The charts show that the share of health expenditures covered by tax-funded mechanisms tends to be larger in countries where the leftist ideology is stronger according to the Kim-Fording index. Figures 5.21 through Figure 5.26 present a last series of charts comparing the average shares of health expenditures covered by the tax-funded mechanisms and 2 different indexes of social values and ideology extracted from the World Values Survey (WVS). The first one is a composite index, Ethos of Work, obtained by averaging the scores of several variables (see Appendix).

The second is directly obtained from one variable of the WVS and regards people's attitude pro- or against-business. The charts in Figure 5.21 and Figure 5.23 show that the public share of health expenditures and the share covered by the government tend to be smaller in countries characterized by higher values of the index Ethos of Work, meaning a stronger ethical sense of work. The Figures 5.24 through 5.25 show that both tax-funded shares of health expenditures tend to be smaller in countries characterized by a stronger pro-business attitude.

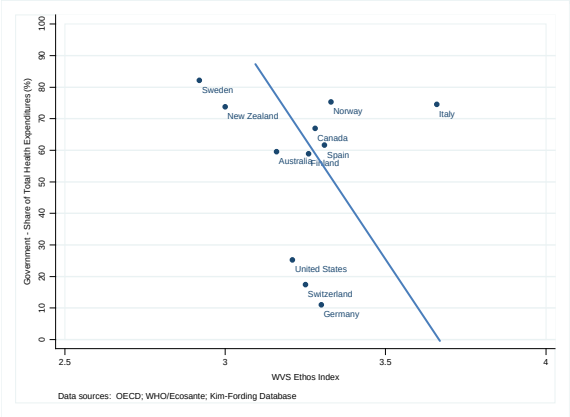

Figure 5.22 – Gov't Expenditures vs. WVS Ethos Index

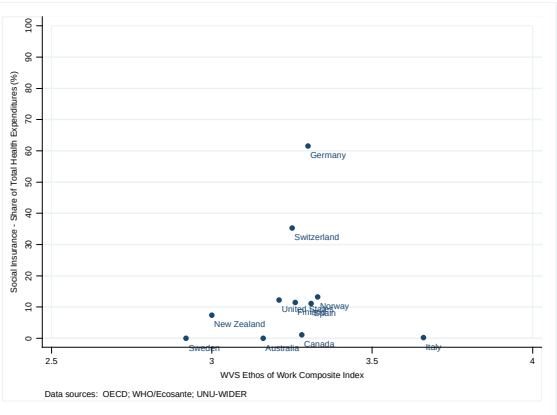

Figure 5.23 - Social Insurance vs. WVS Ethos Index

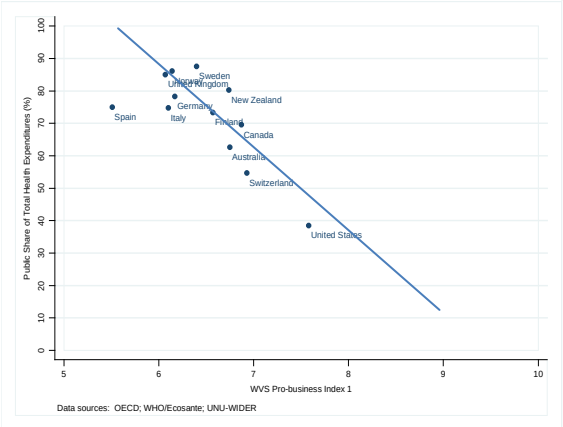

Figure 5.24 – Public Expenditures vs. Pro-business Index

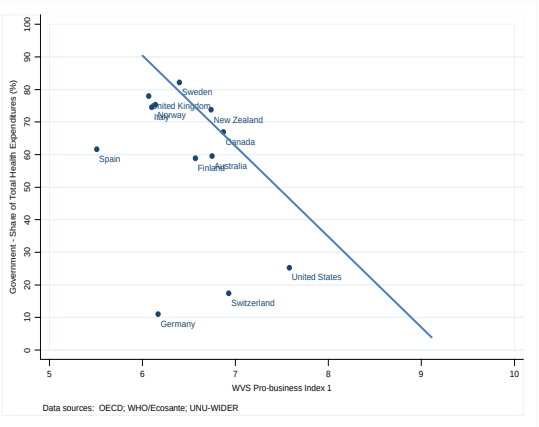

Figure 5.25 - Gov't Expenditures vs. Pro-business Index

5.3.2 Generalized Least Squares Analysis

The hypotheses (1)-(3) can be tested by simple econometric models where the shares of health expenditures covered by different funding mechanisms are used as dependent variables and the Gini coefficient, mortality rates, and ideology indexes are adopted as main independent variables. The models are below:

$$\text{NHS-S}_{it} = \alpha_0 + \alpha_1 \text{GINI}_{it} + \alpha_2 \log(\text{GDPpc})_{it} + \alpha_3 \text{LE65F}_{it} + \alpha_4 \text{LE65M}_{it} + \alpha_5 \text{CANC}_{it} + \alpha_6 \text{RESPD}_{it} + \alpha_7 \text{POP65}_{it} + \theta^N i + \varphi^N t + \varepsilon \quad (5.1)$$

$$\text{SHI-S}_{it} = \beta_0 + \beta_1 \text{GINI}_{it} + \beta_2 \log(\text{GDPpc})_{it} + \beta_3 \text{LE65F}_{it} + \beta_4 \text{LE65M}_{it} + \beta_5 \text{CANC}_{it} + \beta_6 \text{RESPD}_{it} + \beta_7 \text{POP65}_{it} + \theta^S i + \varphi^S t + \eta \quad (5.2)$$

$$\text{PHI-S}_{it} = \delta_0 + \delta_1 \text{GINI}_{it} + \delta_2 \log(\text{GDPpc})_{it} + \delta_3 \text{LE65F}_{it} + \delta_4 \text{LE65M}_{it} + \delta_5 \text{CANC}_{it} + \delta_6 \text{RESPD}_{it} + \delta_7 \text{POP65}_{it} + \theta^P i + \varphi^P t + \xi \quad (5.3)$$

$$\text{OFP-S}_{it} = \gamma_0 + \gamma_1 \text{GINI}_{it} + \gamma_2 \log(\text{GDPpc})_{it} + \gamma_3 \text{LE65F}_{it} + \gamma_4 \text{LE65M}_{it} + \gamma_5 \text{CANC}_{it} + \gamma_6 \text{RESPD}_{it} + \gamma_7 \text{POP65}_{it} + \theta^O i + \varphi^O t + \varphi \quad (5.4)$$

NHS-S, SHI-S, PHI-S and OFP-S are the shares of health expenditures covered by the government, social insurance, private insurance and private out-of-pocket payments respectively. GINI is the Gini coefficient. CANC, and RESPD are the numbers of deaths occurred per year within a population of 100,000 individuals respectively due to cancer, and respiratory diseases. LEF65F and LE65M are life expectancies at 65 for female and male expressed in years. GDPpc is per-capita income and POP65 is the share of

population above 65. The terms θ^N, θ^S, θ^P and θ^O account for country fixed effects, while the terms φ^N, φ^S, φ^P and φ^O account for time fixed effects.

Tables 5.9 through 5.13 present the results obtained from regressing different versions of the models (5.1) through (5.4). Namely, Table 5.9 and Table 5.10 report the results obtained by dropping the variable LE65F and LE65M respectively – i.e., being the correlation between life expectancy at 65 for females and for males pretty high (see Tables 5.31-34 in Appendix) keeping both variables in the same model would generate multicollinearity. Table 5.11 presents the results obtained from regressing the models (5.1) through (5.4) without either LE65F or LE65M. Table 5.12 and Table 5.13 report the results obtained with fixed country and time effects. In each Table 5.9-5.13, the first column reports the estimates from model (5.1); the second column reports the results from (5.2); and so on.

According to the results of Table 5.9, when the distribution of income becomes less equal or per-capita income falls, the share of health expenditures covered by publicly-funded mechanisms tends to shrink while that covered by privately-funded mechanisms tends to enlarge. In particular, per each 1-unit rise in the Gini coefficient, the share of health expenditures covered by government expenditures shrinks by 0.5 percent while those covered by private insurance and private out-of-pocket payments grow respectively by 0.5 and 0.2 percent. On the other hand, the shares covered by government expenditures and social insurance respectively shrink by 26.8 and 27.6 percent as per-capita income rises by 1 percent, while the shares covered by private insurance and out-of-pocket payments respectively grow by 24.6 and 8.6 percent.

These estimated changes in the shares of health expenditures and income distribution and per-capita income support the idea that a less equal but richer society may prefer private funding mechanisms to public funding mechanisms for health care.

The estimates of Table 5.9 also indicate that rising life expectancy at 65 for males tends to increase the share of health expenditures covered by the government and tends to decrease the share covered by private mechanisms. Namely, the share of government expenditures rises by 6.7 percent per a 1-year rise in life expectancy while the shares covered by private health insurance and out-of-pocket payments shrink by 2 and 1.1 percent respectively. With exception of the coefficient obtained for social insurance, these estimates support the hypothesis that private spending on health care tends to fall when morbidity rises.

The estimates obtained for the share of population above 65 are in line with those obtained for life expectancy at 65. The coefficients for the shares of expenditures covered by tax-funded mechanisms are positive while those for the privately-funded mechanisms are negative. This means that once the population of elderly grows, the preferences for publicly-funded health care are likely to strengthen, while the preferences for privately-funded mechanisms are likely to weaken. This effect is particularly strong for social insurance: A 1-percent rise in the population of elderly leads to a 13.7 percent rise in the share of health expenditures covered by this mechanism.

Table 5.9

Dependent Variables:	Health Expenditure Shares (%)			
	Government Expenditures	Social Insurance	Private Insurance	Out-of-pocket Payments
Independent Variables				
Gini Coefficient	-0.55* (.25)	0.25 (.21)	0.51* (.05)	0.20* (.05)
log of GDP_{PC} [(1)]	-26.83* (12.83)	-27.62* (10.46)	24.63* (3.10)	8.60* (1.81)
Life Expectancy at 65 for Males (years)	6.69* (2.06)	-5.16* (1.91)	-2.03* (.46)	-1.13* (.30)
Cancer, Deaths per 100,000	0.13 (.08)	0.88* (.07)	-0.07* (.02)	-0.04* (.01)
Respiratory Diseases, Deaths per 100,000	0.62* (.08)	-0.45* (.11)	-0.03* (.01)	-0.06* (.01)
Population over 65 (%)	1.63* (.65)	13.70* (.69)	-1.76* (.16)	-0.80* (.11)
Constant	155.10 (101.65)	66.70 (84.36)	-185.97* (26.47)	-40.42* (16.04)
R-Squared	0.22	0.74	0.59	0.30
Observations	363	186	280	272

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; robust standard errors are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int);

The coefficients estimated for mortality due to cancer and respiratory diseases also confirm that the preferences for publicly-funded mechanisms tend to strengthen when the risk rises, while the preferences for privately-funded mechanisms tend to weaken. When mortality due to cancer rises by 1 individual in 100,000, the share of health expenditures covered by social insurance rises by 0.9 percent while the shares covered by private insurance and out-of-pocket payments drop by 0.1 and 0.04 respectively. When mortality due to respiratory diseases rises by 1 individual in 100,000, the share covered by government expenditures rises by 0.6 percent while the shares covered by private insurance and out-of-pocket payments respectively drop by 0.03 and 0.1.

Tables 5.10 through 5.13 report the estimates obtained from the models 5.1-5.4 after dropping some variables or applying time and country fixed effects. Table 5.10 reports the results obtained from the same model where life-expectancy at 65 for males is replaced with life-expectancy at 65 for females. The results are very similar to those reported in Table 5.9 – as expected due to the high correlation between life-expectancy at 65 for females and males (see Tables 5.31-34 in Appendix.) Table 5.11 reports the estimates obtained after dropping the variable about life-expectancy at 65 for both males and females. The results remain very similar to those reported in Table 5.9. Tables 5.12-5.13 report the results obtained after applying country and time fixed effects. In the case of country fixed effects only, the estimates remain similar to those reported in Table 5.9 – i.e., rising per-capita income and less equal income distribution are negatively related with the shares of publicly-funded mechanisms and positively related with the privately-funded mechanisms; vice versa for the variables used for morbidity.

Table 5.10

Dependent Variables:	Health Expenditure Shares (%)			
	Government Expenditures	Social Insurance	Private Insurance	Out-of-pocket Payments
Independent Variables				
Gini Coefficient	-0.60* (.26)	0.15 (.20)	0.52* (.06)	0.20* (.05)
log of GDP_{PC} [(1)]	-3.17 (11.55)	-26.46* (3.44)	18.81* (2.99)	5.92* (1.75)
Life Expectancy at 65 for Females (years)	1.16 (2.16)	-6.13* (1.64)	-1.01* (.44)	-0.60** (.33)
Cancer, Deaths per 100,000	0.10 (.09)	0.94* (.07)	-0.06* (.01)	-0.03* (.01)
Respiratory Diseases, Deaths per 100,000	0.57* (.08)	-0.60* (.13)	-0.03** (.02)	-0.05* (.01)
Population over 65 (%)	1.77* (.66)	13.33* (.70)	-1.80* (.16)	-0.82* (.11)
Constant	3.97 (88.47)	98.66* (65.68)	-140.33* (23.43)	-19.60* (15.12)
R-Squared	0.20	0.75	0.57	0.26
Observations	363	183	280	272

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; robust standard errors are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int);

Table 5.11

Dependent Variables:	Health Expenditure Shares (%)			
	Government Expenditures	Social Insurance	Private Insurance	Out-of-pocket Payments
Independent Variables				
Gini Coefficient	-0.63* (.26)	0.31 (.21)	0.55* (.06)	0.21* (.05)
log of GDP_{PC} [(1)]	1.21* (4.01)	-50.23* (5.27)	14.39* (1.90)	3.75* (1.40)
Cancer, Deaths per 100,000	0.10 (.08)	0.84* (.07)	-0.05* (.01)	-0.04* (.02)
Respiratory Diseases, Deaths per 100,000	0.54* (.07)	-0.27* (.10)	-0.02 (.01)	-0.04* (.01)
Population over 65 (%)	1.74* (.65)	13.50* (.72)	-1.78* (.16)	-0.82* (.11)
Constant	-15.78 (83.76)	214.63* (57.49)	-117.29* (18.93)	-9.93* (14.28)
R-Squared	0.20	0.73	0.56	0.25
Observations	363	183	280	272

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; robust standard errors are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int);

Table 5.12

Dependent Variables:	Health Expenditure Shares (%)			
	Government Expenditures	Social Insurance	Private Insurance	Out-of-pocket Payments
Independent Variables				
Gini Coefficient	-0.55* (.25)	0.25 (.21)	0.51* (.05)	0.20* (.05)
log of GDP_{PC} [(1)]	-26.83* (12.83)	-27.62* (10.46)	24.63* (3.10)	8.60* (1.81)
Life Expectancy at 65 for Males (years)	6.69* (2.06)	-5.16* (1.91)	-2.03* (.46)	-1.13* (.30)
Cancer, Deaths per 100,000	0.13 (.08)	0.88* (.07)	-0.07* (.02)	-0.04* (.01)
Respiratory Diseases, Deaths per 100,000	0.62* (.08)	-0.45* (.11)	-0.03* (.01)	-0.06* (.01)
Population over 65 (%)	1.63* (.65)	13.70* (.69)	-1.76* (.16)	-0.80* (.11)
Constant	155.10 (101.65)	66.70 (84.36)	-185.97* (26.47)	-40.42* (16.04)
Country Fixed Effects	YES	YES	YES	YES
R-Squared	0.22	0.74	0.59	0.30
Observations	363	186	280	272

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; robust standard errors are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int);

Table 5.13

Dependent Variables:	Health Expenditure Shares (%)			
	Government Expenditures	Social Insurance	Private Insurance	Out-of-pocket Payments
Independent Variables				
Gini Coefficient	0.08 (.05)	0.10 (.07)	-0.10* (.04)	0.03 (.05)
log of GDP_{PC} [(1)]	-21.28* (4.79)	-18.26* (5.54)	-7.22* (3.37)	-2.68 (3.39)
Life Expectancy at 65 for Males (years)	0.66 (.88)	3.43* (1.15)	-1.60* (.71)	0.45 (.87)
Cancer, Deaths per 100,000	-0.03 (.02)	0.07* (.02)	0.04* (.02)	0.03 (.02)
Respiratory Diseases, Deaths per 100,000	0.10* (.02)	-0.06 (.03)	0.02 (.02)	-0.09* (.02)
Population over 65 (%)	1.25* (.31)	-0.74* (.28)	0.16 (.23)	0.03 (.23)
Constant	236.88 (48.55)	135.26 (59.71)	91.02* (36.28)	-43.64* (38.54)
Country Fixed Effects	YES	YES	YES	YES
Time Fixed Effects	YES	YES	YES	YES
R-Squared	0.22	0.99	0.95	0.30
Observations	363	183	280	272

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; robust standard errors are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int);

In the case of both country and time fixed effects, many of the estimates corresponding to those of Table 5.9 are no longer statistically significant.

Overall, these results support the main hypotheses of Chapter 4. This means that higher levels of per-capita income and a less equal distribution of income may induce individuals to more strongly prefer privately-funded to publicly-funded mechanisms while rising morbidity may induce people to prefer the opposite.

Table 5.14 and Table 5.15 report the results obtained from regressing an extended version of the models in (5.1) and (5.2). The extended models contain 4 variables taking in account the possible effects of changes in ideology. The additional regressors are the Kim-Fording Right-Left index (KF-INDEX) and the shares of votes (LEFT-VOTES), and seats in both the parliament (LEFT-PSEATS) and the government (LEFT-CSEATS) obtained by leftist parties in political elections. The shares of votes and seats are extracted from the Comparative Welfare States Dataset. Here are the extended models:

$$\begin{aligned} \text{NHS-S}_{it} = {} & \alpha_0 + \alpha_1\, \text{GINI}_{it} + \alpha_2 \log(\text{GDPpc})_{it} + \alpha_3\, \text{LE65F}_{it} + \alpha_4\, \text{LE65M}_{it} \\ & + \alpha_5\, \text{CANC}_{it} + \alpha_6\, \text{RESPD}_{it} + \alpha_7\, \text{POP65}_{it} + \alpha_8\, \text{KF-INDEX}_{it} \\ & + \alpha_9\, \text{LEFT-VOTES}_{it} + \alpha_{10}\, \text{LEFT-PSEATS}_{it} + \alpha_{11}\, \text{LEFT-CSEATS}_{it} + \varepsilon \end{aligned} \tag{5.1′}$$

$$\begin{aligned} \text{SHI-S}_{it} = {} & \beta_0 + \beta_1\, \text{GINI}_{it} + \beta_2 \log(\text{GDPpc})_{it} + \beta_3\, \text{LE65F}_{it} + \beta_4\, \text{LE65M}_{it} \\ & + \beta_5\, \text{CANC}_{it} + \beta_6\, \text{RESPD}_{it} + \beta_7\, \text{POP65}_{it} + \beta_9\, \text{KF-INDEX}_{it} + \\ & + \beta_9\, \text{LEFT-VOTES}_{it} + \beta_{10}\, \text{LEFT-PSEATS}_{it} + \alpha_{11}\, \text{LEFT-CSEATS}_{it} + \eta \end{aligned} \tag{5.2′}$$

Table 5.14 reports the estimates obtained for the model (5.1′.) The estimates of α_8 through α_{11} are all positive and statistically significant. This means that the share of health expenditures covered by government expenditures tends to get larger when the number of seats in the parliament or the cabinet gained by leftist parties rises. In particular, the share of government expenditures grows by 0.4-0.6 percent, if the share of votes or parliamentary seats of leftist parties grows by 1 percent. It can grow by 9.2 percent, if the share of seats in the cabinet increases by 1 percent. Finally, it grows by 0.5 percent per each 1-unit rise in the Kim-Fording index. Table 5.15 report the coefficients estimated for the model (5.2′.) where the coefficients obtained for β_8 through β_{11} are not statistically significant. Therefore, no firm conclusion can be drawn about the effect of the leftist ideology strengthening on the share of health expenditures covered by social insurance.

Overall, the results obtained from estimating model (5.1′) support the idea that ideological shifts towards leftist values may affect the expenditures on health care by increasing the share of publicly-funded health expenditures and in particular the expenditure directly covered by the government. On the other hand, the results obtained from model (5.2′) are inconclusive and need further analysis.

Table 5.14

Dependent Variable: Government Share of Health Expenditures (%)				
Independent Variables				
Gini Coefficient	-0.26	-0.03	-0.17	-0.46**
	(.25)	(.25)	(.25)	(.26)
log of GDP_{PC} [(1)]	-47.85*	-15.51	-26.69**	-42.12*
	(14.36)	(15.47)	(14.97)	(15.03)
Life Expectancy at 65	11.90*	9.32*	9.77*	10.73*
Male (years)	(2.43)	(2.42)	(2.45)	(2.53)
Cancer,	0.11	0.13	0.13	0.14
Deaths per 100,000	(.09)	(.09)	(.09)	(.10)
Respiratory Diseases,	0.61*	0.63*	0.58*	0.60*
Deaths per 100,000	(.08)	(.07)	(.08)	(.08)
Population	1.54*	0.60	0.94	1.82*
over 65 (%)	(.70)	(.63)	(.63)	(0.65)
Kim-Fording	0.53*			
Right-Left Index	(.12)			
Share of Votes for		0.65*		
Leftist Parties (%)		(.09)		
Share of Parliamentary			0.44*	
Seats for Leftist Parties (%)			(.08)	
Share of Cabinet				9.19*
Seats for Leftist Parties (%)				(3.38)
Constant	258.07	-20.67	93.34	241.03*
	(114.14)	(120.00)	(120.66)	(119.04)
R-Squared	0.28	0.32	0.30	0.27
Observations	315	301	301	301

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; robust standard errors are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int); CWSDS; Kim-Fording Dataset;

Table 5.15

Dependent Variable: Social Insurance Share of Health Expenditure (%)				
Independent Variables				
Gini Coefficient	0.04	0.01	0.24	0.18
	(.27)	(.35)	(.30)	(.20)
log of GDP_{PC} [(1)]	-28.26*	-31.45*	-25.79*	-26.83*
	(11.96)	(14.95)	(13.47)	(13.04)
Life Expectancy at 65	-6.72	-7.27*	-7.33*	-7.38
Male (years)	(4.29)	(1.92)	(1.94)	(1.95)
Cancer,	0.93*	0.89*	0.87*	0.88*
Deaths per 100,000	(.07)	(.08)	(.08)	(.08)
Respiratory Diseases,	-0.47*	-0.54*	-0.56*	-0.55*
Deaths per 100,000	(.12)	(.12)	(.12)	(.12)
Population	14.59*	14.74*	13.69*	13.97*
over 65 (%)	(.73)	(1.18)	(1.05)	(.94)
Kim-Fording	-0.17			
Right-Left Index	(.17)			
Share of Votes for		-0.12		
Leftist Parties (%)		(.17)		
Share of Parliamentary			0.04	
Seats for Leftist Parties (%)			(.11)	
Share of Cabinet				0.15
Seats for Leftist Parties (%)				(4.43)
Constant	90.92	694.15*	85.93	95.16*
	(96.86)	(154.98)	(111.07)	(104.04)
R-Squared	0.76	0.77	0.77	0.77
Observations	155	143	143	143

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; robust standard errors are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int); CWSDS; Kim-Fording Dataset;

5.4 Odds of Adopting Different Funding Mechanisms

The main hypotheses formulated in Chapter 4 and recalled in the previous sections by (1) through (3) are now tested by a non-ordered multinomial logit model – i.e., an extension of the logit model.

The logit model is used to predict the probabilities of an event occurring given a set of independent variables βX. If Y is a dummy variable taking on 1 when the event in question occurs and 0 when it doesn't, the probabilities of the event occurring and not occurring can be expressed by using the logistic function $f(\theta)=e^{\theta}/(1+ e^{\theta})$ and substituting the combination βX for θ:

$$\Pr (Y=1) = \exp (\beta X) / [1+ \exp (\beta X)]; \qquad (5.4.a)$$

$$\Pr (Y=0) = 1 - \Pr (Y=1) = 1 / [1+ \exp (\beta X)] \qquad (5.4.b)$$

Using the logistic function reduces all possible outcomes within the range [0-1]. Using a linear model for the same purpose – i.e., $Y = \alpha + \beta X$ – could instead produce outcomes beyond these limits. In these cases, interpreting the results in terms of probabilities would be impossible. Maximizing the likelihood function obtained from (5.4) yields:

$$\Pr (Y=1) / \Pr (Y=0) = \exp (\beta X) \qquad (5.5)$$

And therefore:

$$\ln [\Pr (Y=1) / \Pr (Y=0)] = \beta X \qquad (5.6)$$

Equation (5.6) gives the log-odds ratio of the event in question with respect to βX. The effect of a change in each component of the vector X can be thus interpreted as a change in the odds of the event occurring (Y=1) with respect to the odds of the event not occurring (Y=0). The multinomial logit model is a generalization of the logit model obtained without modifying the basic rationale. The difference is given by the use of a dependent variable taking on more than 2 values.

In this case, the dependent variable is HS and takes on 3 values, each corresponding to a nation's largest health funding mechanism: 0 for voluntary private insurance; 1 for compulsory social insurance; and 2 for a national health service. Choosing 0 as base outcome the model can be expressed as follows:

$$\Pr(HS=1) = \exp(\beta_1 X) / [1+ \exp(\beta_1 X) + \exp(\beta_2 X)] \qquad (5.7.a)$$

$$\Pr(HS=2) = \exp(\beta_2 X) / [1+ \exp(\beta_1 X) + \exp(\beta_2 X)] \qquad (5.7.b)$$

$$\Pr(HS=0) = 1 - \Pr(HS=0) - \Pr(HS=1) = 1 / [1+ \exp(\beta_1 X) + \exp(\beta_2 X)] \qquad (5.7.c)$$

There are now 2 conditions in lieu of (5.5):

$$\Pr(HS=1) / \Pr(HS=0) = \exp(\beta_1 X) \qquad (5.8.a)$$

$$\Pr(HS=2) / \Pr(HS=0) = \exp(\beta_2 X) \qquad (5.8.b)$$

And 2 conditions in lieu of (5.5):

$$\ln [Pr (HS=1) / Pr (HS=0)] = \beta_1 X \qquad (5.9.a)$$

$$\ln [Pr (HS=2) / Pr (HS=0)] = \beta_2 X \qquad (5.9.b)$$

The log-odds ratios in (5.9) indicate how a change in any component of the vector X can produce a change in the odds of adopting social insurance (HS=1) with respect to the odds of adopting private insurance (HS=0) and a change in the odds of adopting a national health service (HS=2) with respect to the odds of adopting private insurance (HS=0). The null hypothesis is therefore that neither change can produce such effects. The alternative is that when income is more equally distributed and morbidity gets higher levels, the odds of adopting a national health service or adopting mandatory social health insurance rise with respect to the odds of adopting a system based on private health insurance.

Main independent variables for this model are the Gini coefficient, and cancer incidence for females and for males. Per-capita income and the share of population over 65 are used as control variables. The terms $\beta_j X$ stand for:

$$\beta_j X = \beta_{j1} \text{GINI} + \beta_{j2} \text{CINC-F} + \beta_{j3} \text{CINC-M} + \beta_{j4} \text{GDP}_{PC} + \beta_{j5} \text{POP65} + \varepsilon \qquad (5.10)$$

The Gini coefficient is a standard measure for income inequality. Cancer incidence, or the number of new cases of cancer registered per 100,000 individuals within a year, is adopted as proxy for the morbidity level – i.e., morbidity usually refers to the

relative incidence of a disease or the speed (frequency) with which this occurs per unit of time and population [4].

The terms $\beta_j X$ can be considered as a reduced form model testing the hypotheses formulated in Table 4.4.6. The use of a reduced form model is proper because the mechanisms in place to fund health expenditures are unlikely to affect any of these variables. Both GDP per-capita and share of population over 65 drive the health expenditures [11.] Quite plausibly, they can thus enter individual's choice among different health systems as well. For this reason they are added as control variables.

Table 5.16 reports the results of this test. According to these, the higher the income inequality, the more likely it is that both private insurance and national health services are preferred over compulsory insurance. A 1-unit increase in the Gini coefficient tends to reduce the odds of adopting social insurance or a national health service by respectively 45-65 and 41-61 percent with respect to the odds of adopting private insurance. Changes in the level of morbidity produce a smaller effect: A 1-unit rise in cancer incidence for females increases the odds of adopting social insurance or a national health service private health insurance by 5 percent with respect to the odds of adopting private insurance.

Using mortality rate in lieu of cancer incidence produces very similar results. According to the estimates of Table 5.17, a 1 percent rise in the mortality rates due to cancer, cerebrovascular diseases, and respiratory diseases can increase the odds of adopting social insurance or a national health service by 5 to 18 percent with respect to the odds of adopting private insurance. The results of Table 5.16 and Table 5.17 confirm

part of the predictions of the theoretical model: The adoption of public and highly redistributive mechanisms for funding health care expenditures is more likely than the adoption of private mechanisms when the income distribution becomes more equal and morbidity raises.

The second important hypothesis of Chapter 4 regards the effect of ideology and social values on health care systems—namely, whether social values and ideology, along with income distribution and morbidity, make a particular mix of mechanisms more likely to be adopted. This hypothesis comes from equations (4.23-4.24) and is tested by 2 extended versions of the model in (5.10). The first version is obtained by adding the Kim-Fording Right-Left (KF) index of ideology. The KF index provides a measure of the strength of social values or ideological motivation pro/against welfare and socialization of health expenditures based on the political parties' ideology and their results in the elections.

The null hypothesis is that changes in the KF index have no statistically significant effect. The alternative is that an upward change in the KF index can increase the odds of adopting a national health service and decrease the odds of adopting private insurance. An upward change in the KF index corresponds to a strengthening of the leftist ideology among people and a larger presence of leftist parties in office so the adoption of more redistributive mechanisms to fund health expenditure is likely to occur under this scenario.

Table 5.16 – Multinomial Logistic Model

Dependent Variable: Health System
Outcomes: National Health Service, NHS; Social Insurance, SHI; Private Insurance Regime, PHI (base)

	SHI	NHS	SHI	NHS	SHI	NHS
Independent Variables						
Gini Coefficient	0.35* (.000)	0.39* (.000)	0.55* (.000)	0.59* (.000)	0.39* (.000)	0.44* (.000)
Cancer Incidence for Females	1.05* (.000)	1.05* (.001)			1.05* (.002)	1.04* (.004)
Cancer Incidence for Males			0.98* (.030)	0.98* (.049)	0.98** (.070)	0.98 (.170)
GDP_{PC} (1)	1.00* (.000)	1.00* (.000)	1.00* (.004)	1.00* (.007)	1.00* (.003)	1.00* (.005)
Share of Population over 65 (%)	1.33 (.326)	0.83 (805)	1.73* (.028)	1.35 (.207)	1.47 (.256)	1.09 (.796)
R-Squared	----		----		----	
Observations	319		321		319	

Notes: (1) GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; p-values are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int); and International Agency for Research on Cancer (www.iarc.fr)

Table 5.17 – Multinomial Logistic Model

Dependent Variable: Health System
Outcomes: National Health Service, NHS; Social Insurance, SHI; Private Insurance Regime, PHI (base)

	SHI	NHS	SHI	NHS	SHI	NHS
Independent Variables						
Gini Coefficient	0.68* (.000)	0.71* (.000)	0.65* (.000)	0.68* (.000)	0.60* (.000)	0.60 (.000)
Cancer, No. of Deaths per 100,000 in Population	1.04* (.038)	1.04* (.042)				
Cerebrovascular Diseases, No. of Deaths per 100,000 in Population			1.05* (.002)	1.05* (.002)		
Respiratory Diseases, No. of Deaths per 100,000 in Population					1.12* (.003)	1.18* (.000)
GDP_{PC} [(1)]	1.00* (.000)	1.00* (.000)	1.00* (.000)	1.00* (.001)	1.00* (.000)	1.00* (.000)
Share of population over 65 (%)	1.86* (.000)	1.43* (.021)	2.00* (.000)	1.54* (.009)	3.29* (.000)	2.66* (.001)
R-Squared	----		----		----	
Observations	399		399		399	

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; p-values are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int); and International Agency for Research on Cancer (www.iarc.fr)

The model is extended by adding to the terms $\beta_j X$ the variable related to the KF index, KF:

$$\beta_j X_i = \beta_{j1} \log (GDPpc) + \beta_{j2} GINI + \beta_{j3} CICN\text{-}F + \beta_{j4} CINC\text{-}M + \beta_{j5} KF + \beta_{j6} POP65+ \varepsilon; \quad (5.11)$$

With j=1,2. Table 5.18 reports the results of this test. Adding the KF index produces no substantial change in the estimates obtained for income distribution and morbidity. On the other hand, the estimates obtained for the coefficient of KF confirm that social values and ideology may play some effect as predicted. An upward change in the value of KF can increase the odds of adopting social insurance or a national health service by 7-8 percent with respect to the odds of adopting private insurance.

Substituting cancer incidence with the mortality rates due to cancer, cerebrovascular and respiratory diseases obtains very similar results as reported in Table 5.19.

Testing a similar model obtained by replacing the KM index with different proxies for ideology produces similar results. The proxies are variables extracted through the World Value Survey and based on survey data collected over the course of about 30 years in 5 waves of interviews. The variables in question are ETHOS, PROBUSINSESS1, and PROBUSINSESS2. PROBUSINSESS1 and PROBUSINSESS2 reflect people's attitude pro/against business; ETHOS reflects the ethical consideration of work. PROBUSINSESS1 is based on the question of whether private ownership should

be increased related to government's ownership over the means of production. PROBUSINSESS2 is based on the question of whether private responsibility should be increase related to government's responsibility in the economic life of one society. ETHOS is obtained from 6 questions related to the importance of work in life (see section 5.2.)

The model is below:

$$\beta_j X = \beta_{j1} GDP_{PC} + \beta_{j2} CINC\text{-}F + \beta_{j3} ETHOS + \beta_{j4} PROBUSINSESS1 + \beta_{j5} PROBUSINSESS2 + \varepsilon \quad (5.12)$$

According to the estimates reported in Table 5.20, a 1-unit rise in the ethical sense of work can increase the odds of adopting social insurance with respect to the odds of adopting private insurance by 11 percent. An increase in the score of PROBUSINSESS1 can respectively decrease the odds of adopting social insurance and a national health service by 8 and 11 percent with respect to the odds of adopting private insurance; while a unit-rise in PROBUSINSESS2 can reduce those odds by 28 and 19 percent respectively.

Table 5.18 – Multinomial Logistic Model – Extended

Dependent Variable: Health System
Outcomes: National Health Service, NHS; Social Insurance, SHI; Private Insurance Regime, PHI (base)

	SHI	NHS	SHI	NHS	SHI	NHS
Independent Variables						
Gini Coefficient	0.30*	0.34*	0.52*	0.57*	0.33*	0.37*
	(.000)	(.000)	(.06)	(.000)	(.000)	(.001)
Cancer Incidence for female	1.06*	1.06*			1.06*	1.05*
	(.004)	(.006)			(.011)	(.018)
Cancer Incidence for male			0.98**	0.98	1.00*	0.98
			(.053)	(.118)	(.04)	(.307)
Kim-Fording Index Right-Left Ideology	1.05	1.08*	1.02	1.05	1.04	1.07**
	(.181)	(.043)	(.593)	(.154)	(.327)	(.073)
GDP_{PC} [(1)]	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*
	(.001)	(.002)	(.002)	(.001)	(.011)	(.011)
Share of population over 65	1.23	0.98	1.66**	1.25	1.45	1.03
	(.631)	(.972)	(.085)	(.433)	(.463)	(.950)
R-Squared	----		----		----	
Observations	290		292		290	

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; p-values are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int); and International Agency for Research on Cancer (www.iarc.fr); and Kim-Fording dataset (mailer.fsu.edu/~hkim/dataset.htm)

Table 5.19 – Multinomial Logistic Model

Dependent Variable: Health System *Outcomes:* National Health Service, NHS; Social Insurance, SHI; Private Insurance Regime, PHI (base)						
	SHI	NHS	SHI	NHS	SHI	NHS
Independent Variables						
Gini Coefficient	0.66* (.000)	0.69* (.000)	0.65* (.000)	0.67* (.000)	0.56* (.000)	0.57* (.000)
Cancer, No. of Deaths due per 100,000 in Population	1.04** (.064)	1.03 (.106)				
Cerebrovascular Diseases, No. of Deaths per 100,000 In Population			1.04** (.068)	1.03 (.193)		
Respiratory Diseases, No. of Deaths per 100,000 In Population					1.13* (.010)	1.19* (.000)
Kim-Fording Index Right-Left Ideology	1.05** (.054)	1.07* (.004)	1.03 (.331)	1.05** (.071)	1.03 (.115)	1.04 (.266)
GDP_{PC} [(1)]	1.00* (.000)	1.00* (.000)	1.00* (.000)	1.00* (.001)	1.00* (.000)	1.00* (.000)
Share of population over 65 (%)	1.64* (.018)	1.29 (.210)	1.36 (.131)	1.72* (.010)	3.37* (.001)	2.78* (.005)
R-Squared	----		----		----	
Observations	348		348		348	

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; p-values are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int); and International Agency for Research on Cancer (www.iarc.fr); and Kim-Fording dataset (mailer.fsu.edu/~hkim/dataset.htm)

Table 5.21 reports the results obtained from the model in (5.12) gained by using cancer incidence for males only as proxy for morbidity. In this case, a 1-unit rise in the score of ETHOS can decrease the odds of adopting social insurance or a national health service with respect to the odds of adopting private insurance by 20 and 11 percent respectively. The effect of changes in the score of PROBUSINESS1 and PROBISUNESS2 are less clear: A 1 unit-rise in PROBUSINESS1 can increase the odds of adopting private insurance by only 3 percent with respect to the odds of adopting compulsory social insurance but decrease the odds of adopting private insurance by 12 percent with respect to the odds of adopting a national health service. A 1-unit rise in PROBUSINESS2 can increase the odds of adopting social insurance or a national health service with respect to the odds of adopting private insurance by 15 and 42 percent.

The effect estimated for changes in PROBUSINESS2 contradicts the hypothesis overall, these results confirm that a more pro-business and less welfare-oriented ideology may increase the odds of adopting a high-redistributive mechanism to fund health expenditure with respect to the odds of adopting a high-redistributive mechanism like a national health service.

Table 5.20 – Multinomial Logistic Model – Extended

Dependent Variable: Health System
Outcomes: National Health Service, NHS; Social Insurance, SHI; Private Insurance Regime, PHI (base)

	SHI	NHS	SHI	NHS	SHI	NHS
Independent Variables						
Gini Coefficient	0.89* (.000)	0.64* (.000)	0.81* (.000)	0.65* (.000)	0.85* (.000)	0.64* (.000)
Cancer Incidence for Females	1.11* (.000)	1.04* (.000)	1.10* (.000)	1.04* (.000)	1.11* (.000)	1.04* (.000)
ETHOS	1.10* (.017)	0.96 (.109)				
PROBUSINESS1			0.92* (.000)	0.89* (.000)		
PROBUSINESS2					0.72* (.00)	0.81* (.00)
R-Squared	----		----		------	
Observations	17067		16794		18124	

Notes: [(1)] GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; p-values are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int); and International Agency for Research on Cancer (www.iarc.fr); and World Values Survey (worldvaluessurvey.org)

Table 5.21 – Multinomial Logistic Model – Extended

Dependent Variable: Health System
Outcomes: National Health Service, NHS; Social Insurance, SHI; Private Insurance Regime, PHI (base)

	SHI	NHS	SHI	NHS	SHI	NHS
Independent Variables						
Gini Coefficient	0.97*	1.47*	0.97*	1.48*	0.97*	1.49*
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Cancer Incidence for male	0.97*	0.97*	0.97*	0.97*	0.97*	0.98*
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
ETHOS	0.80*	0.89*				
	(.00)	(.01)				
PROBUSINESS1			0.97*	1.12*		
			(.03)	(.00)		
PROBUSINESS2					1.15*	1.42*
					(.00)	(.00)
R-Squared	----		----		-----	
Observations	17076		16806		18131	

Notes: (1) GDP per-capita is measured in USD PPP; * statistically significant at 5% level; ** statistically significant at 10% level; p-values are reported in parentheses; *Data Source*: OECD (stats.oecd.org); UN World Income Inequality Dataset (wider.unu.edu); World Health Organization (who.int); and International Agency for Research on Cancer (www.iarc.fr); and World Values Survey (worldvaluessurvey.org)

5.5 Health Expenditures across Countries under Different Funding Regimes

This section shows that countries under different regimes tend to systematically differ in terms of income distributions and health expenditures as well as they differ in terms of health outcomes. However, the latter difference may not result from a deeper analysis. This may give some support to the hypothesis that income distribution may be a relevant force at play in the political equlibria leading to the adoption of different health funding regimes. Also, it may support the hypothesis that asymmetric information produces distortionary effects on the price for health care without considerable differences arising in service quality.

5.5.1 Differences in Health Expenditures across Funding Regimes

Informational asymmetries between insured and insurers can produce a distortionary effect on the price for health insurance, especially private health insurance. In addition, administrative costs and the medical procedures covered may vary among systems. If such costs decline as one shifts from private to social to a national health service, expenditures may decrease as the relative size of these sectors shift in the direction of national health services. These cost effects were a key part of the theoretical model – see equations 4.5-4.8, 4.13 and 4.20-4.21. Tests of such cost effects are described below.

The null hypothesis is that adopting the regimes of compulsory social insurance or adopting private insurance produces no change in the level of real, per-capita, health expenditures attained when health expenditure is funded through a national health service. The alternative is that adopting social insurance or private insurance raises the

level of expenditures relative to those of a national health service. Support for the latter hypothesis has already been developed in Chapter 2 in the tables reporting trends in health expenditures between 1970 and 2006.

I now perform a series of statistical tests to further explore this hypothesis. The dependent variable for the first test is the total health expenditures measured as percent of GDP (THE.) Main independent variables are the dummies associated with the regime of compulsory social health insurance (SHI) and private health insurance (PHI) in place. A dummy associated with the regime of a national health service (NHS) is the reference term. Log of per-capita income and share of the population above 65 are used as controls for the reasons expressed above. The model is the following:

$$THE_{it} = \beta_0 + \beta_1 PHI_{it} + \beta_2 SHI_{it} + \delta_1 ACBD_{it} + \delta_2 HBD_{it} \qquad (5.13)$$
$$+ \delta_3 MRI_{it} + \delta_4 CT_{it} + \delta_5 \log (GDP_{PC})_{it} + \delta_6 POP65_{it} + \delta_t + \varepsilon$$

The number per 1,000 individuals in the population of hospital beds for acute care (ACBD) and general hospital beds (HBD) as well as the number of MRI and CT scanners are added as further controls to reduce the heterogeneity among health systems of different countries. This strengthens the causal interpretation of the coefficients β_1 and β_2 by accounting for the effect on health expenditures generated by differences in available health resources. The results are reported in Table 5.22.

Table 5.22 - Health Expenditures under Different Regimes

Dependent Variable: Total Health Expenditure (% GDP)						
Independent Variables						
PHI – Dummy for Countries under Private Insurance Regime	1.19* (.24)	2.02* (.22)	1.97* (.22)	2.51* (.20)	2.70* (.33)	3.17* (.48)
SHI – Dummy for Countries Under Social Insurance Regime	0.72* (.10)	0.70* (.10)	0.86* (.24)	0.55** (.28)	1.43* (.38)	1.45* (.45)
No. Hospital Beds for Acute Care per 1,000			-0.65* (.10)	-0.59* (.09)	-0.29* (.11)	-0.15 (.12)
No. Hospital Beds per 1,000 in Population			0.44* (.09)	0.48* (.11)	0.56* (.12)	0.54* (.12)
No. MRI per 1,000 in Population					-0.02 (.03)	-0.03 (.03)
No. of CT per 1,000 in Population					0.56* (.12)	-0.04* (.01)
log of GDP_{PC}	5.13* (.29)	1.75* (.42)	5.52* (.94)	3.12* (0.92)	11.41* (1.59)	9.45** (2.56)
Population above 65 (%)	0.01 (.02)	-0.01 (.02)	-0.03 (.05)	-0.09** (.05)	-0.03* (.01)	-0.49* (.12)
Constant	-43.84* (2.70)	-11.86* (3.90)	-47.09* (9.36)	-26.52* (9.16)	-103.47 (16.13)	-81.83 (27.17)
Time Fixed Effects	NO	YES	NO	YES	NO	YES
R-Squared	0.58	0.64	0.57	0.64	0.76	0.80
Observations	534	534	293	293	123	123

Note: (1) measured in current USD at purchasing power parity; * statistically significant at 5% level; ** statistically significant at 10% level; robust standard errors are reported in parentheses; *Data Source*: OECD (stats.oecd.org)

The estimates for β_1 and β_2 are statistically significant and positive. The null hypothesis can thus be rejected in favor of the alternative. The total expenditures on health care in countries with a relatively large private health insurance (PHI) or social insurance based system (SHI) are systematically higher than in countries that rely more on a national health service (NHS). In the first case, the difference ranges between 1.2 and 3.2 percent of GDP in the first case and between 0.5 and 1.45 percent of GDP in the second case respectively.

The effects of different funding mechanisms on the level of expenditure may also be estimated by a continuous model, where the dummies PHI and SHI in (5.13) are replaced with the shares of total health expenditure covered by some mechanisms – i.e., private insurance (PIHES); and government expenditure (GHES). However, only one share can be used in turn to estimate each model. Using more than one share as independent variable in the same equation would very likely produce collinearity since the sum of all shares equals one.

$$THE_{it} = \beta_0 + \beta_1 PHES_{it} + \beta_2 GHES + \delta_1 ACBD_{it} + \delta_2 HBD_{it} \qquad (5.14)$$
$$+ \delta_3 MRI_{it} + \delta_4 CT_{it} + \delta_5 \log (GDP_{PC})_{it} + \delta_6 POP65_{it} + \delta_t + \varepsilon$$

The estimates of β_1 and β_2 obtained from (5.14) measure the change in total health expenditures produced by 1 percent rise on health expenditures covered by each mechanism in turn: Private insurance; and government expenditures (the mechanism of social insurance produces no statistically significant results and is thus omitted).

Table 5.23 reports these results. Increasing the share of expenditures covered by private insurance by 1 percent tends to raise health expenditures by 0.2 percent of GDP; while increasing the share covered by the government by 1 percent tends to reduce health expenditures by 0.02-0.03 percent of GDP. Although the magnitude of these changes is small, the results of Table 5.23 confirm those obtained from the models (5.13) that expenditures under regime of private insurance tend to be systematically higher than under regime of a national health service so supporting the hypothesis system cost differences may produce a systematic effect on the provision of health care expenditures.

Table 5.23 - Health Expenditures under Different Regimes – Continuous Model

Dependent Variable: Total Health Expenditures (% GDP)				
Independent Variables				
Private Insurance, % Total Health Expenditure	0.18* (.01)	0.17* (.01)		
Government Expenditures, % Total Health Expenditure			-0.03* (.00)	-0.02* (.01)
No. Hospital Beds for Acute Care per 1,000 in Population	0.20* (.09)	0.17 (.12)	-0.06 (.12)	-0.29** (.15)
No. Hospital Beds per 1,000 in Population	0.17 (.10)	0.19 (.11)	0.33* (.12)	0.53* (.14)
No. MRI per 1,000 in Population	0.01 (.02)	0.00 (.02)	0.04 (.03)	-0.01 (.01)
No. CT per 1,000 in Population	-0.02* (.01)	-0.02* (.01)	-0.04* (.01)	-0.03* (.01)
log of GDP[(1)]	6.06* (1.68)	8.25* (2.54)	10.55* (1.78)	17.45* (2.76)
Population above 65 (%)	0.17* (.03)	0.21* (.06)	-0.37* (.09)	-0.20** (.11)
Constant	-58.04* (16.67)	-81.69* (25.10)	-92.92 (13.20)	-167.00* (29.04)
Time Fixed Effects	NO	YES	NO	YES
R-Squared	0.84	0.88	0.97	0.74
Observations	114	114	54	117

Note: Due to the limited availability of consistent data on the shares of total health expenditures, the sample is here reduced to the following countries: Australia; Denmark; France; Germany; Switzerland; United Kingdom; and United States; [(1)] measured in USD at purchasing power parity; *statistically significant at 5% level; ** statistically significant at 10% level; robust standard errors are reported in parentheses; *Data Source*: OECD (stats.oecd.org)

5.5.2 Life Expectancy and Mortality under Different Funding Regimes

This section tests the following hypothesis: Are life-expectancy at 65 or mortality rates systematically different across countries with different health funding mechanisms?

The time trends in Figure 5.26 and 5.27 indicate that life expectancy at 65 in Switzerland and United States is higher than in other countries throughout the entire period 1970-2006.

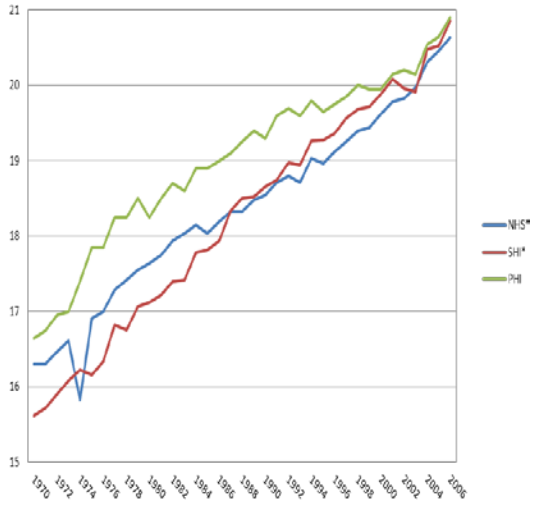

Figure 5.26 – Life Expectancy (Females)

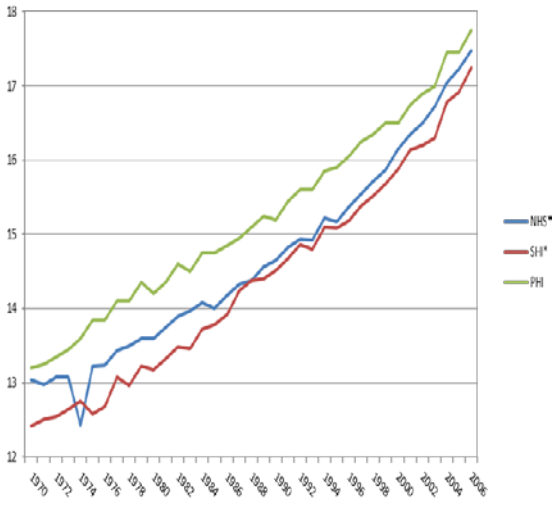

Figure 5.27 – Life Expectancy (Males)

This holds true even when life expectancy is regressed on a dummy for countries under different regimes while controlling for risk factors and time fixed effects. Table 5.24 reports the results obtained from the following model using life expectancy at 65 for females (LE65F):

$$LE65F = \beta_0 + \beta_1 NHS_{it} + \beta_2 PHS_{it} + \beta_3 PPD_{it} + \beta_4 HBD_{it} \quad (5.15)$$
$$+ \beta_5 ACBD_{it} + \beta_6 DCPC_{it} + \beta_7 HDR_{it} + \beta_8 ALS_{it} + \beta_9 ALC_{it}$$
$$+ \beta_{10} TBC_{it} + \beta_{11} \log (GDPpc)_{it} + \beta_{12} GINI_{it} + \alpha_t + \varepsilon$$

As in previous estimates, NHS and PHI are dummy variables referring to countries under regime of a national health service (i.e., Australia, Canada, Denmark, Finland, New Zealand, Norway, Sweden, and the United Kingdom) and countries under regime of private insurance (i.e., Switzerland and the United States.) The countries under social insurance (i.e., Austria, Belgium, France, Germany, and the Netherlands) represent the base group. PPD measures the number of practicing physicians per 1,000 inhabitants; HBD the number of hospital beds per 1,000 inhabitants; ACBD the number of hospital beds for acute care per 1,000 inhabitants. DCPC is the number of doctor consultation per capita; HDR is the number of hospital discharge for all causes per 100,000 inhabitants; ALS is the average length of stay in hospital for all conditions in days. ALC and TBC refer to consumption of alcohol and tobacco respectively measured in liters per population above 15 and share of population of daily smokers.

The estimates of β1 and β2 reported in column 1 of Table 5.24 indicate that life expectancy at 65 in Switzerland and United States is higher than in countries under other regimes. However, such difference is not statistically significant if controlling for available health resources and use of health resources – i.e., see columns 2-5.

Table 5.24 – Life Expectancies under Different Regimes

Dependent Variable: Life Expectancy at 65 for females (years)					
Independent Variables					
NHS – Dummy for Countries under National Health Services	0.06 (.09)	-0.22** (.12)	0.06 (.26)	-0.30 (.37)	-0.34 (.40)
PHI – Dummy for Countries under regime of Private Insurance	0.44* (.17)	0.25 (.27)	0.71 (.46)	0.31 (1.18)	0.13 (.96)
No. of Practicing Physicians per 1,000 in Population			0.65* (.20)		0.24 (.39)
No. of Hospital Beds per 1,000 in Population			0.16* (.07)		-0.17 (.12)
No. of Hospital Beds for Acute Care per 1,000 in Population			-0.41* (.09)		-0.56* (.10)
No. of Doctor Consultations per capita				0.23* (.06)	0.12 (.12)
No. of Hospital Discharges, All Causes, per 100,000 in Population				0.00 ----	0.00 -----
Average length of Stay, for Acute Care, All Conditions (days)				0.05 (.09)	0.24* (.09)
Alcohol Consumption (liters per population, age +15)		-0.04** (.02)	-0.07** (.03)	-0.10** (.05)	0.19* (.07)
Tobacco Consumption (% of daily smokers in population)		-0.01 (.01)	-0.06* (.01)	-0.05* (.01)	-0.06* (.02)
log (GDPpc)	1.38* (.33)	0.74 (.48)	-2.24* (.88)	-1.58 (1.59)	-2.47 (2.33)
Gini Coefficient	-0.01** (.00)	-0.01 (.01)	-0.04* (.02)	-0.04 (.03)	-0.05** (.02)
Constant	-3.25* (3.29)	-10.49* (4.60)	-43.64 (9.08)	-37.98* (16.38)	46.94** (23.68)
Time effects	YES	YES	YES	YES	YES
R-Squared	0.73	0.67	0.66	0.52	0.75
Observations	405	356	179	161	116

Note: NHS refers to Australia, Canada, Denmark, Finland, New Zealand, Norway, Sweden, and United Kingdom; PHI refers to Switzerland and United States; the base group SHI* refers to Austria, Belgium, France, Germany, and Netherlands; *Data sources*: OECD; UNU WIDER; World Health Organization (who.int); and International Agency for Research on Cancer (www.iarc.fr)

The charts in Figures 5.28-5.30 indicate that mortality has been decreasing in all countries, but is consistently lower in Switzerland and the United States than other countries in the cases of cancer and cerebrovascular diseases.

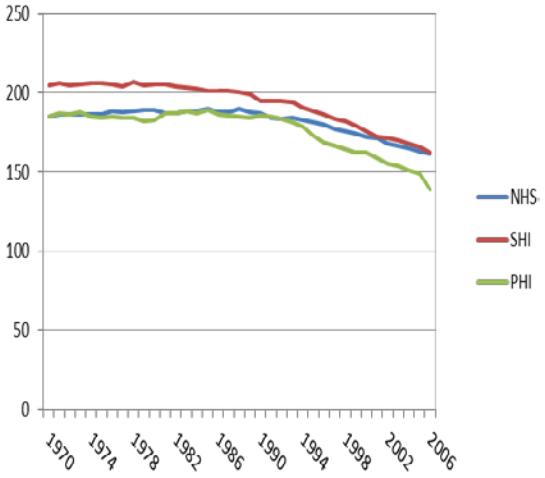

Figure 5.28 – Cancer, Deaths per 100,000

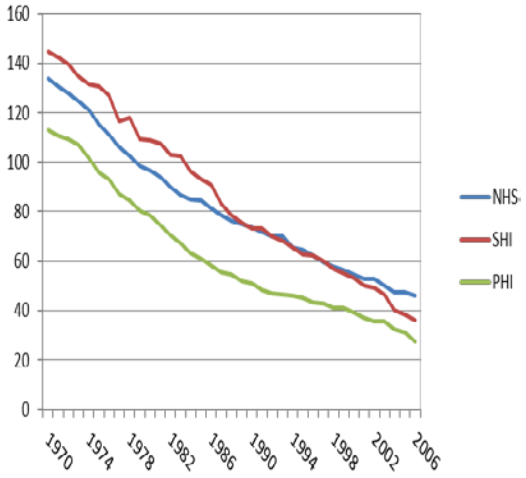

Figure 5.29 – Cerebrovascular Diseases

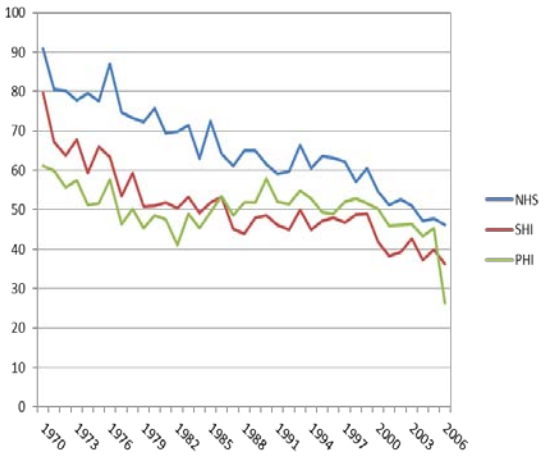

Figure 5.30 - Respiratory Diseases, Deaths per 100,000

Note: NHS* refers to: Australia; Canada; Denmark; Finland; New Zealand; Norway; Sweden; and United Kingdom; SHI* refers to Austria; Belgium; France; Germany; and Netherlands; PHI refers to Switzerland and United States; *Data Source*: OECD (stats.oecd.org)

This tends to remain true even while adding similar controls to those considered in (5.15). In particular, Table 5.25 and Table 5.26 report the estimates obtained from the models below:

$$\begin{aligned} \text{CANC-D} = {} & \delta_0 + \delta_1 \, \text{NHS}_{it} + \delta_2 \, \text{PHS}_{it} + \delta_3 \, \text{PPD}_{it} + \delta_4 \, \text{HBD}_{it} \\ & + \delta_5 \, \text{ACBD}_{it} + \delta_6 \, \text{DCPC}_{it} + \delta_7 \, \text{HDR}_{it} + \delta_8 \, \text{ALS}_{it} + \delta_9 \, \text{ALC}_{it} \\ & + \delta_{10} \, \text{TBC}_{it} + \delta_{11} \log (\text{GDPpc})_{it} + \delta_{12} \, \text{GINI}_{it} + \alpha_t + \varepsilon \end{aligned} \tag{5.16}$$

$$\begin{aligned} \text{CRBVAS-D} = {} & \zeta_0 + \zeta_1 \, \text{NHS}_{it} + \zeta_2 \, \text{PHS}_{it} + \zeta_3 \, \text{PPD}_{it} + \zeta_4 \, \text{HBD}_{it} \\ & + \zeta_5 \, \text{ACBD}_{it} + \zeta_6 \, \text{DCPC}_{it} + \zeta_7 \, \text{HDR}_{it} + \zeta_8 \, \text{ALS}_{it} + \zeta_9 \, \text{ALC}_{it} \\ & + \zeta_{10} \, \text{TBC}_{it} + \zeta_{11} \log (\text{GDPpc})_{it} + \zeta_{12} \, \text{GINI}_{it} + \alpha_t + \varepsilon \end{aligned} \tag{5.17}$$

CANC-D and CRBVAS-D measure the mortality rates due to cancer and cerebrovascular diseases respectively as number of deaths per year in a population of 100,000 individuals.

The estimates of δ_1 and δ_2 reported in the first column of Table 5.25 and those of ζ_1 and ζ_2 reported in Table 5.26 indicate that countries under private insurance score better than others in terms of health outcomes. The mortality rate respectively due to cancer and cerebrovascular diseases in Switzerland and the United States is systematically lower than in countries under a national health service and or social insurance; whereas there is no statistically significant difference between countries under national health service and countries under social insurance.

The estimates may change, if further controls are added. When controlling for

consumption of tobacco and alcohol, the mortality rate in Switzerland and the United States is no longer lower than in countries under social insurance. At the same time, the mortality rate in countries under national health service becomes significantly higher than other countries. When also controlling for available health resources and use of these, the estimate for δ1 shifts from non-statistically significant to significant positive; δ2 shifts from significant negative to non-significant; ζ_1 remains non-significant; and ζ_2 shifts from significant negative to non-significant.

Unfortunately, the conclusions achieved after adding these controls are not reliable because of the considerable lack of consistency in the data – i.e., due to the high number of missing data, the observations retained for calculating the estimates of Table 5.25 and Table 5.26 drop from 399 to 113. Such lack of consistency undermines the robustness of the estimates of δ_1 (ζ_1) and δ_2 (ζ_2) and in turn leads to no firm conclusion when these controls are added. To this extent, it is worth pointing out that the construction of time-series data more consistent than those available through the OECD and WHO databases is necessary in order to shed light on the difference across countries under different regimes.

Overall, these results suggest that higher health expenditures may be matched by better health outcomes. Switzerland and the United spend more than other countries and obtain higher life expectancy at 65 and lower mortality rates. It is possible that coverage is more extensive, monitoring is better, or innovation is faster under systems that have a broader private market foundation. On the other hand, it may be the case that health risks were somewhat lower in those countries to begin with, which partly explained why their

private health care systems were relatively large during the period of analysis – see Figures 5.31-5.34.

It bears noting that better results may affect system choices. This effect tends to reinforce the hypothesis that the majority of individuals may prefer to adopt private insurance over other mechanisms, in countries where income is relatively higher and less equally distributed.

Table 5.25 – Mortality under Different Regimes (Cancer)

Dependent Variable: Cancer, Number of deaths per 100,000 in population					
Independent Variables					
NHS – Dummy for Countries under National Health Services	-0.71 (2.64)	6.77* (2.89)	-12.16* (2.84)	-7.76* (3.17)	-10.00* (3.87)
PHI – Dummy for Countries under Regime of Private Insurance	-15.33* (4.04)	-4.28 (5.21)	-33.77* (5.67)	-2.69 (8.20)	-8.01 (7.35)
No. Practicing Physicians per 1,000 in Population			0.41 (3.68)		-7.00** (3.72)
No. Hospital Beds per 1,000 in Population			-5.91* (1.04)		0.57 (1.49)
No. Hospital Beds for Acute Care per 1,000 in Population			-4.55* (1.18)		-5.69* (1.76)
No. Doctor Consultations per capita				3.21* (.72)	6.83* (1.19)
No. Hospital Discharges, All Causes, per 100,000 in Population				0.00 ----	0.00 ----
Average Length of Stay for Acute care, All Conditions (days)				-4.78* (.88)	-2.74* (1.03)
Alcohol Consumption (liters per population, age +15)		2.40* (.44)	4.55* (.56)	4.50* (.55)	4.85* (.74)
Tobacco Consumption (% of daily smokers in population)		1.72* (.18)	0.80* (.24)	0.60* (.26)	0.68* (.33)
log (GDPpc)	-3.36 (8.14)	-12.88* (8.74)	24.11** (12.85)	-5.61 (12.38)	57.04* (26.91)
Gini Coefficient	1.04* (0.20)	1.28** (.20)	1.02* (.29)	0.00 ---	-0.04 (.33)
Constant	178.09* (81.56)	-174.43* (83.47)	-87.38 (128.91)	-253.84* (123.51)	-393.62* (279.71)
Time effects	YES	YES	YES	YES	YES
R-Squared	0.24	0.58	0.76	0.87	0.89
Observations	399	353	176	158	113

Note: NHS refers to Australia, Canada, Denmark, Finland, New Zealand, Norway, Sweden, and United Kingdom; PHI refers to Switzerland and United States; the base group SHI* refers to Austria, Belgium, France, Germany, and Netherlands; *Data sources*: OECD; UNU WIDER; World Health Organization (who.int); and International Agency for Research on Cancer (www.iarc.fr)

Table 5.26 – Mortality under Different Regimes (Cerebrovascular Diseases)

Dependent Variable: Cerebrovascular Diseases, Number of deaths per 100,000 in population					
Independent Variables					
NHS – Dummy for countries under National Health Services	-2.93 (2.00)	1.14 (1.92)	5.34** (3.18)	9.60** (5.38)	8.64 (5.82)
PHI – Dummy for countries under Regime of private insurance	-13.55* (3.92)	-15.86* (4.99)	-6.94 (6.14)	-12.34 (16.23)	-16.30 (14.50)
No. Practicing Physicians per 1,000 in Population			-10.94* (2.75)		1.24 (5.98)
No. Hospital Beds per 1,000 in Population			-0.76 (1.14)		0.47 (1.62)
No. Hospital Beds for Acute Care per 1,000 in Population			8.29* (1.41)		10.01* (1.74)
No. of Doctor Consultations per capita				-6.73* (.97)	-7.14* (1.54)
No. of Hospital Discharges, all causes, per 100,000 in Population				-0.001* (.00)	-0.001* (.00)
Average Length of Stay for Acute Care, All Conditions (days)				3.40* (1.30)	1.36 (1.36)
Alcohol Consumption (liters per population, age +15)		0.55 (.38)	0.58 (.47)	3.32* (.86)	3.33* (.94)
Tobacco Consumption (% of daily smokers in population)		-0.60* (.18)	0.74* (.17)	0.18 (.29)	0.26 (.26)
log (GDPpc)	-41.53* (8.53)	-20.84* (9.60)	31.82* (12.34)	-1.63 (24.70)	-2.22 (36.54)
Gini Coefficient	0.22 (.21)	-0.36** (.19)	-0.38 (.23)	0.23 (.51)	0.38 (.39)
Constant	551.30* (80.62)	373.42** (90.26)	-230.22 (126.66)	21.90 (255.04)	-46.85 (373.38)
Time effects	YES	YES	YES	YES	YES
R-Squared	0.77	0.75	0.83	0.68	0.82
Observations	399	353	176	158	113

Note: NHS refers to Australia, Canada, Denmark, Finland, New Zealand, Norway, Sweden, and United Kingdom; PHI refers to Switzerland and United States; the base group SHI* refers to Austria, Belgium, France, Germany, and Netherlands; *Data sources*: OECD; UNU WIDER; World Health Organization (who.int); and International Agency for Research on Cancer (www.iarc.fr)

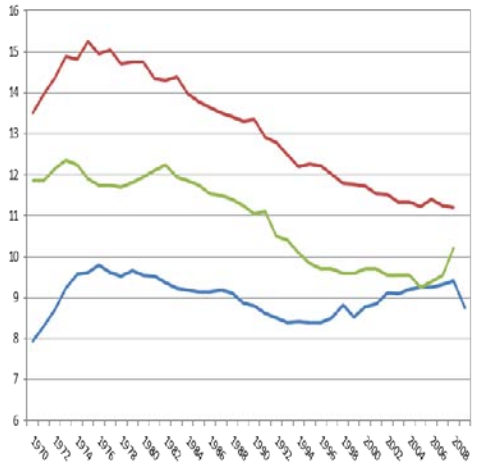

Figure 5.31 – Alcohol Consumption

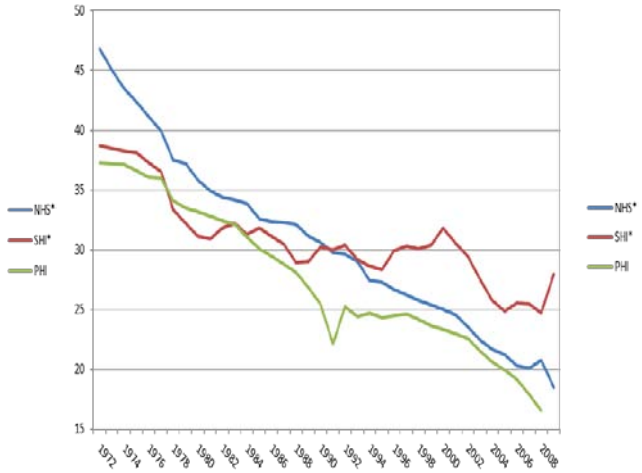

Figure 5.32 – Tobacco Consumption

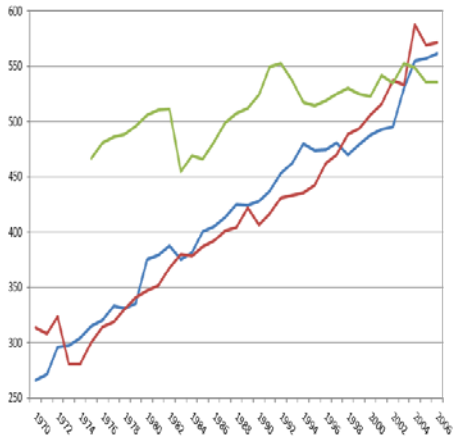

Figure 5.33 – Cancer Incidence (Females)

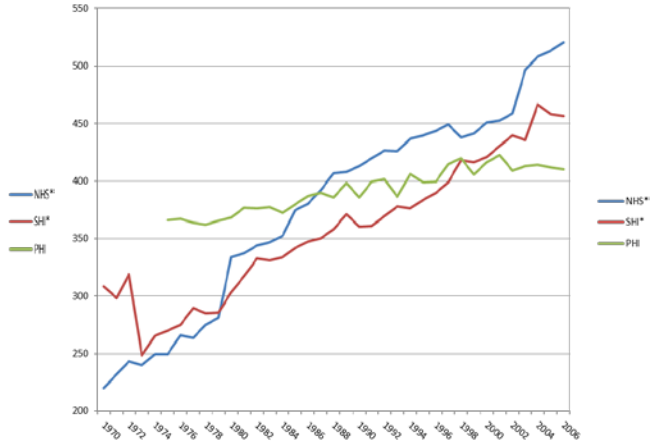

Figure 5.34 – Cancer Incidence (Males)

Note: Cancer incidence is measured as number of new cases of cancer registered per year over a population of 100,000 individuals; NHS* refers to: Australia; Canada; Denmark; Finland; New Zealand; Norway; Sweden; and United Kingdom; SHI* refers to Austria; Belgium; France; Germany; and Netherlands; PHI refers to Switzerland and United States; *Data Source*: World Health Organization; International Agency for Research on Cancer;

5.5.3 Income Distribution Across Countries Under Different Funding Regimes

This section tests the following hypothesis: Do income distributions differ significantly among countries that rely most heavily on particular health care regimes?

The trends reported in Figure 5.35 and the least squares estimates in Table 5.28 suggest that income distribution in countries under private insurance tends to be less equal than in countries under social insurance or a national health service. Using a non-parametric approach to analyzing changes in inequality across countries under different regimes leads to the same conclusion and thus strengthens it.

These trends are analyzed by the Kruskal-Wallis method (KW). This method tests whether statistically significant differences exist in the mean of a variable between different groups of subjects. In this case, the variable of interest is the Gini coefficient; the groups of subjects are given by countries adopting different mechanisms to fund the health expenditure. There are 3 groups. Austria, Belgium, France, Germany, and the Netherlands adopting compulsory social insurance represent the first group. Australia, Canada, Denmark, Finland, Norway, New Zealand, and the United Kingdom adopting a national health service represent the second group. Switzerland and the United States adopting private insurance represent the third group.

The null hypothesis of the test is that no statistically significant difference exists in the mean of the Gini coefficient between these 3 groups of countries. The alternative is that differences exist and are statistically significant. In particular, the mean of the Gini coefficient for countries adopting private insurance should be higher than both, the mean for countries adopting a national health service and the mean for countries adopting

compulsory social insurance:

$$\text{Gini (PHI)} > \text{Gini (SHI)}; \qquad \text{Gini (PHI)} > \text{Gini (NHS)} \qquad (5.18)$$

The alternative is formulated by looking at the average estimates of the Gini coefficient over each group of countries per single year within the observed horizon. The highest levels in the Gini coefficient are attained in countries adopting private health insurance – i.e., the United States and Switzerland. The lowest levels are attained in countries adopting a national health service between 1980 and 1985 and for those adopting social insurance between 1985 and 2002.

The test is conducted between the means of the Gini coefficient calculated within each group and every year over the period 1970-2006. The critical value for the KW test in this case is given by a Chi-distribution with 2 degrees of freedom. This value is 5.99. The cross-group differences are thus statistically significant as long as the estimated value for the KW statistics is above 5.99. Table 5.27 reports the results of the tests. They indicate that the differences are significant at 5% confidence over the entire period with exception of a few years – i.e., 1970, 1974, and 2001.

A final consideration about the possible causal-effect relationship between income distribution and mechanisms to fund the health expenditure is in order. Adopting a more (less) redistributive mechanism to fund health expenditure is unlikely to affect the income distribution. Although the use of public funding for health care redistributes income across the society, the redistribution takes place to a too small extent to affect the

distribution of income across the entire society. In 2007, the highest level of public expenditure on health care among all OECD countries, attained in France, was 8.6 percent of GDP (data source: OECD). This figure is too small for a significant effect on the income distribution to occur. A plausible causal-effect relationship between income distribution and health funding mechanisms can only run therefore from the former to the latter. Therefore, the results of the Kruskal-Wallis test can further support the results of section 5.2 that an increase in income inequality tends to raise the odds of adopting private insurance.

Table 5.27 – Results of the Kruskal-Wallis Test

Year	K	Year	K	Year	Year	K	Year
1970	2.75 *	1980	7.65	1990	11.95	2000	8.83
1971	6.53	1981	8.44	1991	10.1	2001	4.1*
1972	6.53	1982	11.07	1992	13.09	2002	9.61
1973	8.74	1983	9.14	1993	7.42	2003	8.04
1974	5.59	1984	7.4	1994	8.85	2004	9.44
1975	12.24	1985	9.03	1995	9.55	2005	7.05
1976	8.61	1986	6.4	1996	9.09	2006	7.17
1977	8.61	1987	7.07	1997	10.12		
1978	8.56	1988	6.95	1998	9.17		
1979	7.39	1989	7.1	1999	9.4		

Note: The critical value K* for a Chi-distribution with 2 degrees of freedom is 5.99; * Non statistically significant
Data Source: UN World Income Inequality Dataset (wider.un.edu)

Table 5.28 Gini Coefficients under Different Regimes

Dependent Variable: Gini coefficient		
Independent variables		
PHI – Dummy for Countries Under Private Insurance Regime	9.43* (.72)	9.39* (.75)
SHI – Dummy for Countries under Private Insurance Regime	-1.52* (.54)	-1.11* (.50)
Time Trend		-0.12* (.03)
Constant	30.82* (.35)	280.41* (59.87)
R-squared	0.27	0.32
Observations	405	405

Note: * statistically significant at 5%; ** statistically significant at 10%; *Data source*: World Income Inequality Dataset (unu.wider.edu)

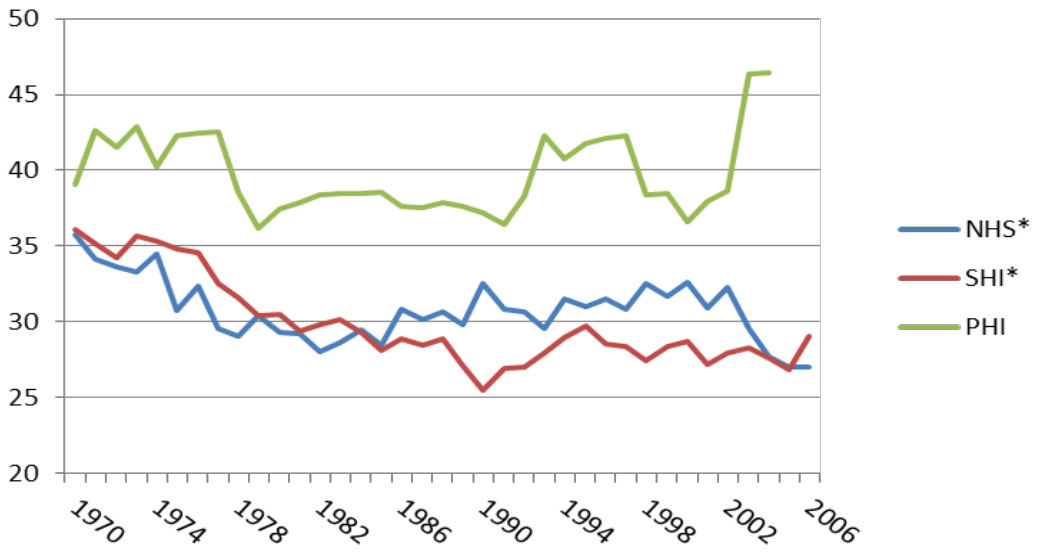

Figure 5.35 - Gini Coefficient (Source: UNU-WIDER)

Note: NHS* refers to: Australia; Canada; Denmark; Finland; New Zealand; Norway; Sweden; and United Kingdom; SHI* refers to Austria; Belgium; France; Germany; and Netherlands; PHI refers to Switzerland and United States; *Data Source*: World Income Inequality Dataset (http://www.wider.unu.edu)

5.6 Conclusions

This chapter provides some empirical evidence that changes in the level and distribution of income and morbidity as well as ideology shifts may affect the adoption of different health funding mechanisms as predicted in Chapter 4. This evidence is provided by both generalized least squares tests and by a non-ordered multinomial logit model.

The tests show that the share of health expenditures covered by tax-funded mechanisms tends to grow when income distribution becomes more uniform, morbidity rises, and the leftist ideology strengthens. Under the same circumstances, the odds of adopting national health service or social insurance regimes tend to rise while those of adopting private insurance tend to fall.

The chapter provides further support to these results by showing that countries under different regimes tend to significantly differ in terms of health expenditures and income distribution, but it may be uncertain whether they also differ in terms of health outcomes. Generalized least squares tests indicate that both per-capita and aggregate health expenditures in countries under social insurance and private insurance are significantly higher than in countries under a national health service. A non-parametric test on the Gini coefficient shows that income distribution in countries under private insurance is statistically less equal than in countries under social insurance or a national health service.

Overall, these results may support the idea that countries characterized by a relatively more equal distribution of income, higher morbidity, and a stronger pro-welfare ideology may prefer the adoption of tax-funded mechanisms to pay for health care, while

less equal countries may prefer private funding mechanisms especially when characterized by lower morbidity.

CHAPTER 6

CONCLUDING REMARKS

6.1 Overview of the Contribution

The dissertation attempts to fill a gap existing in the literature of public choice and political economy regarding the choice of funding mechanisms for health care expenditures. Its main contribution is a model of collective decision making that encompasses all mechanisms in use among the developed countries and a series of statistical tests of that model. The model provides a rationale for the adoption of different mixes of public and private provisions across countries grounded in the Median Voter Theorem. It also provides the foundations for a positive theory of public health care funding and provision.

As explained in Chapter 3, several public choice and political economy papers have explored how the provision of health care may be the affected by political and economic forces, but none take into consideration the fact that the provision of health care can be undertaken not only by mixing public and private provision, but also by mixing different public mechanisms. Previous work mainly focused on the possibility that mixed forms of public and private provision of health care may coexist. However, the reality of the OECD countries shows that all three principal mechanisms are combined at the same time – e.g., payroll-tax-funded social insurance is complemented

with private health insurance in Austria and Germany; while a tax-funded national health service is complemented with private out-of-pocket payments in Great Britain and Canada. The U.S. includes private insurance, social insurance, and direct provision of health care services.

The analysis focuses on the principal mechanisms adopted by OECD countries: private insurance; tax-funded social insurance; and tax-funded national health services – emphasizing some key differences that can be crucial for the adoption of certain combinations, rather than others. Motivations for selection among services may be entirely cost-based, or may be a manifestation of different policy objectives that reflect ideological and self-interest factors. Both administrative costs and payment methods vary among the systems. Administrative costs under a national health service can be smaller than under other funding regimes, but prices are generated by the tax system rather than personal health risks. Private and public provisions, thus, differ in their redistributive or cost sharing effects. Relatively little redistribution takes place across individuals with different incomes and/or risks under private insurance when risks are properly priced. More redistribution takes place within social insurance and national health care systems because prices do not take account of risk and their tax funding tends to be based on income rather than services provided.

Such differences make the unit price of health care coverage vary with the level of income and morbidity. These personal differences may determine voter preferences for health care systems – i.e., low-income and high-morbidity individuals are likely to be in favor of adopting redistributive mechanisms whereas high-income and low-morbidity

individuals are likely to be against it. However, with extended notions of self-interest, that include ideological considerations, the various programs may advance somewhat different goals, and so mixes of health care systems may be preferred to pure forms.

The model provides a framework for analyzing collective decisions to adopt combinations of private insurance, social insurance, and national health care services. The occurrence of diseases is an uncertain event that leads risk-averse individuals to buy private insurance and/or favor government subsidies for such policies or direct provision. However, the distortionary effects produced by asymmetric information makes the market for health insurance inefficient. In cases in which private markets operate poorly because of "lemons" effects and monitoring problems, the adoption of social insurance may offer Pareto-improvements. However, the political process that leads to a social insurance program tends to be based on majority rule, rather than unanimous consent. So, improvements for a majority are sufficient to generate extensive socialization of health care provision in the forms of social insurance and national health service systems.

Chapter 5 includes a broad array of statistic evidence and tests that demonstrate that existing health care systems in OECD countries are consistent with an electoral model in which voters do not regard the various health care systems to simply be alternative methods of personal health care delivery. Instead, ideological factors clearly affect the extent of socialization adopted. For example, it is clear that governments from the left of a nation's center tend to encourage more socialization than parties of the right. And, moreover, even parties of the right favor greater socialization of health care than would have been promoted by even left-leaning parties of the early Twentieth Century.

Alternatively, holding a strong sense of work ethic may increase the likelihood of maintaining relatively large private insurance markets.

The argument developed throughout the dissertation is that the selection of health care service is a political choice; and within democracies, politicians may rationally choose the regime that best advances the interest of a majority of their respective electorates. A crucial assumption is that every individual-voter is aware of his (her) status or that of other individuals once certain mechanisms are in place. For this reason, both self-interested factors like income and morbidity and factors like social norms, ideology, and altruism can affect their preferences over different mixes of health care funding mechanisms.

The viewpoint of the dissertation is clearly different from Rawls' (1971). The individual-voter is assumed to hold a rational expectation about the consequences of adopting a certain mechanism for health expenditures. This assumption seems close to reality and is common in public choice and political economy (Persson and Tabellini, 2000; Congleton, 2007). Voters often have some knowledge about several health care systems, especially in Europe, and through the mass media many of the results of cross-country studies on health care costs and performances have become a common knowledge. Voters may thus have reasonably well-informed opinions about the pros and cons of different mechanisms in place. This implies that electoral outcomes will tend to reflect individual assessments of the narrow and broad interests.

Representing the collective decision-making through a quasi-constitutional framework where the preferences-votes of all individuals can be combined as into an

election allows us to infer under which circumstances certain mechanisms can be more likely adopted than others. In particular, it turns out that the distribution of income and morbidity across the society as well as the strength of social values and ideology can determine different majorities in favor of different mechanisms. As a consequence, both self-interest and ideology can play a role and different regimes of health care funding can simply be due to different majorities. That the mix of funding and service providing institutions can be adjusted year to year is evident in the data sets and statistical work, which shows that the mix of services varies through time in a manner consistent with the policy preferences of centrist voters.

6.2 Concluding Remarks

The dissertation focuses on the different mechanisms adopted to fund health care expenditures providing a rationale that may explain the main differences across countries.

The history of health care provision in Europe can be traced by three main steps. The invention of private insurance in the Middle Ages with the farmer and craftsmen guilds providing health insurance to their members represents the first step. The extension of health insurance on a vast scale credited to the German Chancellor Bismarck in 1883 in the form of mandatory conditions for several professional orders is the second step. Finally, the establishment of a National Health Service extending the provision of health care to the entire population free at the point of use occurred in the aftermath of World War II in Great Britain and other countries is the third step.

This dissertation suggests that these historical transitions reflect the combined

effects of political and economic forces. Special-groups interests, political ideology, or historical events like wars may all have played some role. A complete analysis of the factors behind the rise of different health systems and the use of different funding mechanisms across various countries is not developed in this dissertation or in the literature of public choice and political economy. The dissertation attempts to extend the existing research by developing a more complete election-based model that explains the political and economic process potentially leading to different health care systems. The model encompasses all mechanisms adopted in reality and keeps in account the possible effects on individuals-voters preferences produced by self-interested and altruistic factors.

The theory and evidence developed in this dissertation suggest that the reasons for the adoption of different combinations are related to different distributions of income and morbidity as well as different strengths of social values and ideologies. The adoption of private funding mechanisms, both health insurance and out-of-pocket payments, tend to be preferred in countries where income tends to be relatively higher but not equally distributed and at the same time morbidity tends to be relatively low. The adoption of tax-funded mechanisms like social insurance and a national health service tend instead to be preferred in countries where income is relatively lower but more equally distributed and morbidity tends to be higher. Furthermore, a stronger leftist ideology or pro-welfare social values can make the adoption of the mechanisms for the public provision of health care more likely than the adoption of private mechanisms.

These above are the main predictions of the models developed in Chapter 4.

These predictions are matched by most of the results of the empirical analysis on data conducted in Chapter 5, where data between 1970 and 2007 from 17 OECD countries were used to evaluate the predictions of the models. According to the estimates obtained from simple generalized squares tests, a 1 percent difference in per-capita income can lead to a smaller share of health expenditures covered by tax-funded mechanisms by 25 to 50 percent and can lead to a larger share of private coverage by 26 percent. On the other sides, higher morbidity as measured by different proxies can lead to a larger share of public spending by both mechanisms by 0.3 to 0.9 percent and a smaller share of private spending through both mechanisms ranging from 2 to 5 percent. Furthermore, the multinomial logit test shows that increases in the equality of income distribution and morbidity tend to increase the odds of adopting a national health service and lower the odds of adopting private insurance with respect to the odds of adopting social insurance. Similar effects are produced by leftward shifts in ideology and strengthening beliefs about social equality.

In conclusion, the dissertation provides a more general positive theory of the market for health care elaborating a model of collective decision-making for the choice over different mechanisms to fund health expenditures. It also undertakes a broad cross-country comparison of the effects and politics of alternative health care systems that can be used for future analysis.

APPENDIX

Table 5.29 - Correlations 1

	GOV-S	GINI	lnGDPpc	LE65F	LE65M	CANCD	RSSD
GOV-S	1.00						
GINI	-0.08	1.00					
lgdppc	-0.17	-0.04	1.00				
LE65F	-0.21	-0.20	0.78	1.00			
LE65M	-0.13	-0.14	0.83	0.95	1.00		
CANCD	0.22	0.23	-0.33	-0.39	-0.43	1.00	
RSSD	0.39	0.21	-0.51	-0.65	-0.61	0.53	1.00

Table 5.30 - Correlations 2

	SHI-S	GINI	lnGDPpc	LE65F	LE65M	CANCD	RSSD
SHI-S	1.00						
GINI	-0.37	1.00					
lgdppc	-0.15	0.07	1.00				
LE65F	0.04	-0.21	0.72	1.00			
LE65M	0.03	-0.14	0.83	0.95	1.00		
CANCD	-0.03	0.19	-0.18	-0.08	-0.22	1.00	
RSSD	-0.43	0.41	-0.29	-0.61	-0.56	0.39	1.00

Table 5.31 - Correlations 3

	PHI-S	GINI	lgdppc	LE65F	LE65M	CANCD	RSSD
PHI-S	1.00						
GINI	0.53	1.00					
lgdppc	0.35	0.14	1.00				
LE65F	0.19	-0.03	0.79	1.00			
LE65M	0.17	0.01	0.85	0.96	1.0000		
CANCD	-0.18	0.16	-0.33	-0.41	-0.4116	1.0000	
RSSD	-0.20	0.09	-0.53	-0.61	-0.5834	0.5422	1.0000

Table 5.32 - Correlations 4

	OFP-S	GINI	lgdppc	LE65F	LE65M	CANCD	RSSD
OFP-S	1.00						
GINI	0.29	1.00					
lgdppc	0.13	0.05	1.00				
LE65F	0.05	-0.12	0.74	1.00			
LE65M	0.01	-0.07	0.81	0.96	1.00		
CANCD	-0.16	0.23	-0.27	-0.34	-0.34	1.00	
RSSD	-0.15	0.20	-0.40	-0.60	-0.53	0.55	1.00

Derivative of equation (4.4) with respect to y

The (4.4) as expressed in Chapter 4 is the following:

$$(1-\pi_i)\, z\, (-\Delta_P \pi_i)\, (C_H)^{z-1} + \pi_i\, [z\, (1-\Delta_P \pi_i)\, (C_S)^{z-1} + a(H_P)^{a-1} - b(H-H_P)^{b-1}] = 0 \qquad (4.4)$$

Dividing left-hand-side and right-hand-side by πz and rearranging, the (4.4) can be rewritten as:

$$(1-\pi_i)\, \Delta_P\, (C_H)^{z-1} - (1-\pi_i \Delta_P)\, (C_S)^{z-1} = a/z\, (H_P)^{a-1} - b/z\, (H-H_P)^{b-1} \qquad (4.4.1)$$

Differentiating the (4.4.1) with respect to y yields:

$$A\, (H_P)^{a-2}\, \partial H_P/\partial y + B\, (H-H_P)^{b-2}\, \partial H_P/\partial y = \qquad (4.4.2)$$

$$= (1-\pi_i)\, \Delta_P\, (1-\pi_i\, \Delta_P\, \partial H_P/\partial y)\, (C_H)^{z-2} - (1-\pi_i \Delta_P)\, [1 + (1-\pi_i \Delta_P)\, \partial H_P/\partial y]\, (C_S)^{z-2}$$

Where $A \equiv a/z\ (1-a)/(1-z)$; and $B \equiv b/z\ (1-b)/(1-z)$. Rearranging the terms gives:

$$\{(1-\pi_i)\, \Delta_P\, (C_H)^{z-2} - (1-\pi_i \Delta_P)\, (C_S)^{z-2}\} = \{(1-\pi_i)\, (\Delta_P)^2\, \pi_i\, (C_H)^{z-2} + \qquad (4.4.3)$$

$$- (1-\pi_i \Delta_P)^2\, (C_s)^{z-2} + A\, (H_P)^{a-2} + B\, (H-H_P)^{b-2}\}\, \partial H_P/\partial y$$

Further rearranging the terms yields:

$$\partial H_P/\partial y = \frac{(1-\pi_i)\, \Delta_p\, (C_H)^{z-2} - (1-\pi_i \Delta_P)\, (C_S)^{z-2}}{\pi_i\, (1-\pi_i)(\Delta_P)^2 (C_H)^{z-2} - (1-\pi_i \Delta_P)^2 (C_S)^{z-2} + A(H_P)^{a-2} + B(H-H_P)^{b-2}}; \qquad (4.4.4)$$

Where $A \equiv a/z\ (1-a)/(1-z)$; and $B \equiv b/z\ (1-b)/(1-z)$. Considered that the consumption of health care is considerably smaller than the consumption of any other good and service, the terms $(H_P)^{a-2}$ and $[(H-H_P]^{a-2}$ dominate the terms $(C_H)^{z-2}$ and $(C_S)^{z-2.}$ The (4.4.4) can thus be approximated by the following expression:

$$\partial H_P/\partial y \approx \frac{(1-\pi_i)\ \Delta_P\ (C_H)^{z-2} - (1-\pi_i\Delta_P)\ (C_S)^{z-2}}{A\ (H_P)^{a-2} + B\ (H-H_P)^{\ b-2}}; \qquad (4.4.5)$$

The sign of the (4.4.5) is positive or $\partial H_P/\partial y > 0$ as long as the following expression is satisfied:

$$(C_S/C_H)^{z-2} < \Delta_P\,(1-\pi_i)/(1-\pi_i\Delta_P) \qquad (4.4.6)$$

If no distortion applies to the price of health insurance or $\Delta_p = 0$, the (4.4.6) is never satisfied. However, the OECD data about health expenditures in the United States between 1970 and 2007 makes this case unlikely. According to the OECD estimates about the consumption of private health insurance and private out-of-pocket payments for health care, the term C_S/C_H is about 0.96-0.97 – i.e., the level of consumption besides health care expenditures while healthy is about 3-4 percent higher than the corresponding level of consumption while sick. [1] Using OECD data on mortality rates for cancer, cerebrovascular diseases, and respiratory diseases as proxy for morbidity, the highest estimate for π ranges around 0.005. Taking $z = 0.05$, the (4.4.6) yields:

$$(1-0.005\Delta_p)\ (1.03)^{1.95} < \Delta_p\,(0.995) \qquad (4.4.7)$$

or also:

$$\Delta_p > 0.997 \qquad (4.4.8)$$

Which makes the result of the (4.4.6) pretty general. In fact, the (4.4.8) means that the distortionary effect of asymmetric information reduces rather than increases the price of private health insurance with respect to the fair price. Therefore, any more plausible distortionary effect that raises the price of health insurance or $\Delta_p > 1$ satisfies the (4.4.6) implying in turn that income rises tend to increase the purchase of private health insurance.

Derivative of equation (4.4) with respect to π

Equation (4.4) can be reformulated as in (4.4.1):

$$(1- \pi_i)\, \Delta_P\, (C_H)^{z-1} - (1-\pi_i\Delta_P)\, (C_S)^{z-1} = a/z\, (H_P)^{a-1} - b/z\, (H-H_P)^{b-1} \qquad (4.4.1)$$

Deriving the (4.4.1) with respect to π yields the following expression:

$$\Delta_p\, [(C_S)^{z-1} - (C_H)^{z-1}] + (1-\pi_i)\, \Delta_P\, (1-z)\, [\Delta_P H_P + \pi_i \Delta_P\, \partial H_P/\partial\pi]\, (C_H)^{z-2} + \qquad (4.4.8)$$

$$+ (1-\pi_i\Delta_P)\, (1-z)\, [(1-\pi_i\Delta_P)\, \partial H_P/\partial\pi - \Delta_P\, H_P\,]\, (C_S)^{z-2} =$$

$$= - a/z(1-a)\, (H_P)^{a-2}\, \partial H_P/\partial\pi - b/z\, (1-b)\, (H-H_P)^{b-2}\, \partial H_P/\partial\pi;$$

Rearranging the terms yields:

$$\partial H_p/\partial\pi = \frac{1/H_P\, [(C_H)^{z-1} - (C_S)^{z-1}] - [(1-\pi_i)\Delta_p(C_H)^{z-2} - (1-\pi_i\Delta_P)^{\,2}\, (C_S)^{z-2}\,]}{(1-\pi_i)\pi_i(\Delta_P)^2(C_H)^{z-2}+(1-\pi_i\Delta_P)^2(C_S)^{z-2}+\mathbf{A}\, (H_P)^{a-3}+\mathbf{B}\, (H-H_P)^{b-2}/H_P}; \qquad (4.4.9)$$

Where $\mathbf{A} \equiv a/z\ (1-a)/(1-z)\ 1/\Delta_P$; and $\mathbf{B} \equiv b/z\ (1-b)/(1-z)\ 1/\Delta_P$. The denominator of the (3.4.9) is positive. Therefore, the sign of $\partial H_P/\partial\pi$ is determined by the numerator. Considered that the purchase of health insurance is small relative to the consumption of other goods and services or (i.e.) $H_P/C_H << 1$ and $H_P/C_S << 1$, the (3.4.9) can be approximated by the following expression:

$$\partial H_P/\partial\pi \approx \frac{1/H_P\ [(C_H)^{z-1} - (C_S)^{z-1}]}{(1-\pi_i)\pi_i(\Delta_P)^2(C_H)^{z-2}+(1-\pi_i\Delta_P)^2(C_S)^{z-2}+\mathbf{A}\ (H_P)^{a-3}+\mathbf{B}\ (H-H_P)^{b-2}/H_P}\ ; \quad (4.4.10)$$

the sign of the numerator and thus the sign of the (4.4.10) is likely negative. This means that rising morbidity tends to decrease the purchase of private health insurance.

Derivative of (4.13) with respect to y

The equation (4.13) derived in Chapter 4 is the following:

$$-\ z\ (C_i)^{z-1}\ [\Delta_S\ \pi\ y_i/y - \Delta_P\ \pi_i] = a\ \pi_i\ (H-H_S)^{a-1} - b\ \pi_i\ (H_S)^{b-1} \qquad (4.13)$$

Deriving the (4.13) with respect to y yields:

$$A\ \pi_i\ (H-H_S)^{a-2}\ \partial H_S/\partial y + B\ \pi_i\ (H_S)^{b-2}\partial H_S/\partial y = \qquad (4.13.1)$$

$$= (C)^{z-2}\ [\Delta_P\pi_i - \Delta_S\pi\ y_i/y]\ (1-\Delta_S\pi\ 1/y\ H_S)$$

$$-\ \Delta_S\ \pi\ y_i/y\ \partial H_S/\partial y + \Delta_P\pi_i\ \partial H_S/\partial y] - 1/(1-z)\ \Delta_S\ \pi\ 1/y\ (C)^{z-1}$$

Where A and B are the terms indicated above – i.e., $A \equiv a/z\ (1-a)/(1-z)$; $B \equiv b/z\ (1-b)/(1-z)$. Rearranging the terms of (4.13.1) yields:

$$(C)^{z-2}\ [\Delta_P \pi_i - \Delta_S \pi\ y_i/y] - 1/(1-z)\ \Delta_S\ \pi\ 1/y\ (C)^{z-1} = \qquad (4.13.2)$$

$$= \{(C)^{z-2}\ [\pi_i \Delta_P - \Delta_S\ \pi\ y_i/y]^2 + A\ \pi_i\ (H-H_S)^{a-2} + B\ \pi_i\ (H_S)^{b-2}\}\ \partial H_S/\partial y$$

The (4.13.2) can be further rearranged as below:

$$[\Delta_P\ \pi_i - \Delta_S\ \pi\ y_i/y] - 1/(1-z)\ \Delta_S\ \pi\ 1/y\ (C) = \qquad (4.12.3)$$

$$= \{[\pi_i \Delta_P - \Delta_S \pi\ y_i/y]^2 + A\ \pi_i\ (C)^{2-z}\ (H-H_S)^{a-2} + B\ \pi_i\ (C)^{2-z}\ (H_S)^{b-2}\}\ \partial H_S/\partial y$$

From (4.12.3) it can be obtained the following expression:

$$\partial H_S/\partial y = \frac{\Delta_P\ \pi_i - \Delta_S\ \pi\ y_i/y - 1/(1-z)\ \Delta_S\ \pi\ 1/y\ (C)}{[\pi_i \Delta_P - \Delta_S \pi\ y_i/y]^2 + A\ \pi_i\ (C)^{2-z}\ (H-H_S)^{a-2} + B\ \pi_i\ (C)^{2-z}\ (H_S)^{b-2}}; \qquad (4.13.4)$$

The denominator of equation (4.13.4) is always positive; therefore, the sign of $\partial H_S/\partial y$ depends on the numerator only. The numerator is likely negative as the only positive term $\Delta_P\ \pi_i$ is likely smaller than the sum of the other two terms. Therefore, the sign of $\partial H_S/\partial y$ is likely negative in any case, implying that income rises tend to decrease the preferred level of social health insurance.

Derivative of equation (4.13) with respect to π

Equation (4.13) is the following:

$$-(C_i)^{z-1}\,[\Delta_S\pi\; y_i/y - \Delta_P\pi_i] = a/z\;\pi_i\,(H-H_S)^{a-1} - b/z\;\pi_i\,(H_S)^{b-1} \qquad (4.13)$$

Deriving the (3.13) with respect to π yields:

$$\{a/z\,(H-H_S)^{a-1} + a/z\,(1-a)\,(H-H_S)^{a-2} - b/z\,(H_S)^{b-1} + b/z\,(1-b)\,(H_S)^{b-2}\}\;\partial H_S/\partial\pi = \qquad (4.13.5)$$

$$= (1-z)\,(C)^{z-2}\,[\Delta_S\pi\; y_i/y - \Delta_P\pi_i]\;\Delta_P\pi_i\;\partial H_s/\partial\pi$$

$$-\Delta_S\pi\; y_i/y\;\partial H_S/\partial\pi - \Delta_P\,(H-H_s)] + (C)^{z-1}\;\Delta_P$$

Rearranging the terms of the (4.13.5) yields:

$$-(1-z)\,(C)^{z-2}\,[\Delta_S\pi\; y_i/y - \Delta_P\pi_i]\;\Delta_P\,(H-H_s) + \Delta_P\,(C)^{z-1} + \qquad (4.13.6)$$

$$-a/z\,(H-H_S)^{a-1} + b/z\,(H_S)^{b-1} = \{(1-z)\,(C)^{z-2}\,[\Delta_S\pi\; y_i/y - \Delta_P\pi_i]^2$$

$$+ a/z\,(1-a)\,(H-H_S)^{a-2} + b/z\,(1-b)\,(H_S)^{b-2}\}\;\partial H_S/\partial\pi$$

The (4.13.6) can be expressed as:

$$\partial H_S/\partial\pi = \frac{\Delta_P(C)^{z-1}[1-(1-z)(\Delta_S\pi\; y_i/y - \Delta_P\pi_i)\,(H-H_S)\,(1/C)] + b/z(H_S)^{b-1} - a/z\,(H-H_S)^{a-1}}{(1-z)\,(C)^{z-2}\,[\Delta_S\,\Pi\; y_i/Y - \Delta_P\;\pi_i]^2 + a/z\,(1-a)\,(H-H_S)^{a-2} + b/z\,(1-b)\,(H_S)^{b-2}} \qquad (4.13.7)$$

The denominator of the (4.13.7) is always positive. Therefore, the sign of the (4.13.7) depends on the numerator only. The numerator of (4.13.7) can be rearranged by using the (4.13) and so obtaining:

$$\partial H_S/\partial\pi = \frac{\Delta_P (C)^{z-1}\{1 - (1-z) [\Delta_S\pi\, y_i/y - \Delta_P\pi_i] (H-H_s) (1/C)\}}{(1-z)(C)^{z-2} [\Delta_S\pi\, y_i/y - \Delta_P\pi_i]^2 + a/z(1-a) (H-H_S)^{a-2} + b/z (1-b) (H_S)^{b-2}} + \quad (4.13.8)$$

$$+ \frac{(C_i)^{z-1} [\Delta_S\pi\, y_i/y - \Delta_P\, \pi_i]}{(1-z)(C)^{z-2} [\Delta_S\pi\, y_i/y - \Delta_P\pi_i]^2 + a/z(1-a) (H-H_S)^{a-2} + b/z (1-b) (H_S)^{b-2}};$$

The (4.13.8) can in turn be approximated by:

$$\partial H_S/\partial\pi \approx \frac{(C_i)^{z-1} [\Delta_S\, \Pi\, y_i/Y + \Delta_P (1-\pi_i)]}{(1-z)(C)^{z-2} [\Delta_S\pi\, y_i/y - \Delta_P\pi_i]^2 + a/z(1-a) (H-H_S)^{a-2} + b/z (1-b) (H_S)^{b-2}}; \quad (4.13.9)$$

The sign of the (4.13.9) is always positive. This means that morbidity increases always tend to produce an increase in the preferred level of social insurance H_S.

Derivative of equations (4.20-4.21) with respect to y

Equations (4.20) and (4.21) are the following ones:

$$z\,(C_i)^{z-1} [\Delta_P\pi_i - \Delta_S\,\pi\, y_i/y] = a\,\pi_i\,(H-H_S-H_G)^{a-1} - b\,\pi_i\,(H_S)^{b-1} \quad (4.20)$$

$$z\,(C_i)^{z-1} [\Delta_P\pi_i - \Delta_G\,\pi\, y_i/y] = a\,\pi_i\,(H-H_S-H_G)^{a-1} - c\,\pi_i\,(H_G)^{c-1} \quad (4.21)$$

Deriving (4.20) and (4.21) with respect to y yields:

$$- z\,(C_i)^{z-1}\,[\Delta s\pi\ 1/y] - z(1-z)\,[\Delta_P\pi_i - \Delta s\pi\ y_i/y]\,(C_i)^{z-2}[(1-\Delta_S H_S + \tag{4.20.1}$$

$$- \Delta_G H_G)\ \Pi\ 1/Y - \Delta_S\,\pi\ y_i/y\ \partial H_S/\partial y + \Delta_P\pi_i\,\partial H_S/\partial y] =$$

$$= a(1-a)\,\pi\,(H-Hs-H_G)^{a-2}\,\partial H_s/\partial y + b(1-b)\,\pi\,(Hs)^{b-2}\,\partial H_S/\partial y;$$

$$- z\,(C_i)^{z-1}\,[\Delta_G\,\pi\ 1/y] - z(1-z)\,[\Delta_P\,\pi_i - \Delta_G\pi\ y_i/y]\,(C_i)^{z-2}[(1-\Delta_S H_S + \tag{4.21.1}$$

$$-\Delta_G H_G)\ \Pi\ 1/Y - \Delta_G\,\pi\ y_i/y\ \partial H_G/\partial y + \Delta_P\ \pi_i\,\partial H_G/\partial y] =$$

$$= a(1-a)\,\pi\,(H-Hs-H_G)^{a-2}\,\partial H_G/\partial y + c(1-c)\,\pi\,(H_G)^{c-2}\,\partial H_G/\partial y;$$

Rearranging the terms yields:

$$- z\,[\Delta s\ \pi\ 1/y]\,(C_i)^{z-1} - z(1-z)\,[\Delta_P\pi_i - \Delta s\pi\ y_i/y]\,[1 - \Delta_S H_S + \tag{4.20.2}$$

$$\Delta_g H_g]\ \Pi\ 1/Y\,(C_i)^{z-2} = \{[\Delta_P\pi_i - \Delta s\pi\ y_i/y]^2\ z(1-z)\,(C_i)^{z-2}\ +$$

$$+ a(1-a)\,\pi\,(H-Hs-H_G)^{a-2} + b(1-b)\,\pi\,(Hs)^{b-2}\}\partial H_S/\partial y;$$

$$- z\,[\Delta_G\pi\ 1/y]\,(C_i)^{z-1} - z(1-z)\,[\Delta_P\pi_i - \Delta_G\pi\ y_i/y]\,[1-\Delta_S H_S + \tag{4.21.2}$$

$$\Delta_g H_g]\ \Pi\ 1/Y\,(C_i)^{z-2} = \{[\Delta_P\pi_i - \Delta_G\pi\ y_i/y]^2\ z(1-z)\,(C_i)^{z-2}\ +$$

$$+ a(1-a)\,\pi\,(H-Hs-H_G)^{a-2} + c(1-c)\,\pi\,(H_G)^{c-2}\}\partial H_G\,/\partial y;$$

Therefore, the derivative of the optimal level of social insurance, H_S, and government provision, H_G, can respectively be obtained as:

$$\partial H_S/\partial y = \frac{-\Delta_S \pi\, 1/y\, (C_i)^{z-1} - [\Delta_P\pi_i - \Delta_S\pi\, y_i/y]\,[1-\Delta_S H_S-\Delta_G H_G]\,\pi\, 1/y\, (C_i)^{z-2}}{[\Delta_P\pi_i-\Delta_S\pi\, y_i/y]^2\, (C_i)^{z-2} + A\pi\, (H-H_S-H_G)^{a-2} + B(H_S)^{b-2}}; \quad (4.20.3)$$

$$\partial H_G/\partial y = \frac{-\Delta_G \pi\, 1/y\, (C_i)^{z-1} - [\Delta_P\pi_i - \Delta_G\, \pi\, y_i/y]\,[1-\Delta_S H_S-\Delta_G H_G]\,\pi\, 1/y\, (C_i)^{z-2}}{[\Delta_P\pi_i - \Delta_G\pi\, y_i/y]^2\, (C_i)^{z-2}+A\pi\, (H-H_S-H_G)^{a-2}+\Lambda\pi\, (H_G)^{c-2}}; \quad (4.21.3)$$

Where $\Lambda \equiv c/z\ (1-c)/(1-z)$. The sign of the numerator is positive for both (4.20.3) and (4.21.3). Therefore, the sign is determined by the numerator in both cases. Considered that 1/C in the first term of the numerator is one order lower than the 1/C in the second term, the expressions can be approximated by the following ones:

$$\partial H_S/\partial y \approx \frac{-(C_i)^{z-1}\,\Delta_S\,\pi\, 1/y}{[\Delta_P\,\pi_i - \Delta_S\,\pi\, y_i/y]^2\, (C_i)^{z-2} + A\pi\, (H-H_S-H_G)^{a-2} + B\pi\, (H_S)^{b-2}}; \quad (4.20.4)$$

$$\partial H_G/\partial y \approx \frac{-(C_i)^{z-1}\,\Delta_G\,\pi\, 1/y}{[\Delta_P\pi_i - \Delta_G\pi\, y_i/y]^2\, (C_i)^{z-2} + A\,\pi\, (H-H_S-H_G)^{a-2} + \Lambda\pi\, (H_G)^{c-2}}; \quad (4.21.4)$$

Therefore, the sign of (4.20.4) and (4.21.4) is always negative. This implies that income-rises tend to lower the preferred level of health care provision through both social insurance, H_S, and government direct expenditures, H_G.

Derivative of equations (4.20-4.21) with respect to π

The derivative of equation (4.20) with respect to π is the following:

$$-(C_i)^{z-2}(\Delta_P\pi_i - \Delta_S\pi\, y_i/y)[(\Delta_P\pi_i - \Delta_S\pi\, y_i/y)\,\partial H_S/\partial\pi - \Delta_P(H-H_S-H_G)] + \quad (4.20.5)$$

$$+ 1/(1-z)\,\Delta_P(C_i)^{z-1} = 1/z\;1/(1-z)\{a(H-H_S-H_G)^{a-1} - b(H_S)^{b-1}\} +$$

$$+ A\,\pi_i(H-H_S-H_G)^{a-2}\,\partial H_S/\partial\pi + B\,\pi_i(H_S)^{b-2}\,\partial H_S/\partial\pi;$$

Rearranging the terms yields:

$$(C_i)^{z-2}(\Delta_P\pi_i - \Delta_S\pi\, y_i/y)\,\Delta_P(H-H_S-H_G) + \quad (4.20.6)$$

$$+ 1/(1-z)\,\Delta_P(C_i)^{z-1} - 1/z\;1/(1-z)\{a(H-H_S-H_G)^{a-1} - b(H_S)^{b-1}\} =$$

$$= [A\,\pi_i(H-H_S-H_G)^{a-2} + B\,\pi_i(H_S)^{b-2} + (C_i)^{z-2}(\Delta_P\pi_i - \Delta_S\pi\, y_i/y)^2]\,\partial H_S/\partial\pi;$$

Or also:

$$\partial H_S/\partial\pi = \frac{\Delta_P(C_i)^{z-2}(\Delta_P\pi_i - \Delta_S\pi\, y_i/y)(H-H_S-H_G) +}{A\,\pi_i(H-H_S-H_G)^{a-2} + B\,\pi_i(H_S)^{b-2} + (C_i)^{z-2}(\Delta_P\pi_i - \Delta_S\pi\, y_i/y)^2} +$$

$$+ \frac{(1-z)^{-1}[\Delta_P(C_i)^{z-1} - 1/z[a(H-H_S-H_G)^{a-1} - b(H_S)^{b-1}]}{A\,\pi_i(H-H_S-H_G)^{a-2} + B\,\pi_i(H_S)^{b-2} + (C_i)^{z-2}(\Delta_P\pi_i - \Delta_S\pi\, y_i/y)^2}; \quad (4.30.7)$$

Using the (4.20.5) the (4.20.7) can be reformulated as below:

$$\partial H_S/\partial\pi = \frac{\Delta_P/(1-z)\,(C_i)^{z-1} + (C_i)^{z-2}\,\Delta_P\,(H-H_S-H_G)\,[\Delta_P\pi_i - \Delta_S\,\pi\,y_i/y]}{(C_i)^{z-2}\,[\Delta_P\pi_i - \Delta_S\pi\,y_i/y]^2 + A\pi_i\,(H-H_S-H_G)^{a-2} + B\pi_i\,(H_S)^{b-2}} +$$

$$+ \frac{\pi_i/(1-z)\,(C)^{z-1}[\Delta_P\pi_i - \Delta_S\pi\,y_i/y]}{(C_i)^{z-2}\,[\Delta_P\pi_i - \Delta_S\pi\,y_i/y]^2 + A\pi_i\,(H-H_S-H_G)^{a-2} + B\pi_i\,(H_S)^{b-2}}; \quad (4.20.8)$$

Considered that the term multiplying $(1/C)^{2-z}$ in the numerator is smaller than the other terms, the (4.20.8) can be approximated by the following expression:

$$\partial H_S/\partial\pi = \frac{1/z\;1/(1-z)\,(C_i)^{z-1}\,[z\,\Delta_P - \Delta_S\,\pi\,y_i/y]}{(C_i)^{z-2}\,[\Delta_P\pi_i - \Delta_S\pi\,y_i/y]^2 + A\pi_i\,(H-H_S-H_G)^{a-2} + B\pi_i\,(H_S)^{b-2}\}}; \quad (4.20.9)$$

The denominator of the (4.20.8) is always positive. The numerator is positive as long as the following condition holds true:

$$z\,\Delta_P\,/\Delta_S > y_i/y\;\;\pi \qquad (4.20.9)$$

The (4.20.9) is likely to hold for individuals characterized by income below the average – i.e., $y_i/y < 1$. Therefore, for individuals with income below average, the effect of a morbidity-rise is that of increasing the preferred level of social health insurance while the effect may be opposite for individuals characterized by income sufficiently higher than the average level. An increase in the average level of morbidity, π, also contributes to make more likely the (4.20.9) to hold – i.e., the spectrum of income levels satisfying the (4.20.9) gets larger. The derivative of H_G can be obtained from similar steps and similar considerations apply for the effect of morbidity-rises on the preferred level of H_G*. The derivative is equal to:

$$\partial H_S/\partial \pi = \frac{1/z\ 1/(1-z)\ (C_i)^{z-1}\ [z\ \Delta_P - \Delta_G\ \pi\ y_i/Y]}{(C_i)^{z-2}\ [\Delta_P \pi_i - \Delta_G \pi\ y_i/y]^2 + A\pi_i\ (H-H_S-H_G)^{a-2} + \Lambda \pi_i\ (H_G)^{b-2}\}}; \quad (4.21.9)$$

NOTES

Notes from Chapter 3

[1] Varian, Hal (1992) *Microeconomic Analysis, 3rd Ed.* New York: W.W. Norton & Co.

[2] Mas-Colell, Andreu, Michael D. Whinston and Jerry R. Green (1995) *Microeconomic Theory*. Oxford University Press.

[3] Neumann, John von and Oskar Morgenstern *Theory of Games and Economic Behavior*, Princeton, NJ, Princeton University Press, 1944, 2nd ed. 1947, 3rd ed. 1953.

[4] If π varies across individuals, the price in (3.18) will be given by a weighted average of the quantities of insurance and risk levels.

[5] Akerlof, George (1970) "The Market for "Lemons": Quality Uncertainty and the Market Mechanism," *The Quarterly Journal of Economics 84*(3): 488-500.

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Notes from Chapter 4

[1] Social funds or "sickness funds" are usually competing health insurance autonomous, not-for-profit, non-governmental bodies regulated by law..

[2] See Roger D. Congleton (2003) "The Median Voter Model," *The Encyclopedia of Public Choice*, Part 2, 707-712.

[3] Busse, Reinhard and Annette Riesberg, "Healthcare Systems in Transition:

Germany" (2000), European Observatory on Healthcare Systems; see also Holborn, Hajo (1969) *A History of Modern Germany — 1840–1945*, Princeton University Press: pp. 291-93.

[4] Results of the 1945 political elections in United Kingdom can be found online here: http://en.wikipedia.org/wiki/United_Kingdom_general_election,_1945 and here: http://www.election.demon.co.uk/geresults.htm.

[5] Abel-Smith, B. (1992) "The Beveridge Report: Its Origins and Outcomes" *International Social Security Review 45*: 5–16; The first 20 pages of the Beveridge Report is available on line at news.bbc.co.uk/2/shared/bsp/hi/pdfs/19_07_05_beveridge.pdf

[6] Database of Elections in Italy, Italian Ministry for Internal Affairs (http://elezionistorico.interno.it)

[7] Varian, Hal (1995) *Microeconomic Analysis, 3rd Ed.* New York: W.W. Norton Inc.; Mas-Colell, Andreu, Michael D. Whinston, and Jerry R. Green (1995) *Microeconomic Theory*, Oxford University Press.

[8] See Akerlof, George (1970) "The Market for Lemons: Qualitative Uncertainty and the Market Mechanism," *Quarterly Journal of Economics 74:* 494; Arrow, Kenneth (1963) "Uncertainty and the Welfare Economics of Health Care," *American Economic Review 53*(5): 941-973; and Rothschild, Michael and Joseph Stiglitz (1976) "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information," *The Quarterly Journal of Economics 90(*4*):* 629-649.

[9] See Brown, Jeffrey R. (2001) "Private Pensions, Mortality Risk, and the Decision to Annuitize," *Journal of Public Economics 82*(1): 29-62; Hubbard, R. Glenn, Jonathan Skinner and Stephen P. Zeldes (1995) "Precautionary Saving and Social Insurance," *The Journal of Political Economy 103*(2): 360-399; and Anderson, Fredrik and Carl H. Lyttkens (1999) "Preferences for Equity in Health Behind a Veil of Ignorance," *Health Economics and Econometrics 8*: 369-378.

[10] That $0 > a,b,c > 1$ is a standard assumption implying that the marginal utility in consumption rises at a constant decreasing rate or that individuals tend to be risk-averse under condition of uncertainty.

[11] In reality, the non-profit social funds providing health insurance can be hundreds like in Germany or Austria or they can be a few, like in France – see European Observatory on Health Systems and Policies -- www.euro.who.int/en/home/projects/observatory/publications/health-system-profiles-hits.

[12] International Monetary Fund, 2010, "Macro-Fiscal Implications of Healthcare Reform in Advanced and Emerging Economies," IMF Departmental Paper No. 1228/10 (Washington) -- www.imf.org/external/np/pp/eng/2010/122810.pdf

[1] Chapter 3 develops a rationale for the adoption of different health funding mechanisms across different countries based on the Median Voter Theorem: If the mechanisms are part of political platforms ranked on a 1-dimension scale, the political competition can make them converge towards the platform matching the preferences of the median voter.

[2] International Monetary Fund (2010) "Macro-Fiscal Implications of Health Care Reform in Advanced and Emerging Economies," IMF Departmental Paper No. 1228/10 (Washington) -- www.imf.org/external/np/pp/eng/2010/122810.pdf.

[3] The Gini coefficient is a measure of the inequality of a distribution, a value of 0 expressing total equality and a value of 1 maximal inequality, and is commonly adopted to measure the inequality of income distribution. See Gini, C. (1936) "On the Measure of Concentration with Special Reference to Income and Statistics," Colorado College Publication, General Series No. 208, 73-79.

[4] The Merriam-Webster dictionary defines the morbidity rate as "the relative incidence of a disease;" incidence is in turn the number of new detected cases of disease within a given time-horizon, usually expressed in number of new cases per 100,000 people; same definition is provided by the World Health Organization, Regional Office for Europe Database (http://data.euro.who.int/hfadb/)

[5] The Kim-Fording Right-Left index is based on the left-right ideology of the political parties running in one election and the share of votes that each received; namely, it provides an estimate on a right-left scale of the median voter's ideology based on a 0-100 scale where larger values are used to indicate greater support for leftist ideologies. The left parties are considered to be traditionally pro- welfare and thus pro-increasing socialization of health expenditure. The countries covered in the Kim-Fording dataset are: Australia; Austria; Belgium; Canada; Denmark; Finland; France; Greece; Germany; Iceland; Ireland; Israel; Italy; Japan; Luxembourg; Netherlands; New Zealand; Norway; Portugal; Spain; Sweden; Switzerland; Turkey; United Kingdom; and United States. Specific references for the Kim-Fording index are: HeeMin Kim and Richard C. Fording (1998) "Voter Ideology in Western Democracies, 1946-1989," *European Journal of Political Research 33*:73-97; and HeeMin Kim and Richard C. Fording (2003) "Voter Ideology in Western Democracies: An Update."*European Journal of Political Research 42*: 95-105.

[6] On the possible causes of cancer see Danaei, Goodarz, Stephen Vander Hoorn, Alan D. Lopez, Christopher J. L. Murray, and Majid Ezzati (2005) "Causes of Cancer in the World: Comparative Risk Assessment of Nine Behavioural and Environmental Risk Factors," *Lancet 366*: 1784-93; and Clapp, Richard W., Molly M. Jacobs, and Edward L. Loechler (2008) "Environmental and Occupational Causes of Cancer New Evidence, 2005–2007," *Review of Environment Health 23*(1): 1-37.

[7] The OECD on-line data set is available at stats.oecd.org; the UNU-WIDER World Income Inequality Dataset is available at wider.unu.edu/research/Database/en_GB/database; the Kim-Fording dataset is available at mailer.fsu.edu/~hkim/dataset.htm; the Comparative Welfare States Dataset is available at www.lisproject.org/publications/welfaredata/welfareaccess.htm; and the World Values Survey is available at www.worldvaluessurvey.org.

[8] The data sources for the WIID2 are: (i) WIID1; (ii) Deininger, K. and Squire, L. (2004), Unpublished data provided by World Bank based on unit record data, (iii) the unit record data of the Luxembourg Income Study (LIS), and (iv) the Transmonee data by UNICEF/ICDC, Central Statistical Offices – see www.wider.unu.edu/research/Database/en_GB/database.

[9] According to the OECD/WHO data, the components of public spending for the United States cover about two fifths of the total expenditure on health care; precisely, the average share of health expenditures incurred by central, states/regional and local government authorities excluding social security schemes is of 25.3 percent while the average share covered by social security schemes is of 12.2 percent (the former includes Non-market, non-profit institutions that are controlled and mainly financed by government units).

[10] Summing the value of the coefficients singularly estimated for female and male may provide a rough estimate of the combined effect of changes in life expectancy. This is possible because on average about 48 percent of the population of the considered OECD countries is made of men and about 52 percent is made of women (see OECD at stats.oecd.org.

[11] Sanz, Ismael and Francisco J. Velázquez (2007) "The Role of Ageing in the Growth of Government and Social Welfare Spending in the OECD," *European Journal of Political Economy 23*: 917-931.

Notes from Appendix

[1] The estimate of $C_h/C_s = 1.03\text{-}1.04$ is obtained from the average level of total health expenditures in the United States over the period 2000-7, which is about 15 percent of GDP, and from the share of health expenditures covered by out-of-pocket payments, which is about 3 percent of GDP, and the share of private health expenditures that ranges around 4.5-5.3 percent of GDP. The terms Ch and Cs are respectively obtained by subtracting from the GDP the shares going to cover health expenditures through one and both mechanisms. – i.e., $C_h \approx 96\text{-}98$ percent of GDP; and $C_s \approx 92.5\text{-}95$ percent of GDP.

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