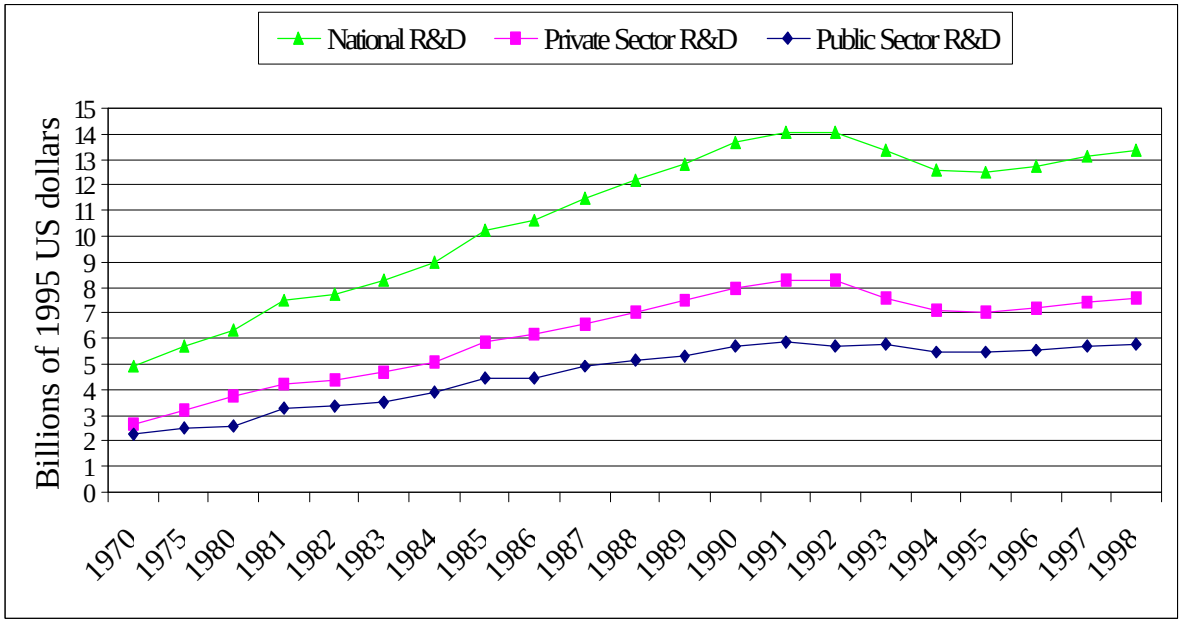
THE ITALIAN NATIONAL SCIENCE AND TECHNOLOGY EFFORT

The Italian government funded 43% of the national R&D effort in 1998 and this proportion of the total funding has remained stable over the last 25 years. As Figure 1 shows, the Italian government spent $5.8 billion on R&D in 1998, while corporations spent $7.6 billion on R&D for a total R&D effort of $13.3 billion.

Figure 1: Italian National S&T Effort 1985-1998[i]



The total Italian national R&D effort grew steadily from the end of World War II until the 1990s. The early 1990s, however, saw a significant decline in R&D spending in both the public and private sectors. Public funding for R&D fell by 6.1% from 1991 to 1995.[ii] At the same time, many private firms cut their research budgets because of sluggish economic performance and/or increased competition within the larger European market. Throughout most of the 1990s, R&D spending levels have seen slower growth than GDP. The Italian government is concerned that Italy is losing ground in this area compared with other industrialized countries.[iii] National R&D spending levels have recovered somewhat since 1995, but are still below their 1991 peak.[iv] Energy R&D, however, has seen a much greater drop in funding than most other research areas.

The Italian government funds a relatively large portion of the R&D conducted by Italian corporations (12.2% in 1995), particularly for technologies that would benefit small and medium-sized enterprises. The government's share of these expenditures has been dropping since 1985, but Italy is still one of the top ten countries globally providing public funding for such expenditures.[v]

Corporate R&D is concentrated in large companies, particularly in very large industrial groups. Only 9% of companies carry out 80% of corporate research.[vi] This is in part because a large portion of Italy's private sector is in the hands of small, family-owned enterprises. Such firms also dominate the portion of the private sector experiencing considerable growth. These firms rarely fund major innovative technological research, which limits the potential growth of private-sector R&D in the near to medium term. Most of the growth in R&D expenditures from the late 1960s until the early 1990s was in spending by state-owned firms. Many of these firms have now been privatized, which may have long-term implications for growth of R&D in Italy.[vii]

The following points describe several other key R&D trends in Italy:

- While Italy has relatively strong programs in government-funded basic research and, to a lesser degree, in physics and pharmaceuticals, overall its science and technology effort lacks strong specialization. Italy tends to invest in R&D in numerous sectors without concentrating its effort in priority sectors or sectors in which it excels.[viii]
- Italy does not tend to rank highly in most research impact indicators compared to other EU countries. For example, it generally ranks average on indices of bibliometric impact.[ix]
- Corporate R&D activity is most intense in the chemical, pharmaceutical, telecommunications and automobile industries.[x]
- Italian R&D is heavily concentrated in a few regions, particularly Lombardy, Piedmont and Lazio. The former two regions see the greatest share of corporate research, while Lazio, where Rome is located, sees the largest share of government-sponsored research. The Italian government is trying to increase its R&D spending in Southern Italy as part of its economic development campaign there.

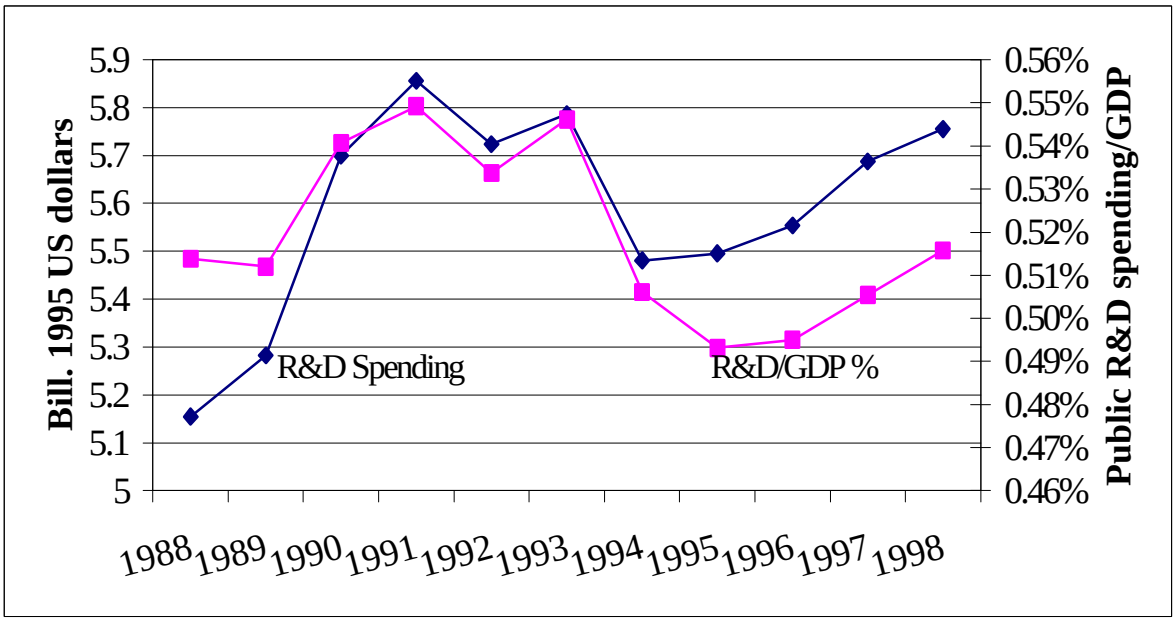
Trends in Public Sector Support for R&D

The Italian government's R&D expenditures have declined since the early 1990s both in real terms and as a percentage of GDP, as seen below in Figure 2. Public R&D spending as a percentage of GDP reached its lowest point in 1995 and 1996 at 0.49%.

Italian R&D expenditures, both public and private, are again rising in real terms. Nonetheless, Italy has not yet again reached its 1990 levels for total R&D spending. For example, total R&D spending in real terms was $14.1 million in 1991, while in 1997 and 1998 it was only $13.1 and $13.3 million, respectively.[xi]

The decline of the early and mid 1990s was a result of several factors, including decreasing tax revenue due to the economic recession; pressure to reduce taxes, particularly from Northern Italian politicians; Italy's need to reduce its budget deficit to qualify for the Euro; and public spending cuts in response to the "Clean Hands" anti-corruption campaign. The Italian government has expressed growing concern about Italy's need to increase R&D expenditures to help its economy remain competitive internationally. In the government's budget plan for 2000-2003, improving education and R&D systems is listed as the number one strategic objective of the government's fiscal policy for development and jobs. One of the government's main research goals is to increase public funding for R&D conducted in corporations.[xii]

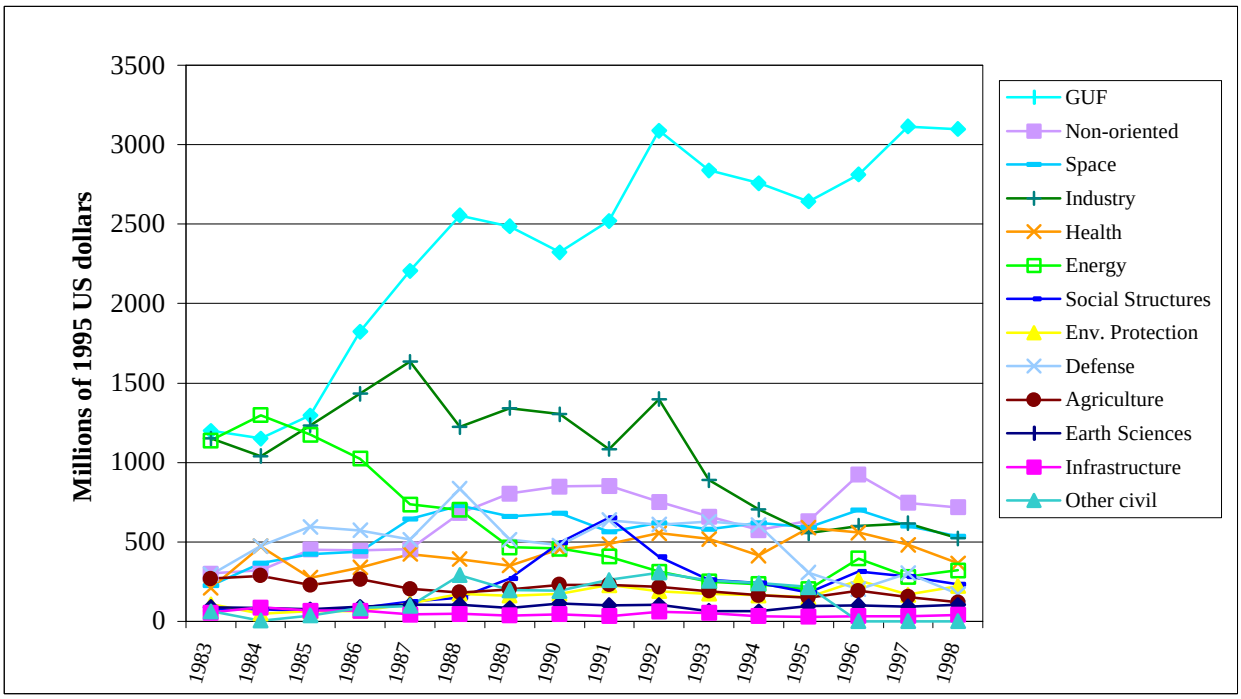
Figure 2: Italian Public Administration Support for S&T: 1985-1996[xiii]



The Italian government has committed specifically to increasing its R&D expenditures in certain areas, such as public health, space and climate change mitigation technologies. As Figure 3 describes, public health R&D spending has gone up, but R&D expenditures for space have remained level. Energy R&D has declined overall, although the Italian government may soon refocus its remaining energy R&D portfolio to concentrate on the technologies it feels have the most commercial promise. Italy has also recently included several renewable energy technologies in its National Research Plans. Specifically, Italy has launched National Research Plans for photovoltaics, solar storage and biomass. National Research Plans receive special funding, generally from the National Research Council. These plans are used to concentrate resources and provide better coordination in key technological areas.

Figure 3 also shows that the majority of the Italian government's support for R&D is for General University Funds (GUF). These funds are large block grants distributed to universities and other state-sponsored research institutions for research activities and capital expenditures. Thus, it is difficult to know what specific areas of research or what broad socio-economic areas are supported with GUF.

Figure 3: Major Socioeconomic Areas of Italian Governmental S&T Support[xiv,1]



[1] The data in this chart are based on the State Budget information. The numbers contain budget authorization numbers, as opposed to actual expenditures. This chart also includes amounts transferred directly from the state budget to state companies for R&D. Therefore, the data in this chart will vary somewhat from the government and public sector R&D expenditures given elsewhere in this report.

R&D Policy Goals

The Italian government has several stated goals driving its R&D funding decisions. These goals include international economic competitiveness, environmental protection, job creation, and European integration. Regarding international competitiveness, the Italian government focuses its attention on two areas in particular. The first is publicly funded R&D for private companies, particularly small and medium-sized companies. The Italian National Research Council begins its 1998 annual report by stating, "Italy's research is neglected. If there were a Maastricht[2] exclusively of research, Italy could not be part of Europe… Unable to compete, Italy will miss the opportunity to reap the benefits of Europe in terms of wealth and jobs."[xv] Italy's economic growth in recent years has been driven by small, often family-owned companies concentrated in the north.[xvi] These companies are usually too small to fund R&D themselves, but the government believes they could benefit from technological advances when competing on the European market. This is one of the reasons that Italian government funding of R&D performed in the private sector is high compared to other countries.[xvii] The second area of focus is R&D and technology transfer in the south, or Mezzogiorno. The Mezzogiorno is economically depressed compared with the rest of Italy and the European Union; the Italian government is trying to improve the economic situation there by sponsoring technological innovation projects and centers.[xviii]

Trends in Private Sector Support for R&D

Italian companies funded $7.6 billion (14.0 trillion lire) of Italian R&D in 1998. This number has been growing steadily since 1995, and, in fact, companies now spend more on R&D than they did in 1990. The industrial sectors that funded the largest portion of R&D in 1997 are electric and electronic machine manufacturing, including turbines (24.3% of total corporate R&D spending), automobile manufacturing (15.6%), chemicals (14.1%) and other transportation means (13.5%). Research by electricity companies accounted for only 3.4% of total corporate R&D in 1997.[xix]

The key driver behind overall Italian economic growth has been small, family-owned companies, particularly in the North.[xx] These companies are able to adapt quickly and flexibly to new market conditions, and they account for a growing share of Italian exports. However, these firms are not as likely as larger firms to invest in R&D or even in major innovations within their own facilities. The bulk of Italian private sector R&D, thus, comes from large multinational companies such as FIAT (automobiles) and ENI (energy).

A significant share of Italian corporations is state owned, and, traditionally, many of the largest companies have been state owned. The share of state ownership in the economy, however, has been declining as the government privatizes its holdings in companies like ENEL and ENI. As companies privatize, their priorities change. On the one hand, they feel a greater need to compete with state-of-the-art technology and products, yet they have increased pressure from shareholders to cut costs. It is still too early to assess the long-term impact of privatization on Italian R&D investment.

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[2] The Maastricht Treaty, concluded in 1992, cleared the way for closer European integration and aims "to promote economic and social progress which is balanced and sustainable, in particular through the creation of an area without internal frontiers, through the strengthening of economic and social cohesion and through the establishment of economic and monetary union, ultimately including a single currency in accordance with the provisions of this Treaty." The Maastricht Treaty also laid the foundation for the creation of a single European currency and a common foreign and defense policy among Member States. For those countries participating in Economic and Monetary Union, Maastricht sets strict macroeconomic guidelines regarding price stability, debt-to-GDP ratios, and currency fluctuations.

As Table 1 shows, state-owned firms, many of which have been privatized in recent years, funded the majority of their research with their own earnings in 1990, although a larger share of their R&D is funded by the government than in the case of private firms. This tradition of funding R&D internally should make it easier for firms to continue financing R&D even after privatization.

Table 1: Corporate R&D Expenditures by Source of Funds, 1990[xxi]

Funding Source	**Private Firms**	**State-Owned Firms**
Total Expenditures (million 1995 US$)	5.24	2.73
Own Funds	77.9%	61.8%
Government	4.3%	15.4%
Public Institutions	11.2%	11.3%
Abroad	5.8%	10.1%
Public Firms	0.8%	
Private Firms		1.4%

Italy keeps very detailed statistics on corporate R&D spending and recently has begun polling the most innovative of these companies on their opinions about environmental technologies. Of the most innovative firms in Italy, 57% of them feel that recent innovations to reduce atmospheric pollution are irrelevant in terms of their effect on reducing emissions. Large firms and energy-related firms have a greater than average tendency to feel that environmental technologies are beneficial, but still almost half of energy-related firms felt technologies to reduce air pollution were not important. Likewise, innovative Italian firms rank both energy efficiency and environmental protection very low among their objectives for innovation.[xxii,3]

[3] ISTAT determined whether firms were innovative or not based on the firms' responses to a questionnaire, and, in particular, whether they stated that they introduced innovative technologies in the time period under study.

[i] Ministero delle Universita' e della Ricerca Scientifica (MURST). *Il quadro della ricerca pubblica in Italia.* http://www.murst.it/Ricerca/Quadro; *Scienza e tecnologia in cifre.* Consiglio nazionale delle ricerche, Istituto di studi sulla ricerca e documentazione scientifica at http://www.isrds.rm.cnr.it; *Statistiche sulla ricerca e sviluppo in Italia.* ISTAT. Rome, forthcoming, table 1.1.
[ii] Ministero delle Universita' e della Ricerca Scientifica (MURST). *Il quadro della ricerca pubblica in Italia.* http://www.murst.it/Ricerca/Quadro; *Scienza e tecnologia in cifre.* Consiglio nazionale delle ricerche. Istituto di studi sulla ricerca e documentazione scientifica. At http://www.isrds.rm.cnr.it; *Statistiche sulla ricerca e sviluppo in Italia.* ISTAT. Rome, forthcoming, table 1.1.
[iii] *Statistiche sulla ricerca scientifica e l'innovazione tecnologica.* ISTAT. Rome, 1998, pp. 19-22.
[iv] *Statistiche sulla ricerca e sviluppo in Italia*. ISTAT. Rome, forthcoming, table 1.1; *Ricerca e sviluppo in Italia nel periodo 1995-97*. ISTAT at http://www.istat.it/Anotizie/Aaltrein/statinbrev/inficerca.html/; *La Ricerca e Sviluppo in Italia nel periodo 1996-98*. ISTAT. 25 February 1999 at http://istat.it/Anotizie/Aaltrein/statinbrev/RiceSvil.html/.
[v] *Second European Report on S&T Indicators 1997*. European Commission, DG XII. Brussels, Belgium, 1997, p. 55.
[vi] *Statistiche sulla ricerca scientifica e l'innovazione tecnologica.* ISTAT. Rome, 1998, p. 24.
[vii] *Science and Technology Statistics, Italy*. Institute for Studies on Scientific Research and Documentation. Rome, 1990, p. 18.
[viii] *Second European Report on S&T Indicators 1997*. European Commission, DG XII. Brussels, Belgium, 1997, pp. 45, 258-9.
[ix] *Second European Report on S&T Indicators 1997*. European Commission, DG XII. Brussels, Belgium, 1997, p. 256-7, 259.
[x] *Ricerca e sviluppo in Italia nel periodo 1995-97.* ISTAT, at http://www.istat.it/Anotizie/Aaltrein/statinbrev/inficerca.html/.
[xi] *Statistiche sulla ricerca e sviluppo in Italia*. ISTAT. Rome, forthcoming, table 1.1; *Ricerca e sviluppo in Italia nel periodo 1995-97.* ISTAT, at http://www.istat.it/Anotizie/Aaltrein/statinbrev/inficerca.html/; *La Ricerca e Sviluppo in Italia nel periodo 1996-98.* ISTAT. 25 February 1999 at http://istat.it/Anotizie/Aaltrein/statinbrev/RiceSvil.html/.
[xii] *Documento di Programmazione Economic-Finanziaria per gli Anni 2000-2003.* Ministero del tesoro, del bilancio e della programmazione economica, e Ministero delle finanze. June 1999, Rome, pp. 57-58.
[xiii] *Statistiche sulla ricerca e lo sviluppo in Italia.* ISTAT. Rome, forthcoming, table 1.1; Ministero delle Universita' e della Ricerca Scientifica (MURST). *Il quadro della ricerca pubblica in Italia.* http://www.murst.it/Ricerca/Quadro; *Scienza e tecnologia in cifre.* Consiglio nazionale delle ricerche. Istituto di studi sulla ricerca e documentazione scientifica. At http://www.isrds.rm.cnr.it; OECD. *National Account: Main Aggregates, 1960-1996*. OECD, Paris, 1998; ISTAT. *Rapporto Annuale: La situazione del paese nel 1998*. ISTAT, Rome, 1999, Appendix, Table A.1.
[xiv] *Statistiche sulla ricerca e sviluppo in Italia*. ISTAT. Rome, forthcoming, table 3.1.1; *Statistiche sulla ricerca scientifica e l'innovazione tecnologica.* ISTAT. Rome, 1998, p 291.
[xv] *CNR Report 1998: Research results 1997, Budget 1998-99.* Italian National Research Council. Rome, 1998, pp. 11-12.
[xvi] *Rapporto Annuale1998*. ISTAT, Rome, 1999, pp. 97-117.
[xvii] "Gli obiettivi per la ricerca e l'innovazione" Speech of the Minister of Universities and Scientific and Technological Research on June 25 1995 at http://www.murst.it/progprop/audiz96/audiz963.htm.
[xviii] "Il progetto Mezzogiorno" Consiglio Nazionale di Ricerca at http://soi.cnr.it/~tminfo/rel_garaci/mezzogiorno.html; *Second European Report on S&T Indicators 1997*. European Commission, DG XII. Brussels, Belgium, 1997, table 6c.1.
[xix] B. Schippa. *Le Strategie di Ricerca. Informazioni e Dati Statistici sulla Ricerca e Sviluppo.* Conferenza Nazionale Energia e Ambiente, ENEA, Rome, 1998, pp. 7 and 9.
[xx] *1998 Rapporto Annuale*. ISTAT, Rome, 1999, pp. 97-117.
[xxi] *Science and Technology Statistics Italy.* Institute for Studies on Scientific Research and Documentation. Rome, 1993, p. 24.
[xxii] *Statistiche sulla ricerca scientifica e l'innovazione tecnologica.* Istituto Nazionale di Statistica. Rome, 1998, pp. 143, 214; Eurostat. *Second European Report on S&T. Indicators 1997. Appendix.* European Commission, Brussels, 1997, p. S-97.