FRANCE'S RELATIVE ECONOMIC DECLINE : 1980-2000

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I. Introduction
II. GDP per Capita

Over the last twenty years, the relative standing of France, in terms of living standards, has been declining relative to most of the countries with which it is competing. The decline is most marked relative to Anglo-Saxon countries. Until 1980, France was closing the gap relative to the U.S. while diverging from the U.K. In 1980, the French were 23 % richer than their British counterparts and 19 % poorer than Americans. In 1999, the French were only 9 % richer than the British, and 31 % poorer than Americans. These facts are apparent from Table 1 , which represents relative GDP in purchasing power parity, in terms of the working age population. Using the working age population as the denominator allows us to filter out sources of impoverishment due to aging while keeping sources due to economic distortions such as taxes, labor market rigidities, etc. Essentially, table 1 tells us that in 1999, on average, a potential producer in France was producing 31 % less of purchasing power than an American.

One exception that stands out in Table 1 is Germany. This is due to the shock of reunification. Between 1980 and 1990 France was also losing ground relative to Germany. However reunification reduced German GDP per capita because of a composition effect : new workers from the East were less productive than their Western counterparts. Furthermore, the fiscal shock of unification had further adverse effects on Germany relative to France. This is represented on Figure 1, which makes clear that between 1983 and reunification France's relative GDP was declining. Reunification shows as a jump which puts France above Germany, and the jump is followed by a diverging pattern. If one takes Austria, a country somewhat similar to Germany but which did not have the same shock, the picture is one of continuing relative decline, which is partly due, however, to income convergence as France was originally richer.

The second panel of table 1 compares France to other major continental European countries. The picture is more mixed as some of these trends are due to income convergence. However, a striking fact emerges : in no cases is France strictly better-off in relative terms in 1999 compared to 1980. In particular, it has fallen behind Belgium and the Netherlands, which it was leading in 1980. Note that both Italy and Belgium have suffered from a big public debt problem. This has not prevented Italy from keeping up with France and Belgium from overtaking it.

Panel 3 looks at Japan and three Nordic countries. The picture is similar. In 1999, France is worse-off in relative terms compared to 1980 for all these countries. It has slept behind Norway and Japan and is on par with Sweden, which it slightly outperformed in 1980. Note that three of these countries have suffered very severe macroeconomic problems : in Japan, the asian crisis, in Sweden and Norway, the speculative attacks and very severe recessions of the nineties. Panel 4 looks at 2 anglo-saxon countries plus denmark. The picture is quite similar to the comparison

[1] I am extremely grateful to Michel Martinez and François Bourguignon for having facilitated data on French income shares.

between France and the U.S. and the U.K. Between 1980 and 1999, France has stopped converging to Canada and has fallen behind Australia and Denmark. Finally, Panel 4 describes what has happened to three small poor European economies. While Portugal has steadily converged, Ireland is now 7 % richer, and Greece joins Germany in the « outliers » club, having diverged from France after 1980.

It is interesting to compare our results in terms of ranking. This is done in table 2, which shows that France has falled from rank 4 to rank 11 in 20 years.

Country	U.S.A.	U.K.	Germany	Austria
63	0.63	1.02	0.88	1.15
70	0.73	1.14	0.89	1.10
80	0.81	1.23	0.92	1.04
90	0.76	1.14	0.91	1.03
99	0.69	1.09	1.03	0.99

Country	Italy	Netherlands	Spain	Belgium
63	1.19	0.93	1.49	1.03
70	1.17	0.95	1.42	1.03
80	1.11	1.04	1.44	1.00
90	1.11	1.06	1.37	0.99
99	1.11	0.97	1.29	0.94

Country	Japan	Sweden	Norway	Finland
63	1.65	0.91	1.12	1.19
70	1.28	0.95	1.20	1.22
80	1.16	1.01	1.02	1.18
90	0.98	0.98	0.99	1.04
99	0.98	1.00	0.85	1.01

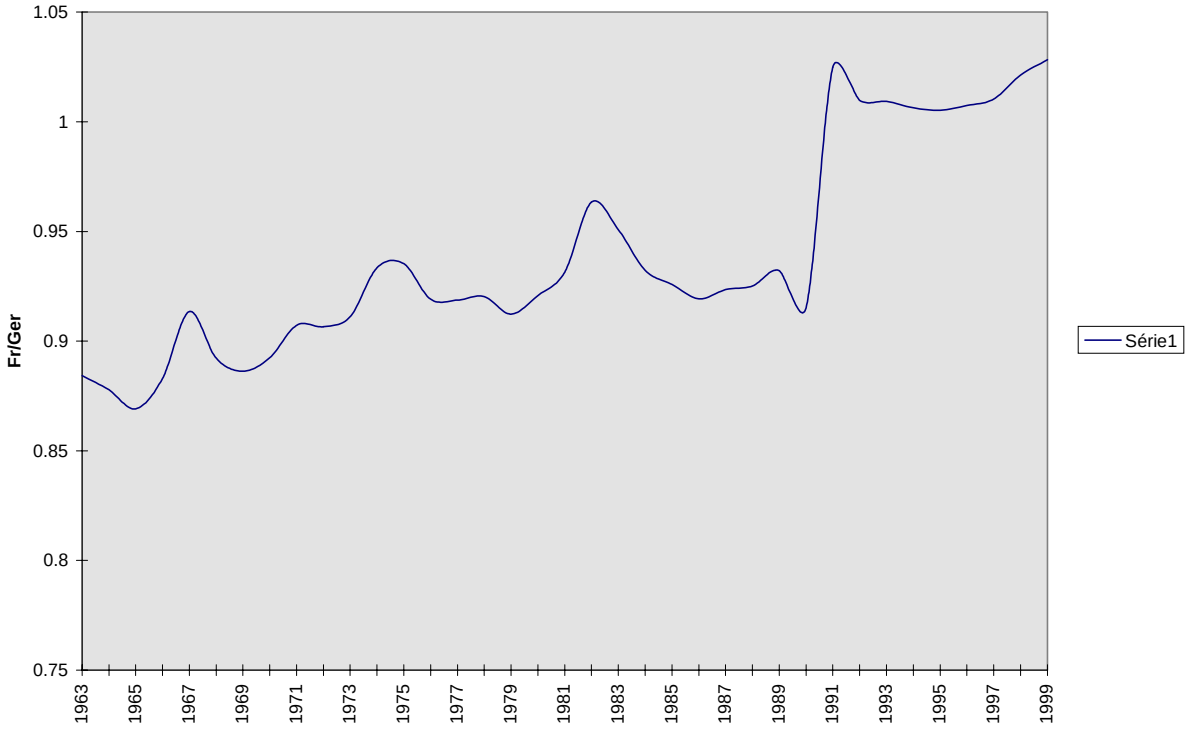
Country	Australia	Canada	Denmark
63	0.89	0.75	0.92
70	0.95	0.86	0.95
80	1.06	0.91	1.01
90	1.06	0.90	1.00
99	0.96	0.91	0.91

Country	Greece	Ireland	Portugal
63	2.09	1.46	2.36
70	1.73	1.55	1.93
80	1.52	1.46	1.79
90	1.63	1.27	1.64
99	1.60	0.93	1.52

Rank	1980	1999
1.	USA	USA
2	Canada	Norway
3	Germany	Canada
4	**FRANCE**	Denmark
5	Belgium	Ireland
6	Sweden	Belgium

7	Denmark	Australia
8	Norway	Netherlands
9	Netherlands	Japan
10	Austria	Austria
11	Australia	**FRANCE**
12	Italy	Sweden
13	Japan	Finland
14	Finland	Germany
15	U.K.	U.K.
16	Spain	Italy
17	Ireland	Spain
18	Greece	Portugal
19	Portugal	Greece

Figure 1



To summarize, the only two OECD countries relative to which France has improved its economic standing over the last twenty years are Germany and Greece, which respectively suffered from the burden of reunification and from the crisis in the Balkans.

III. Inequality

The next step is obviously to look at the distribution of income. It may well be that on average the French are getting worse-off relative to the Americans, but this does not imply that the poorest French would like to trade their lot against those of the poorest Americans. Since 1980, French society has engaged in a socialist path involving greater social insurance and

redistribution. It is legitimate to have a deterioration in economic efficiency if the counterpart is greater equity. This section and the following ones are devoted to the following question : how much of a counterpart did France get in terms of social cohesion ? What trade-off has it faced between equity and efficiency ? Is that trade-off more or less favorable than in other countries ? In other words, is France on the frontier of the equity-efficiency set, in which case its output decline only reflects different social preferences that lead to pick up a different point on that frontier, or is it in the interior of this set, which may be interpreted as resulting from inefficient policies ?

To answer that question, we ideally need data on the distribution of income in the set of countries that we consider, over the period we are interested in. However, this is not an easy task, for several reasons. First, income distribution data are typically not comparable across countries. Second, what we are really interested in is the distribution of *net* rather than gross income, which makes it harder to obtain. Third, time series on income shares are typically not produced, so that within each country one has to rely on various sources that use different income concepts and only cover a fraction of the period of interest.

To address these problems, we use as our benchmark statistics the share of the first quintile in net total household income as computed in the Luxembourg Income Study (LIS). These data are comparable across countries, but they typically fail to cover the period of interest, especially for France. To complete our data, we use other national sources that are gathered, along with the LIS income shares, in the United Nations' World Income Inequality Database (WIID), which is downloadable from :

http://www.undp.org/poverty/initiatives/wider/wiid_download.htm#download.

These numbers are then re-scaled and pasted to the LIS income share series in order to obtain longer series. For some countries, however, there is no overlap between the LIS data and other sources that might extend the time span of our data. For these countries we use other sources that are internally consistent but not comparable across countries. We also do so for countries where the LIS only covers a few years while their exists good national sources throughout the period. This is true for Italy, Sweden, and the U.K. As a result, we are able to compare trends in inequality across countries but not inequality levels unless the LIS-based numbers are used.

For France, we are able to get numbers for 79,84,89 and 94 from the Family Expenditure Survey (courtesy of Michel Martinez and François Bourguignon), which give us the distribution of net equivalized household income, and to express them in LIS-equivalent numbers using the net household income distribution from LIS, available for the first two years. For other countries, available years do not necessarily match these four years, so that we break the period in 4 sub-periods : 77-81, 82-86, 87-91, and 92-96. For each country we construct a first quintile share using the above described procedure for whatever years are available in these periods.

COUNTRY	Period I	Period II	Period III	Period IV
Australia	6.46	6.42	6.14	
Canada	6.56	6.65	6.69	
Finland	7.63664706		7.78	7.78
France	7.18	7.06	7.06	7.14506024

Germany	7.67	7.9	8.12503748	7.82893553
Italy	7.05	8.2	8.35	8.41
Netherlands	7.41135417	7.47275	8.42	7.54291667
Norway	7.45	7.34	7.32	7.1004
Portugal	5.53		5.7	
Spain	5.3		5.3	
Sweden	7.03	6.79	8.1	6.68
U.K.	10.97	9.32	8.12	7.64
U.S.	5.72	5.29	5.43	

Sources : Luxembourg income study first quintile income share for household net income as reported in WIID. For Finland, the series was prolonged using household equivalent income data from Statistics Finland. For France, using the Family expenditure survey net equivalent household income. For Germany, using the income classes data from Einkommens- und Verbrauchsstichproben, Germany CSO . For Italy, the bank of Italy income shares were used. For the Netherlands, the series were prolonged to period I using the Household per capita income distribution from the statistical yearbook, and to period IV using the household equivalent income quintiles from the LIS. For Norway, the LIS numbers were prolonged to period IV using World Bank data . For Portugal, the data are all from PINE, while for Spain they come from the monetary expenditure distribution data in Goerlich and Mas (2000). For Sweden, we used the net family income from the Swedish Income Distribution Survey. For the U.K., the data are net equivalent household income from UKIFS. All numbers were taken from the WIID database, except the French family expenditure surveys who were provided by Michel Martinez.

Next, we can use these data to compute the living standards of the poorest (as defined by those households in the first quintile) by multiplying their income share by our GDP per capita in PPP terms data. Within each period, we can then express that relative to France for each country. If data were comparable across countries, this would give us an indication of how well-off are the poorest relative to France's poorest. However, these income shares are not always comparable across countries. So we divide the relative living standards of the poor between the last period where it is available (either III or IV) and the first period. This gives us a measure of the trend in the living standards of the poorest relative to the corresponding trend in France.

The results are much more fragile than those of the previous section, given the difficulties in constructing income distribution data . Furthermore, the time period is different and shorter, and for many countries has only 10 years. So the results have to be interpreted with caution.

Ausrtralia	0.992836
Canada	1.079983
Finland	1.094074
France	1
Germany	0.929876
Italy	1.240232
Netherlands	1.032329
Norway	1.136811
Portugal	1.140997
Spain	1.048121
Sweden	0.93982
U.K.	0.753179
U.S.	1.017271

Trend in the poor's living standards relative to France

Among the 12 countries that we have been able to consider, the poor have been doing less well than their French counterparts in 4 cases, one of which being Germany, and they have fared better in 8 cases. So, although the picture is not as bleak as the one that emerges from the comparison of GDP levels, it does not seem that France has been able to get a big relative improvement in its poors' living standards as a compensation for its declining relative economic performance. In particular, despite the tremendous rise in inequality and the absolute fall in the lowest real wages in the U.S., when one looks at *households*, the poorest american households' fate has not worsened relative to their French counterpart, although it certainly has not improved by the same order of magnitude as GDP per capita.

If, on the other hand, one compares with the U.K., we see that while the average British has gained in real income relative to the average French, the contrary has happened if one looks at the poorest. Note however that according to our data, Britain started with a much more equal distribution than France, and it is still more equal despite the tremendous rise in inequality in the U.K.

Has France moved to the interior of the equity-efficiency frontier ? Given the quality of our data, it is not easy to answer that question. We construct that frontier by restricting ourselves to those countries whose first quintile income share was constructed on the basis of the LIS, i.e. excluding the U.K, Sweden, Italy, Spain and Portugal. This makes the data more comparable. Assuming a concave frontier, it turns out that only two countries were on the frontier at the beginning : Germany and the U.S., and two at the end : Norway and the U.S. We can then draw a straight line which approximmates the frontier in the (average income, poor income) plane. Figure X illustrates how this frontier has moved and where France lies. The equation for the equity efficiency frontier at the beginning of the period is $y = -x + 2.26$, and at the end of the period it is $y = -0.45\ x + 1.61$. Interestingly, the frontier seems flatter, meaning it is more costly to redistribute to the poor than in the past.. There is no clear sign that France is moving away from the frontier. Its horizontal distance has increased : in the early eighties it could increase output per capita by 26 % while not making the poor poorer, and this figure is 36 % in the early nineties. But the vertical distance has fallen. In the early eighties the poor's income could be increased by 26 % without reducing total output ; in the early nineties this figure was just 16 %. The picture that emerges is that France is not drifting away from the frontier, but many countries have managed to get closer to it, what France has not achieved.

IV. Social indicators : crime, suicide, health

A. Crime

Another way to assess whether there has been counterparts to the purchasing power that has been given up is to look at crime statistics.

The United Nations publish statistics on total recorder crime per 100.000, from 1974 to 1997. Unfortunately, the data for France are only available until 1994. So we are again confined to a shorter period than we would like. The following table gives the results.

Country	1983	1994	1997
Austria	4594	6285	
Belgium	2348 (1987)	5713	8035
Canada	8504	9979	
Denmark	8282	11878	10051
Finland	10062	7650	7273
FRANCE	4577	6765	
Germany	4873	8168 (1995)	
Greece	3063	2909	3591
Italy	2019	3805	
Japan	1175	1491	1507
Netherlands	4919	7422 (1991)	
Norway	3565	5946	6895
Portugal	475	3290 (1995)	3234
Spain	1547 (1986)	1770	1764
Sweden	11171	12670	13516
USA	5901	5375	

Source : United Nations Survey on Crime Trends and the Operations of Criminal Justice Systems. Available at http://www.uncjin.org/Statistics/WCTS/wcts.html.

Unfortunately, the UK is missing from these data. Also, cross country differences should be interpreted with caution. For example, the reported rate for Uganda in 1997 was 222, lower than any of these figures. These data imply that crime is rising in France but also in many other countries ; Scandinavian countries appear quite unsafe while contrary to some conventional wisdom, the U.S. is not that bad and increasingly safe. The following table gives the rankings in 1983 and 1994 as well as the percentage of increase per year, between the first and last years.

Country	Ranking 1983	Ranking 1994	Trend in crime (%)
Austria	9	9	+3.3
Belgium	5	7	+24.2
Canada	14	14	+1.6
Denmark	13	15	+1.5
Finland	15	13	-2.0
FRANCE	8	10	+4.3
Germany	10	12	+5.6
Greece	6	3	+1.2

Italy	4	5	+8.0
Japan	2	1	+2.4
Netherlands	11	11	+6.3
Norway	7	8	+6.7
Portugal	1	4	+41.0
Spain	3	2	+1.3
Sweden	16	16	+1.5
USA	12	6	-0.8

Source : see previous table.

The table makes clear that France has not been doing very well on that account as well, although there is nothing spectacular about it : its ranking has deteriorated from 8th to 10th over 10 years, but some countries have experienced much sharper increases in crime. Only two, the U.S. and Finland, have falling crime, and the trend in France is representative of the general trend.

Given that the quality of these data is problematic, we check with another data source, based on standardized victimization surveys across countries. While the previous data are about reported crime, from national police sources, these surveys directly ask people whether they have been a victim of crime. Again, data for long periods are missing, so we do not exactly get what we want.

Country	All crimes (88)	All crimes (95)	Assault (88)	Assault (95)
Canada	28.1	25.2	3.9	4.0
England+Wales	19.4	30.9	1.9	5.9
Finland	15.9	18.9	2.9	4.1
FRANCE	19.4	25.3	2.0	3.9
Netherlands	26.8	31.5	3.3	4.0
Switzerland	15.6	26.7	1.2	3.1
USA	28.9	24.2	5.4	5.7

Source : Mayhew, P. & Dijk, J.J.M. van. (1997).
http://ruljis.leidenuniv.nl/group/jfcr/www/icvs/data/i_VIC.HTM

Finally, we can also look at data on causes of death from the World Health Organization, these data allow to compare France with other countries regarding the most violent crimes, and given that they come from civil registries they are likely to be much better than other crime data, in particular there is no reporting bias. The WHO reports two sources of violent death, homicide and ‘other violence’.

As the following table makes clear, if one just looks at homicide rates , France is pretty safe. What picture do we get, however, if to homicide we add other sources of violent death ? The picture is far less encouraging, with France ranked 5th , behind an unlikely Portugal, the US, Sweden, and Finland.

US	7,35
Finland	3,3
New Zealand	1,85
Belgium	1,8
Italy	1,55
Canada	1,45
Netherlands	1,35
Portugal	1,3
Sweden	1,25
Austria	1,15
Switzerland	1,1
France	1,05
Norway	1,05
Ireland	0,95
Germany	0,9
Spain	0,9
UK	0,7
Japan	0,55

Portugal	14,55
US	8,75
Sweden	5,95
Finland	5,8
France	4,85
UK	4,45
Belgium	4,1
Germany	3,15
New Zealand	2,55
Canada	2,5
Italy	2,2
Austria	1,95
Netherlands	1,75
Switzerland	1,7
Norway	1,5
Ireland	1,3
Spain	1,15

Source-World health organization, latest year available.

It is interesting to note that if one adds ‘other violence’ to ‘homicide’, France’s performance deteriorates considerably. One should add that murder is probably underreported in France. As an anecdotal evidence, a teacher was stabbed to death by one of his pupils during the summer of 1997, and the criminal was charged with ‘voluntary wounds having triggered death without intent of inflicting it’.

B. Suicide

One measure of how happy people are is whether they find life worth living. Therefore to assess whether it has improved in France relative to other countries, one may look at suicide rates. The following map, taken from the WHO web site, is clear enough :

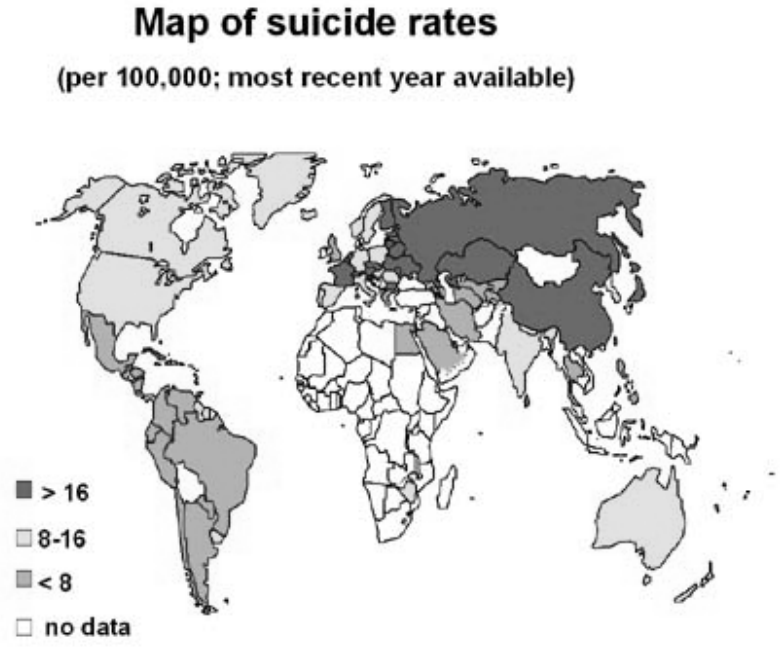


Figure X – The suicide map. Source : WHO (http://www.who.int/mental_health/Topic_Suicide/suicide1.html)

The impression that this map gives is that the « suicide belt » corresponds almost exactly with the former Communist block, with one noticeable « compagnon de route » : France ! However, closer inspection reveals that some Central European countries have escaped this fatality, such as Romania and Poland, while France is joined by Austria, Belgium, Finland and Japan.

From our viewpoint, the question is : are these differences pure cultural traits, or is it the sign that the French have become increasingly unhappy ? To find out, we need time-series data on suicide rates . The WHO has data on suicides between 1950 and 1997. For France, there is indeed an upward trend, but it starts in 1975 and peaks in 1985, being followed by a slight decrease between 1985 and 1997. The timing of this deterioration therefore does not coincide with that of the relative decline in GDP per capita ; if one compares 1997 and 1980, one finds essentially the same suicide rates in both years. Furthermore, several other countries experience similar upward trends in suicide in the 1970s. To compare these trends, we therefore compare suicide rates for the years 1965 and 1997. The results are reported in the following table . Unfortunately, we don't have long data for two major countries : The U.K. and Germany . It is useful to bear in mind, however, that over the nineties both of these countries had a downward trend in their suicide

rates, which moves from 8.1 per 100.000 to 7.1 in the UK between 1987 and 1996, and from 17.8 to 14.2 in Germany between 1990 and 1998.

As evidenced in this table, cross-country differences in suicide rates are quite stable. France was already doing poorly in 1965. Furthermore, the 1970's and early 1980's are a period of growing suicide rates in the Western World, while the following period has experienced a decline in many countries, including France. Nevertheless, its ranking has not improved over that period : it dropped from 12th to 14th , falling behind Denmark and Sweden. Hence, while France is following global trends, the French have clearly not improved their happiness in relative terms.

Country	1965 (inverse rank)	1980 (inv. rank)	1997 (inv. rank)
France	15.0 (12)	19.4 (12)	19.0 (14)
Australia	14.9 (11)	11 (7)	13.0 (10)
Austria	22.8 (17)	25.7 (15)	19.3 (15)
Belgium	15.0 (12)	22.1 (14)	21.1 (16)
Canada	8.8 (7)	14.0 (10)	12.3 (8)
Denmark	19.3 (15)	31.6 (17)	17.5 (12)
Finland	19.8 (16)	25.7 (15)	24.3 (17)
Greece	3.2 (2)	3.3 (1)	3.6 (1)
Ireland	2.4 (1)	6.3 (3)	11.3 (6)
Italy	5.4 (4)	7.3 (4)	8.2 (3)
Japan	14.7 (10)	17.6 (11)	18.8 (13)
Netherlands	6.9 (5)	10.1 (6)	10.1 (5)
Norway	7.7 (6)	12.4 (9)	12.6 (9)
Portugal	9.1 (8)	7.4 (5)	5.6 (2)
Spain	4.7 (3)	4.4 (2)	8.5 (4)
Sweden	18.9 (14)	19.4 (12)	14.2 (11)
United States	11.1 (9)	11.8 (8)	11.4 (7)

C. Health

This is an area where France is doing extremely well and where there is no sign of decline. For example, in the World Health Organization's *World Health Report*,[2] France is ranked 1st among all countries in the global performance of its health system. Note that this does not come free : France ranks 4th in health expenditure per capita in U.S. dollars. However, the French get more out of each dollar spent than Americans, who are ranked 1st in expenditure but only 37th in performance.

Similarly, France is doing very well in indicators such as Life expectancy.

Let us however play the devil's advocate and see if there are some reasons to be question these remarkable achievements. For example, one may speculate that a high life expectancy may hide problems for specific groups, while at the same time being explained by factors that may only be tangentially related to living standards. For example, a more widespread use of preventive therapeutic abortion will probably lower infant mortality statistics ; or many resources may be spent to prolong the life of very old people with a terminal disease.

[2] The statistics are available at http://www.who.int/whr/2000/en/statistics.htm.

Therefore, let us look at an indicator which may well be more relevant, i.e. the probability of dying between 15 and 69. This indicator is reported in the *World Health Report* (2000) and for males, one gets the following ranking :

Rank	Country	Prob. per 1000
1	Iceland	81
2	Sweden	89
3	Australia	94
4	Malta	94
5	Japan	95
6	Israel	101
7	Cyprus	102
8	Netherlands	103
9	Canada	104
10	Italy	109
11	Norway	109
12	San Marino	109
13	Switzerland	111
14	United Kingdom	111
15	Ireland	116
16	Greece	117
17	United Arab Emirates	117
18	Kuwait	119
19	Belgium	121
20	Costa Rica	121
21	Qatar	122
22	Dominica	123
23	New Zealand	125
24	Singapore	126
25	Andorra	129
26	Spain	129
27	Austria	131
28	Saudi Arabia	131
29	Chile	132
30	Jamaica	135
31	Oman	135
32	Germany	136
33	Bahrain	137
34	Denmark	138
35	Algeria	139
36	Luxembourg	139
37	Cuba	143
38	France	146
39	United States	148
40	Finland	148

France is ranked 38th, behind all Western European countries barring Portugal and Finland, and virtually at the same level as the U.S., the parangon of « Economic Horror ». These statistics reflect all sources of death, including suicide, violence, alcoholism, car accidents, and so forth. Given that females are less prone to these social evils than males, their death probability may better reflect the quality of the health system. What do we get when we look at the same statistics for females ? As the next table shows, France is indeed doing much better on that account, being ranked 13th ex-aequo.

1	Malta	45
2	Japan	48
3	Greece	50
4	Italy	51
5	San Marino	51
6	Australia	53
7	Andorra	54
8	Iceland	54
9	Spain	54
10	Dominica	55
11	Cyprus	57
12	Switzerland	58
13	Canada	59
14	Finland	59
15	Israel	59
16	France	59

V. Literacy and education

The following table is taken from the OECD education database,[3] and gives spending on public education as a fraction of GDP for 1997. France is among the high spenders. Given that, it would seem natural for French taxpayers to have comparative statistics on achievements, in order to know whether that money is well spent. Nevertheless, the relative performance of the French educational system seems a well-kept state secret. The media reported that the country allegedly dropped from an OECD study after poor preliminary results. As a result, one of the major sources for international comparisons in reading skills, the International Literacy Survey, cannot be used for our purpose.[4] An earlier survey was conducted in 1989 by the International Education Association, and France ranked among the very top countries in reading achievements (Elley, 1992).

Rank	Country	Fraction GDP
1	Sweden	0.083

[3] http://www.oecd.org/els/education/ei/

[4] Unesco's International Literacy Explorer, available at http://litserver.literacy.upenn.edu/explorer/, is not particularly useful for developed countries and does not report any statistic of interest for France.

2	Denmark	0.079
3	Norway	0.077
4	New Zealand	0.072
5	Poland	0.062
6	France	0.060
7	Canada	0.058
8	Portugal	0.056
9	Switzerland	0.056
10	USA	0.055
11	Iceland	0.054
12	Finland	0.051
13	Australia	0.050
14	Ireland	0.050
15	Netherlands	0.050
16	UK	0.048
17	Spain	0.048
18	Czech R.	0.048
19	Germany	0.048
20	Italy	0.047
21	Hungary	0.047
22	Korea	0.044
23	Luxembourg	0.044
24	Japan	0.036
25	Greece	0.035
26	Austria	0.018

Table Z—Educational expenditure as a fraction of GDP.

Things are a bit easier in Science. In 1995 was conducted the *Third International Mathematics and Science Study,* hereafter TIMSS, which gives comparable test scores for various countries. In Mathematics, French 13-year old students got an average score of 492, implying that France was ranked 20th out of 39 countries.[5] Results were substantially better for 14 year old, where France was ranked 13th out of 41 countries, with a score of 538, above the international average of 513. In Science, French 13-year old get a score of 451, which is below the international average of 483, and France ranks 28th out of 39 countries ; for 14-year old, France is again 28th out of 41 countries, and its score is 498, below the international mean of 527. Remember that the country ranks 6th in public expenditure as a fraction of GDP. The TIMSS was followed in 1999 by the *Third International Mathematics and Science Study – Repeat* (TIMSS-R), and comparison between the two data sets would have given us some idea of the recent trends ; however , France has not participated in the TIMSS-R.

One may speculate that France is not so good at training the average student, but is quite good at training the elite. Depending on one's vision of the educational system, this may be interpreted either as a good or a bad thing . Nevertheless, as far as teenagers are concerned, this is

[5] See National Center For Education Statistics (2000), available at http://nces.ed.gov/pubs2000/2000014.pdf ; and Beaton et. al. (1996).

not true. According to the TMSS, only 7 % of French 14-year old students are in the world top 10 % in mathematics. On that account, its rank is 19th out of 41, which is lower than its rank of 13th for the corresponding average student. In Science, the corresponding figure drops to a miserable 1 %, with a rank of 34th out of 41. The often held view that the French educational system is « too elitist » is therefore not supported by these data : at the high school level, the upper tail fares worse relative to other countries than the average.

The next question is : is there any trend in these performance indicators ? The TIMSS publication reports results from previous surveys that are not easy to compare with the TIMSS. In particular, these earlier studies involve far fewer countries than the TIMSS. The First and Second Science survey did not involve France, so that the only possible comparison is in specific areas of mathematics. The following table gives the ratio between the average French score and the average world score in four areas of mathematics, comparing the 1982 Second International Mathematics Survey with the 1995 TIMSS.

	1982	1995
Arithmetics	1.16	1.10
Geometry	0.93	1.18
Algebra	1.28	1.04
Measurement	1.18	1.12

The bottom line is that France is gradually losing its edge in 3 out of 4 areas, but has considerably improved in geometry, so that there is no clear overall trend in relative mathematics achievement.

VI. Technology

How does France stand as a provider and user of advanced technology ?

A. R & D Input

The following table shows that, like other countries, France has increased its R & D effort over the 1981-1997 period. It has managed to maintain its rank, which is 7th at both the beginning and the end of the period.

Country	1981	1997		rk 81	rk 97	
Sweden	2.22	3.71			5	1
Japan	2.32	2.91			4	2
Switzerland	2.18	2.73	96		6	3
Finland	1.18	2.73			11	4
United	2.35	2.55			3	5

	States of America					
	Germany	2.36	2.29		2	6
	Frace	1.94	2.21		7	7
	Netherlands	1.78	2.04		8	8
	Denmark	1.07	1.91		14	9
	United Kingdom	2.39	1.84		1	10
	Australia	1.02	1.68	96	16	11
	Norway	1.18	1.67		12	12
	Austria	1.14	1.60		13	13
	Canada	1.22	1.59		10	14
83	Belgium	1.57	1.57	95	9	15
	Ireland	0.68	1.41		18	16
	New Zealand	1.05	1.14		15	17
	Italy	0.88	0.99		17	18
	Spain	0.41	0.82		19	19
82	Portugal	0.30	0.65		20	20

Table X—General R and D expenditure as a fraction of GDP. Source : OECD Basic Science and Technology Indicators.

B. Patents and Royalties

The previous table just gives us the input into R & D. It does not tell us whether this money is well used. In this section we look at France's standing in terms of the *outcome* of its research effort.

The first indicator we look at is the number of resident patent applications, i.e. the number of patent applications in a given country by residents of that country. The following table gives the number per 100,000 inhabitants. France's performance is average and stable, although over the period its ranking slightly deteriorates from 12th to 13th. It exhibits a slight positive trend, which puts it half-way between those countries that have a substantial upward trend, such as Japan, Germany, or the U.S., and those that have a downward trend, such as Austria. The number suggest that knowledge production is increasingly concentrated in a few leading centers, those countries that have experienced fastest growth in applications per capita : in addition to the three already mentioned countries, Finland, Norway, Ireland, and Canada.

Another indicator is the number of patent applications abroad by residents of a given country. This indicator compounds creativity with international dynamism. These data are reported in tables Z and the corresponding ranking is in table Z'. One can note a true explosion of international patent applications, reflecting the growing importance of international trade. France has not quite caught up with that trend, and has experienced a marked relative decline of its international standing, dropping from 8th in 1981 to 14th in 1997.

Country	1980	1990	1997
Australia	45.18	37.85	43.12

Austria	31.06	27.36	23.00
Belgium	10.07	9.16	8.94
Canada	7.26	9.17	11.33
Denmark	18.82	25.06	25.51
Finland	28.37	41.30	46.48
France	20.58	22.47	22.98
Germany	39.06	38.97	54.88
Iceland	8.33	6.67	8.03
Ireland	11.58	20.95	22.70
Japan	141.88	269.52	277.95
Luxembourg	30.77	10.76	21.10
Netherlands	14.10	17.70	16.03
New Zealand	36.88	23.87	43.83
Norway	17.52	21.20	27.73
Portugal	0.94	1.02	0.73
Spain	5.00	5.75	5.72
Sweden	49.65	37.40	47.40
Switzerland	68.25	53.07	35.75
Turkey	0.30	0.25	0.34
United Kingdom	34.99	33.83	30.95
United States	26.95	35.67	43.97

Resident patent applications per 100,000 inhabitants. Source : *OECD basic science and technology indicators.*

Rank	1980	1997
1	Japan	Japan
2	Switzerland	Germany
3	Finland	Sweden
4	Germany	Finland
5	Australia	United States
6	Sweden	New Zealand
7	United States	Australia
8	United Kingdom	Switzerland
9	Austria	United Kingdom
10	Denmark	Norway
11	New Zealand	Denmark
12	**France**	Austria
13	Norway	**France**
14	Ireland	Ireland
15	Netherlands	Luxembourg
16	Luxembourg	Netherlands
17	Canada	Canada
18	Belgium	Belgium
19	Iceland	Iceland
20	Spain	Spain
21	Portugal	Portugal
22	Turkey	Turkey

Rankings based on the preceding table.

Country	1981	1990	1997
Sweden	14.9	30.1	182.3
Norway	3.6	12.4	150.2
Finland	5.3	19.6	148.2
Switzerland	33.5	48.9	141.0
Denmark	6.3	19.9	117.5
Luxembourg	22.2	25.1	95.6
Netherlands	8.5	17.6	68.5
United States	5.5	11.6	58.3
United Kingdom	5.5	14.0	55.0
Germany	10.6	19.8	52.8
New Zealand	2.1	2.2	45.3
Australia	3.1	9.6	42.6
Austria	6.1	11.8	32.0
France	5.8	11.8	31.4
Canada	2.1	6.8	31.0
Belgium	3.7	8.0	30.9
Japan	4.2	10.5	30.3
Ireland	1.5	3.5	27.0
Italy	2.4	5.3	15.0
Spain	0.5	1.2	5.6
Greece	0.1	0.5	2.1
Portugal	0.0	0.1	0.8

International patent applications per 10,000 inhabitants.

Country	rk 80	rk90	rk97
Sweden	3	2	1
Norway	14	9	2
Finland	11	6	3
Switzerland	1	1	4
Denmark	6	4	5
Luxembourg	2	3	6
Netherlands	5	7	7
United States	10	12	8
United Kingdom	9	8	9
Germany	4	5	10
New Zealand	17	19	11
Australia	15	14	12
Austria	7	11	13
France	8	10	14
Canada	18	16	15

Belgium	13	15	16
Japan	12	13	17
Ireland	19	18	18
Italy	16	17	19
Spain	20	20	20
Greece	21	21	21
Portugal	22	22	22

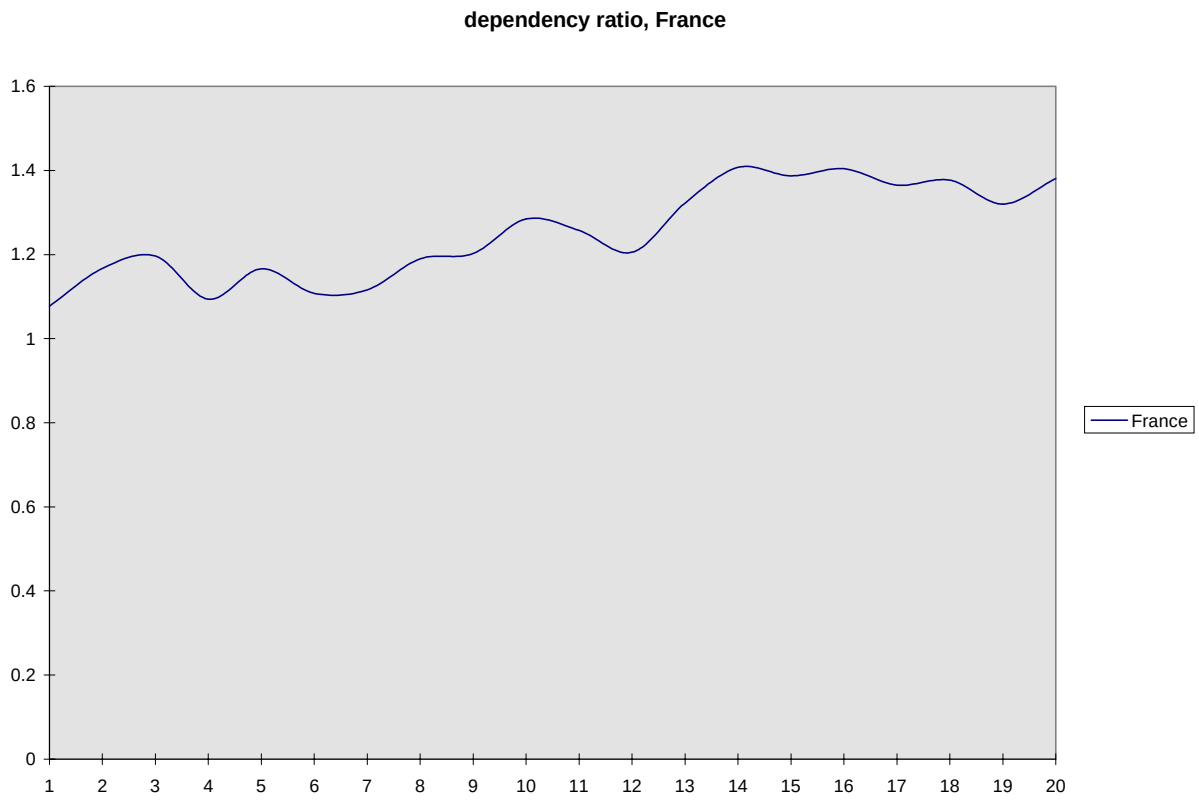
Rank in international patent application

These results should be considered again with caution, as data on patents are not easily comparable across countries, and these data do not capture the importance of the patents being obtained. Alternatively, one may look at the technological balance of payments. Data on receipts as counterparts of patents and royalties give us an indication of the amount of techology being sold to the rest of the world. The following table gives this flow as a fraction of GDP. These numbers are somewhat negatively correlated with country size, and comparability is not obvious. However, it suggests again that France has been losing ground, in relative terms, as an exporter of knowledge. It has dropped from 6th to 11th in about 15 years.

Country	1982		1997		rank 82	rank 97
Belgium	0.67		1.88		3	1
Netherlands	0.84		1.85	(3)	2	2
Switzerland	0.90	(2)	1.22		1	3
Germany	0.15		0.60		7	4
United Kingdom	0.18		0.44	(6)	4	5
United States of America	0.17		0.42		5	6
Portugal	0.01		0.23		15	7
Canada	0.08		0.22	(5)	8	8
Sweden	0.06	(1)	0.21	(4)	11	9
Japan	0.07		0.16	(6)	10	10
France	0.15		0.15	(5)	6	11
Italy	0.04		0.14	(6)	14	12
Finland	0.00		0.08		17	13
Norway	0.05		0.06		13	14
Australia	0.01	(1)	0.06	(5)	16	15
Austria	0.05		0.05		12	16
Spain	0.08		0.03	(6)	9	17

Technological receipts as a percentage of GDP. Source : *OECD Basic Science and Technology Indicators*. Notes : (1) : 1981 ; (2) : 1985 ; (3) : 1992 ; (4) : 1993 ; (5) : 1996 ; (6) : 1997

What about technological payments to the rest of the world ? This is an indicator of technological dependency ; however, a high value should not necessarily be interpreted as a bad sign, since it may mean a rapid pace of adoption of technologies invented abroad. There is nothing wrong with a country buying a lot of technology from abroad unless it means that this country is becoming a ‘follower’. Therefore, we report the ‘technological dependency ratio’, i.e . the ratio of technological payments over receipts. If this ratio is lower than 1, this indicates that the country sells less technology than it buys.



As this picture makes clear, this ratio exhibits an upward trend over the period. How does France compare with other countries ? This is represented in the following table. While France remains fairly 'independent ' relative to some other countries, its rank has dropped from 5th to 10th.

	Country	1982	1998.00		rk 82	rk 98
81	Sweden	0.94	0.11	93	4	1
	United States of America	0.14	0.31		1	2
85	Switzerland	0.27	0.43		2	3
	United Kingdom	0.83	0.59		3	4
	Japan	1.53	0.64	97	9	5
	Canada	1.74	0.74	96	10	6
	Belgium	1.25	0.85		7	7
	Netherlands	1.22	0.99	92	6	8
	Germany	1.41	1.18		8	9
	France	1.17	1.38	96	5	10
81	Australia	10.33	1.61	96	16	11
	Italy	3.72	1.74	97	13	12
	Portugal	10.22	3.04		15	13
	Norway	2.62	3.79		11	14

Finland	32.50	3.84		17	15
Spain	5.03	6.64	97	14	16
Austria	3.46	8.14		12	17

C. Internet and the New Economy

One of the most important new technology is telecommunications. The better the telecommunications infrastructure, the greater the productivity of all sectors. The OECD has gathered a variety of very interesting statistics in that respect. The following table gives the number of *Internet Hosts* per 1,000 people. It is a composite indicator of people's education level, their computer literacy, their creativity, and their integration with the outside world.

For internet hosts per capita, France was ranked 14th in 1991 out of 29, when the internet was in its infancy, and had dropped to 19th in 1997. It has failed to quite catch up with the trend. In 1991 it was above the OECD average, in 1997 it is more than 3 times below the OECD average. One problem with this historical series is that it stops in 1997. One may argue that because of network externalities the adoption process of the internet is highly nonlinear and that France's performance could have been boosted since then due to rapid adoption. Fortunately, more recent indicators are made available by the OECD at http://www.oecd.org/dsti/sti/it/cm/stats/newindicators.htm#hosts. According to these more recent statistics, as of september 1999, France had dropped to 20th in the number of internet hosts per 1000 inhabitants, having been overtaken by Ireland. This site also publishes a ranking by the number of secure servers, which is more recent (April 2000) , and France ranks 19th on that indicator. One should also add that France is not doing as badly in terms of the access price, although its price is above EU average. This suggests that the demand for internet services is lower in France, perhaps because firms and households are less up-to-date than in other OECD countries.

Another indicator which is worth looking at is the number of access lines to the telephone per capita. As data are older, one can look at longer trends than for the internet. Furthermore, this sector has been, over the period in which we are interested, under state monopoly. If the hypothesis that the excess burden of the state is hampering the functioning of the private sector but maintains France at a decent level in terms of public goods is correct, then France should fare much better in that indicator than with the previous one. That is indeed what the statistics say. From 1980 to 2000, France has improved its rank from 14th to 8th in the number of access lines per capita.

Country	1991	(rank)			1997
Australia	1.27	(6)	38.77	(6)	
Austria	0.28	(12)	10.71	(13)	
Belgium	0.03	(17)	8.45	(17)	
Canada	0.66	(8)	23.05	(9)	
Switzerland	1.44	(4)	20.34	(11)	
Czech Republic	0.00	(22)	4.80	(20)	
Germany	0.26	(13)	10.65	(14)	
Denmark	0.30	(11)	26.11	(8)	
Spain	0.02	(20)	3.07	(23)	
Finland	1.75	(2)	65.34	(1)	
France	0.16	(14)	4.99	(19)	
United Kingdom	0.12	(15)	15.09	(12)	
Greece	0.02	(20)	1.87	(25)	
Hungary	0.00	(22)	3.39	(22)	
Ireland	0.03	(17)	9.28	(15)	
Iceland	0.75	(7)	51.65	(2)	
Italy	0.03	(17)	3.70	(21)	
Japan	0.05	(16)	7.61	(18)	
Korea	0.00	(22)	2.90	(24)	
Luxembourg	0.00	(22)	9.24	(16)	
Mexico	0.00	(22)	0.37	(28)	
Netherlands	0.49	(9)	21.81	(10)	
Norway	1.94	(1)	47.90	(3)	
New Zealand	0.35	(10)	42.76	(5)	
Poland	0.00	(22)	1.12	(27)	
Portugal	0.00	(22)	1.85	(26)	
Sweden	1.37	(5)	32.17	(7)	
Turkey	0.00	(22)	0.37	(28)	
United States	1.67	(3)	43.55	(4)	
OECD	0.13		17.17		

Table X – Number of internet hosts per 1,000 inhabitants. Source : *OECD Science and Technology Statistics.*

Country	1980		1990	1997	
Australia	0.35	(9)	0.46	0.51	
Austria	0.29	(15)	0.42	0.46	
Belgium	0.25	(18)	0.39	0.48	
Canada	0.41	(5)	0.55	0.62	(7)
Switzerland	0.45	(2)	0.58	0.64	(4)
Czech Republic	0.11	(23)	0.16	0.32	
Germany	0.26	(17)	0.40	0.55	
Denmark	0.43	(4)	0.57	0.64	(4)
Spain	0.19	(21)	0.32	0.40	
Finland	0.36	(7)	0.54	0.56	
France	0.30	(14)	0.50	0.58	(8)
United Kingdom	0.31	(13)	0.44	0.54	
Greece	0.24	(19)	0.39	0.52	
Hungary	0.06	(26)	0.10	0.32	
Ireland	0.14	(22)	0.28	0.42	
Iceland	0.37	(6)	0.51	0.57	
Italy	0.23	(20)	0.39	0.45	
Japan	0.33	(12)	0.44	0.48	
Korea	0.07	(25)	0.36	0.52	
Luxembourg	0.36	(7)	0.48	0.67	(2)
Mexico	0.04	(28)	0.06	0.10	
Netherlands	0.35	(9)	0.46	0.57	
Norway	0.29	(15)	0.50	0.63	(6)
New Zealand	0.35	(9)	0.44	0.51	
OECD	0.28		0.39	0.49	
Poland	0.05	(27)	0.09	0.19	
Portugal	0.10	(24)	0.24	0.41	
Sweden	0.58	(1)	0.68	0.68	(1)
Turkey	0.03	(29)	0.12	0.28	
United States	0.44	(3)	0.54	0.66	(3)

Table Z—Acess lines per 10,000 inhabitants.

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