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Escaping the Natural Resource Curse and the Dutch Disease? Norway's Catching up with and Forging ahead of Its Neighbors

Growth studies show, counter to intuition, that the discovery of a natural resource may be a curse rather than a blessing since resource-rich countries grow slower than others. Moreover, resource abundance may involve a displacement of a growth-essential manufacturing sector, leading to Dutch Disease. Norway is an important exception to the curse and the disease. Since oil production started in 1971 its overall growth has been remarkable side-by-side with phenomenal oil exports. At the same time, manufacturing has been performing well. This article uses neighbor countries Denmark and Sweden to highlight Norway's relative development. The article employs structural break techniques to demonstrate that Norway started a sudden acceleration in 1974, three years after having started oil extraction, and never slowed down. After catching-up with its neighbors, Norway surprisingly maintained a higher pace, and appears to have escaped the curse and the disease. This article establishes the fact through rigorous hypothesis testing before examining explanations of why Norway did escape.

JEL Classification: C22, N10, O10, Q33

Key words: booming sector, catch-up, development, Dutch Disease, economic convergence, growth, natural resource curse, oil discovery, structural break

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1. Introduction

Most people believe that finding a treasure is a fortunate event that promises future happiness. However, Sachs and Warner (2001) show, puzzlingly, that countries with great natural resources tend to grow slower than countries that have fewer resources at their disposal. Gylfason (2001a) informs us that Nigeria, despite commanding vast oil riches, has the same gross national product that it had forty years ago. Oil nations such as Iran and Venezuela grew at -1 percent per year from 1965 to 1998 and Iraq and Kuwait grew -3 percent. These disappointing results may arise from negative effects of riches on policies and human endeavor. The riches may be a curse rather than a blessing. Moreover, resource riches may displace and diminish the manufacturing sector, a symptom of the Dutch Disease. The disease may become an acute problem since the manufacturing sector often is associated with productivity growth and technical advance. Since many resource booms are only temporary, the displacement may portend a later on-set of stagnant growth. This article seeks to extract the important lessons learned in one country, Norway, which escaped both the curse and the disease. I do this by first establishing the fact that Norway avoided the resource curse through rigorous hypothesis testing before proceeding to show that it did not contract the Dutch Disease. Second, I explain why.

It is fitting that the curse and the disease are puzzling to observers since natural resources should be a blessing, if managed correctly. Proper management addresses at least two challenges in a resource boom. First, it discourages rent seeking and internal conflicts of redistribution. Second, it properly allows and plans for the general equilibrium effects of a dominant sector that may displace others through allocation and spending effects, especially if the dominant sector itself will disappear one future point in time. Auty (2001a) approaches the political economy of internal conflicts, and argues that mismanagement of resources lies at the core of the curse. He suggests that development may be halted, even reversed, by the pursuit of rents that easily becomes prevalent in resource-abundant countries. Leamer et al. (1999) tell a story centered on the general equilibrium mechanisms that shows how resource abundance in Latin America determined a certain capital allocation and development path that may not have been conducive to growth. They demonstrate that resource abundance may lead to a product profile that may delay or diminish the growth of manufacturing, which is thought to be of essence in development. This article discusses Norway's handling of both.

I discuss them by examining the recent economic history of oil riches in Norway and its relative performance in the economically, politically, and culturally homogeneous Scandinavia. Norway found a resource treasure in the 1969 while Denmark and Sweden did not. Two all-important questions emerge: Did Norway start catching up *after* having found oil? Did Norway *continue* its relative growth after oil had permeated the economy?

This article offers a definitive "yes" on the former, and believes that this helps identify oil as the cause for the acceleration leading to catch-up. It also offers a "yes" on the latter, and suggests that the avoidance of a deceleration is indicative of a well-managed natural resource gift. The article argues that a double affirmative constitutes a counter-example of the resource curse. In comparison, a yes-no combination on the above questions would be symptomatic of a curse, and a no-yes combination would reflect a general, oil-unrelated catch-up combined with well-designed policies of growth. A double negative, given an observed catch-up, would typically result from a general convergence followed by a business-as-usual process. But there is no "no" in what we observe. Instead, what we see is a spectacular Norwegian spurt leading to parity, followed by high-paced growth as it forges ahead of Denmark and Sweden. While none of the countries with extremely abundant natural resources in 1970 grew rapidly for the next 20 years in Sachs and Warner's study, Norway in contrast started oil production in 1971 and grew impressively for the next 20 years. And it continues to grow fast. Arguably, Norway is now the richest country in the world.

While establishing the fact requires advanced statistical tools; explaining why demands approaches from several less-quantifiable angles. For these reasons, the article has two distinct sections. First, I use structural break techniques to demonstrate the absence of the curse. I proceed to show that Norway also did not contract the disease, a fact, however, that has received some attention in the literature. Second, I invoke multiple-sourced evidence to build a story of why Norway escaped the curse and the disease. Doing so, I shall rely on policy indicators, appeal to institutional frameworks, and utilize a counterfactual simulation of the development trajectory that shows how Norway's performance would have been *without* oil discovery.

Let me say in advance where I am headed. The next section discusses some preliminary issues concerning comparative growth, structural breaks, and alternative development trajectories. Section 3 introduces the underlying theoretical framework for comparing relative economic development and the method for assessing it empirically. The identification of structural breakpoints is also explained. Section 4 presents the empirical evidence from the statistical tests. Section 5 discusses the explanations of why Norway succeeded in managing oil. Section 6 concludes and put forward policy implications. In an appendix, I describe the data set, present regression estimates, and outline the bootstrap algorithm I used in simulating thresholds for statistical inference.

2. Why Scandinavia is an especially interesting natural experiment

The Scandinavian experience is worth taking a closer look at. Forty years ago, Norway offered less attractive economic circumstances to its inhabitants than its immediate neighbors. Economic indicators show that Norway at the time was no remarkable place. Most important, gross domestic product per capita was significantly lower than in Sweden and Denmark. By the turn of the century, the positions were reversed. Today, Norway is in the lead, with Sweden and Denmark lagging. In the meantime, oil was discovered off the Norwegian coast.

The chronology of these two events, oil discovery and relative acceleration, is especially interesting when it occurs in a country that is so similar to its neighbors and when these neighbors do not have the same lucky strike nor have the same spectacular growth. Explaining this story or relative performance we find it less likely that the sudden growth was caused by cultural changes, new political institutions, or other unobservable causes and more likely that the sudden growth may be attributed to management of the resource gift. Thus, it is interesting when homogeneous countries experience heterogeneous development chronologically associated with the appearance of a valuable commodity in one of the countries. Of course, the explanation could be that the neighbors performed badly. That is not the case for at least the comparison with Denmark. In our data, the Scandinavian countries Norway, Denmark, and Sweden were ranked as numbers 9, 6, and 4 in the world by 1960 in terms of GDP per capita. By 1998, similar rankings were 2, 3, and 12. Thus, if anything, using world number 3, Denmark, as yardstick should make it harder than using most other countries to document Norwegian relative acceleration.

If I could substantiate that the onset of Norwegian catch-up really started *before* oil reserves were exploited, this finding would be inconsistent with an oil-alone explanation of rapid Norwegian growth. If, however, the catching up cannot be demonstrated to have started until *after* oil revenues befell Norwegians, it is consistent with the oil explanation, and Norway may then be a curse candidate. If Norwegian performance some time after an oil-fueled acceleration shows signs of a deceleration, we would classify this as a candidate for the resource curse phenomenon. Conversely, if there are few signs of deceleration even many years after the oil discovery, we may argue that we are witnesses to an escape from the curse.

The affirmative answers to the two questions posed above, begs a third question: Did Norway's non-oil economic sectors perform better or worse than they would have without oil? This is a question related to Dutch Disease[1]. To answer it, one would have to involve the concept of significant reductions in Norwegian manufacturing sectors in excess of the normal displacement all industrialized countries experience. While much resource literature focusing

[1] Dutch Disease may be defined in many ways. This article uses the term consistent with observations of shrinking non-resource export sector, in terms of labor hours and/or export receipts.

attention on Northern Europe has been preoccupied with Norway's possible contraction of the Dutch Disease and subsequent labor market re-allocations; see e.g. Brunstad and Dyrstad (1997) and Bjørnland (1998), there has been less emphasis on Norway's overall performance in aggregate production and growth. Moreover, there is a paucity of explanations for the Norwegian performance. This article seeks to remedy that by discussing the interplay between the curse and the disease and to suggest what policy approaches may be attributed the success. To see the relation between the curse and the disease, let me reiterate that the curse is related to aggregate production and the disease with the composition of the export base. But since the latter probably affect the former, and since the former possibly interact with the latter, one would be wise to study them simultaneously in understanding inter-temporal development. In Table 1, a simple tabulation shows how four combinations of curse and disease give potential realizations.

Table 1. Empirical Effects of a Resource Curse and a Dutch Disease

		Resource Curse	
		No	**Yes**
Dutch Disease	**No**	Overall growth and diverse export base	Stagnant growth, but diverse export base
	Yes	Overall growth, but reduced manufacturing	Stagnant growth, and reduced manufacturing

Different policies may be directed to address these different resource effects, but the policies may share a common politico-economical platform and originate from the same long-term goals for society. Such a social foundation would contain dimensions resembling Rodrik's (1995, 1997) initial conditions and propensity for governmental intervention, Eichengreen's (1996) notion of social contract, and Abramovitz' (1986) ideas on social capabilities. We shall see below how these contributions help us understand the early plans Norwegian policymakers made in order to deal with the newfound treasure.

While attempts at explaining policy foundations may necessarily be found wanting in rigor and validity, statistical tests designed to establish certain facts may be made transparent and accountable. The methodology this article employs in testing for acceleration and deceleration is straightforward. I compute differences between the GDP per capita in Norway and its neighbors, and examine the properties of the development of differences in the period 1960-1998 using structural break techniques for identification and Monte Carlo bootstrap simulations for inferences. The results are arresting. Norway clearly started a relative acceleration compared to its neighbors three and four years after oil production started in 1971. The Norwegian trend passed the Swedish trend eight years after oil production, in 1979, and the Danish trend early in 1985. Thereafter, Norway maintained a higher pace than Denmark and even increases its relative speed compared to Sweden after 1988.

3. Theoretical framework for locating relative acceleration and deceleration in time

I use one indicator of economic development in each of the three Scandinavian countries Denmark, Norway, and Sweden: gross domestic product (GDP) per capita converted to U.S. dollars using purchasing power parity; see Bureau of Labor Statistics (2000). I denote by y_t the gross domestic product per capita in Norway in year t. The variables x_t and z_t represent the gross domestic product per capita in year t of Denmark and Sweden, respectively. Let the differences $\delta_1^t = y_t - x_t$ and $\delta_2^t = y_t - z_t$ represent the differences between the gross domestic product per capita in Norway in year t and the corresponding gross domestic product per capita in Denmark and Sweden, respectively. The idea of a Norwegian catching up to economic parity with the neighbors is captured by negative differences δ_1^t and δ_2^t becoming zero. When Norway is lagging, the differences are negative. When Norway is at parity, the differences are zero. Differences become positive when Norway is leading.

First, the article identifies when economic parity occurred between Norway and both neighbors. To this end, two different assessment methods may be used. The first involves locating the last time t_L all preceding Norwegian GDP per capita were smaller than the Danish and Swedish equivalents. In addition, we locate the time t_F, after which all Norwegian gross domestic products per capita were larger than the Danish and Swedish equivalents. This will yield an interval in which the Norwegian gross domestic products alternated as being smaller or larger than those of the neighbors. The second method consists of performing a linear time trend regression of gross domestic product per capita, and calculating the time when the Norwegian regression line, the time trend, passes the Danish and the Swedish trends.

Second, and more importantly, I search for structural breaks. The idea of a smooth, non-oil related relative acceleration and eventual catch-up and passing is manifested by a pattern in which the differences δ_1^t and δ_2^t follow a linear progression through the full period. The alternative idea, an abrupt, possibly oil-related, relative acceleration and the onset of a sudden, possibly curse-related, relative deceleration would show up such that the same differences do not to follow a linear progression through the observed period. In stead, there will be one or several structural breakpoints, discontinuities or regime changes, after which the differences follow a changed path until a new break occurs. These ideas may be written rigorously and tested statistically using structural breakpoint analysis. To the best of my knowledge, it is the first time structural breakpoint analysis is used in this fashion.

Consider as null hypothesis a model of a linear development process of the differences between Norway and its neighbors, δ_1^t and δ_2^t, presented in equations (1)-(3).

(1) $$\delta_i^t = \alpha_i + \beta_i t + e_i^t, \qquad i \in \{1,2\}, t \in T,$$

(3) $$E(e_i^t) = 0, \qquad i \in \{1,2\}, t \in T,$$

(4) $$E(e_i^t e_j^s) = \sigma_i^2, \qquad when\, i = j, t = s, \qquad and = 0\, otherwise, \qquad i, j \in \{1,2\}; t, s \in T,$$

in which the parameters α and β represent the structure of the governing catch-up trend mechanisms for the two inspected differences between Norway and Denmark, subscripts i and j refer to the two inspected differences, and times t and s are years within the full period T. The e's represent error terms that are distributed identically and independently and have zero mean and constant variance, σ^2. Under the null, the ordinary least square slope coefficient estimate is consistent. In fact, it has a sufficiently high speed of convergence to be called hyper-consistent; see Hayashi (2000, p. 163). Under the null, the process is said to be *trend stationary*, consisting of a sum of two parts. The first part is a time trend and the second part is a stationary process, the white noise provided by the error term.

Equation (1) tells us that any change in intra-Scandinavian economic position follows a linear time trend pattern where the governing parameters α and β are constant over the period. Thus, the null hypothesis is that the process is trend stationary with two governing parameters, an intercept and a linear time trend. In this model, an oil discovery makes no difference.

Consider now the alternative model in which an oil discovery could lead to acceleration, deceleration, or both. In the problem at hand, both a level effect and a pace effect could occur in the relative intra-Scandinavian economic development. A level effect would manifest itself in the intercept, and could e.g. be due to sudden reaping of oil riches in Norway. A pace effect would be observable in the slope, and could e.g. be caused by oil-induced accelerated growth. These possibilities are exemplified in equations (4)-(6) for the special case in which there is one break.

$$(4)\qquad \delta_i^t = \alpha_i + \beta_i t + u_{1i}^t, when \quad t < b, and \quad \delta_i^t = (\alpha_i + \kappa_i) + (\beta_i + \lambda_i)t + u_{2i}^t, when \quad t \geq b, i \in \{1,2\}, t \in T,$$

$$(5)\qquad E(u_{ki}^t) = 0, \qquad i,k \in \{1,2\}, t \in T,$$

$$(6)\qquad E(u_{ki}^t u_{lj}^s) = \omega_{ki}^2, \qquad when\, i = j, t = s, k = l, \quad and = 0\, otherwise, \quad i,j,k,l \in \{1,2\}; t,s \in T,$$

in which the level effect is captured by κ_i and the pace effect λ_i, subscripts k and l denote period, of which there are two possibilities: before and after catch-up. The unknown breakpoint year is represented by b, and the error terms u are identically and independently distributed with zero-mean and constant variance. In the remainder I shall scrutinize models (1)-(3) and (4)-(6) empirically, and investigate whether the differences between the Norwegian GDP per capita and the GDP per capita of each neighbor follows a pattern in which the level and slope effects κ_i and λ_i are negligible at any and all suggested breakpoint years or particularly acute at possible candidate breakpoint years. In particular, I shall follow the idea that there may be a first breakpoint year b first such that Norwegian development accelerates and possibly a second breakpoint year c such that the Norwegian development decelerates. This, then, constitutes a test of the presence of a resource curse.

In order to compare models (1)-(3) and (4)-(6), I employ diagnostic structural break analysis; as described e.g. by Hansen (2001); and tabulate a sequence of test statistics designed to capture structural breaks in time series. Put differently, I first break the full period T, 1960-1998, into two periods: before and after candidate breakpoint years b, and I successively vary the breakpoint over a range of candidates. If one linear trend governs the full period, as stated by the null hypothesis, the sum RSS_{tot} of the residual sum of squares for period 1, RSS_1, and the residual sum of squares for period 2, RSS_2, has no distinct minimum when we compare sums of residual sums of squares for different candidate breakpoint years. The alternative hypothesis entails that the Norwegian relative development is better described as a linear step function at possibly different levels and with possibly different slopes. Then, the RSS_{tot} will have a clear minimum, and a concomitant F-statistic will have maximum.

In this study, I have simplified the alternative to be limited to two one-time breaks, one before parity and one after. I see at least two compelling reasons for doing this. First, from a theoretical point of view, the most interesting case in light of this article's purpose lies in whether there is none or at least one breakpoint of acceleration, and none or at least one breakpoint of subsequent deceleration. Second, from a technical point of view there are so many permutations of possible breaks that a full search would be highly involved; see Elliott and Müller (2002); and the complexity costs of such an analysis would not match the benefits. The simplifications of the alternative hypothesis make the search feasible and highly intuitive. The candidate breakpoint year may be found by identifying at what time the F-ratio reaches a maximum:

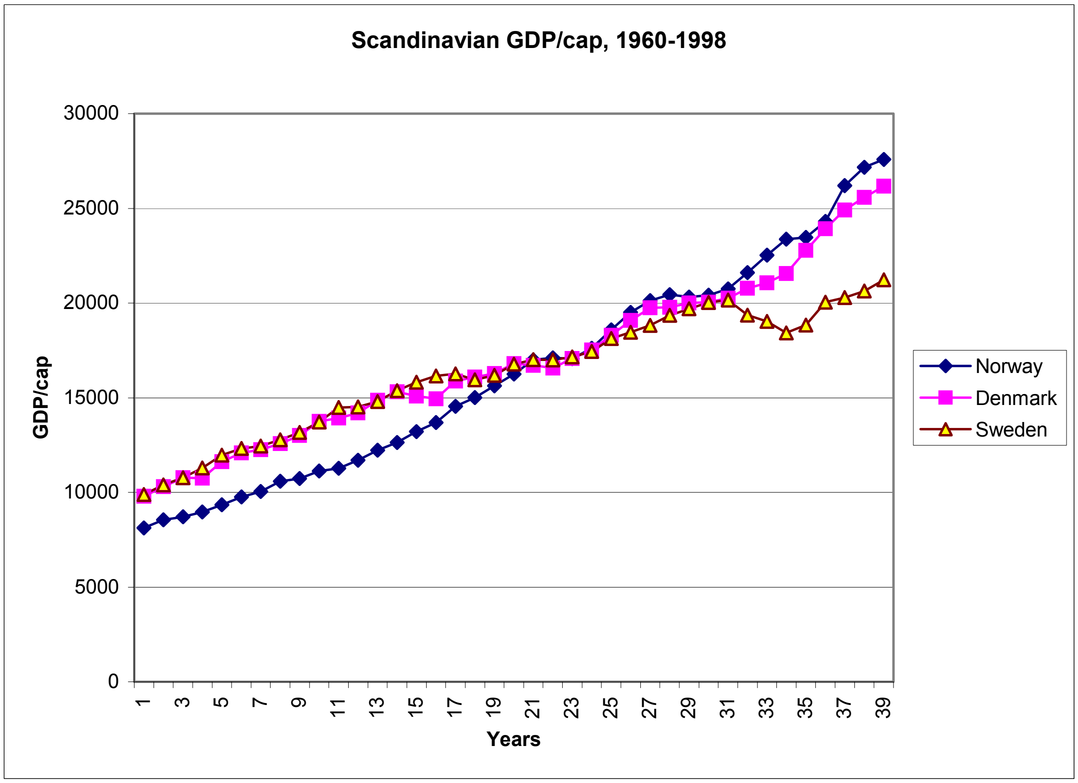
(7) $$F = [(RSS_R - RSS_U)/r]/[(RSS_U/(n-K)].$$

In equation (7), RSS denotes the sum of squared residuals, the subscripts R and U represent the restricted and unrestricted case, respectively; r the number of linear restrictions; n the number of observations; and K the number of parameters in the unrestricted case. I examine a series of F-ratios for two sub-periods, before and after the breakpoint year so r will be equal to 2 since in the null hypothesis there are restrictions to the effect that both intercept and slope are identical over the period. Thus, the restricted model, the null hypothesis, requires level and slope to be identical for both periods. The unrestricted case allows both different levels and different slopes for the period before the breakpoint year and after, reflecting oil's possible level and slope effect. In the appendix, I include an explanation of how to make inferences and perform tests after scrutinizing the data using bootstrap Monte Carlo simulation schemes.

4. Empirical Results

This article finds that Norway passed its neighbors in terms of GDP per capita around 1980. The Norwegian trend passes the Swedish trend as early as 1979, and overtakes the Danish trend in 1985. But the catch-up was not smooth. Until the early 70s, the gap between Norway and its neighbors expanded. This article's structural analysis shows that suddenly, in 1974, Norway started accelerating relative to Sweden, and the year after compared to Denmark. After having caught up with its neighbors, Norway still forged ahead at a higher pace than Denmark and Sweden, even if the growth difference between Norway and Denmark was somewhat slowed down.

Figure 1. GDP per capita in Scandinavian Countries, PPP, 1960-1998 (in 1998 US Dollars)



Source: Bureau of Labor Statistics, 2000

Parity

First, let us focus attention on the question of parity. In Figure 1, Scandinavian levels of GDP per capita are depicted. We observe that Norway trailed both Denmark and Sweden economically in 1960. In terms of GDP per capita at purchasing power parity, we see that Norway produced output at a level of 8120 U.S. dollars (USD) per capita, much below Denmark's USD 9793 per capita and Sweden's leading USD 9894 per capita. In 1998, Norway was the Scandinavian leader, and Norwegian citizens produced on average USD 27581 per year, while Danes delivered USD 26176 per year, and Swedes only 21218. Thus, during the four decades the ranking was reversed, and the most notable story is Norway's ascendancy to the top. By visual inspection of Figure 1, it is not obvious when Norway became the leading producer nor is it obvious whether the catch-up was gradual (e.g. from emulation) or a spurt (e.g. oil-induced). Moreover, it remains unclear whether Norway slowed down compared to Denmark after parity. Data show that the absolute size of the gap between Norway and its southern neighbor in GDP per capita was largest in 1973, in which Danes were ahead by USD 2673 per capita, while the gap between Norway and its eastern neighbor was largest in 1970, when it was at a magnitude of USD 3212. In relative size, the Danish lead was largest in 1964 when it amounted to 24 per cent of Norwegian GDP per capita, and the Swedish lead largest the same year, when it amounted to 28 percent of Norwegian GDP per capita. Thus, while Norwegians overcame the largest backwardness in percentage terms as early as 1964, the absolute bottom came as late as 1973.

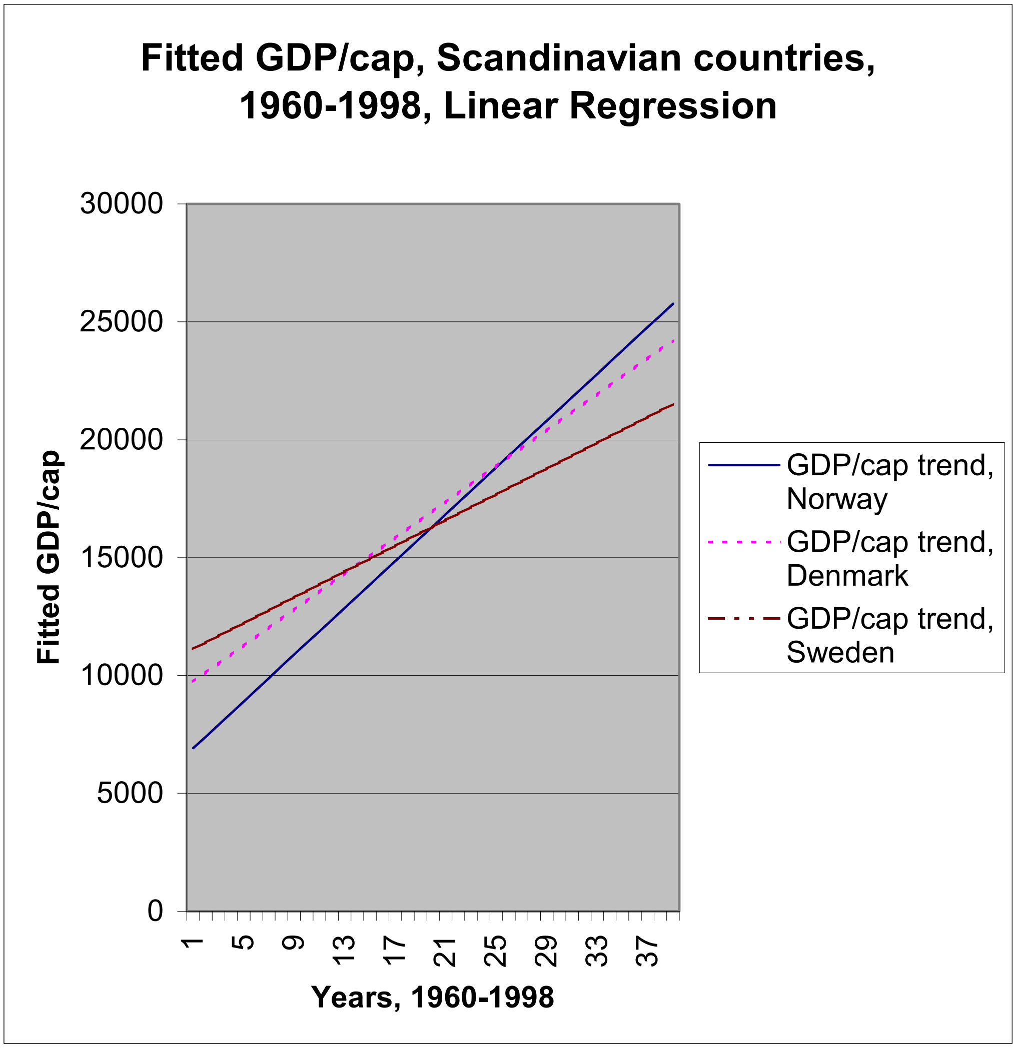
Norway discovered oil in 1969 and started production in 1971. In 1980, Norway had a larger GDP per capita than Denmark for the first time. In 1982, Denmark had a larger GDP per capita than Norway for the last time. In 1981, Norway outdistanced Sweden for the first time, and in 1982 Sweden was ahead for the last time. It appears that in terms of GDP per capita, Norway trailed its neighbors until 1980, and led from 1983.

A linear regression of GDP per capita onto time listed in Table 2 shows that the Norwegian trend surpassed the Danish trend in the winter 1984-85 and the Swedish trend in spring 1979; given that each year is tabulated by its midpoint value. Figure 2 shows the three trends. Notice in Table 2, that the Norwegian slope coefficient in the trend fitting is as large as USD 496 per capita per year, while the Danish slope is USD 381 per capita per year and the Swedish is USD 273 per capita per year. These results alone open the possibility that Norway already in 1960 was on a development path with larger growth than its neighbors, and that this higher growth eventually would lead to catch-up and passing, with or without oil. However, we realize that the trend does not account for breaks, and we demonstrate below the importance of examining exactly that, structural breaks.

Table 2: Linear Regression of GDP/cap for Scandinavian countries onto Time, 1960-1998 (t-values)

Country	**Intercept**	**Slope**	**R-squared**
Norway	6911.2 (29.8)	496.2 (47.2)	0.984
Denmark	9745.0 (42.5)	380.7 (36.7)	0.973
Sweden	11124.6 (49.0)	273.0 (26.6)	0.950

Figure 2: GDP/cap in Scandinavian countries, 1960-1998, PPP, Fitted Linear Time Trend

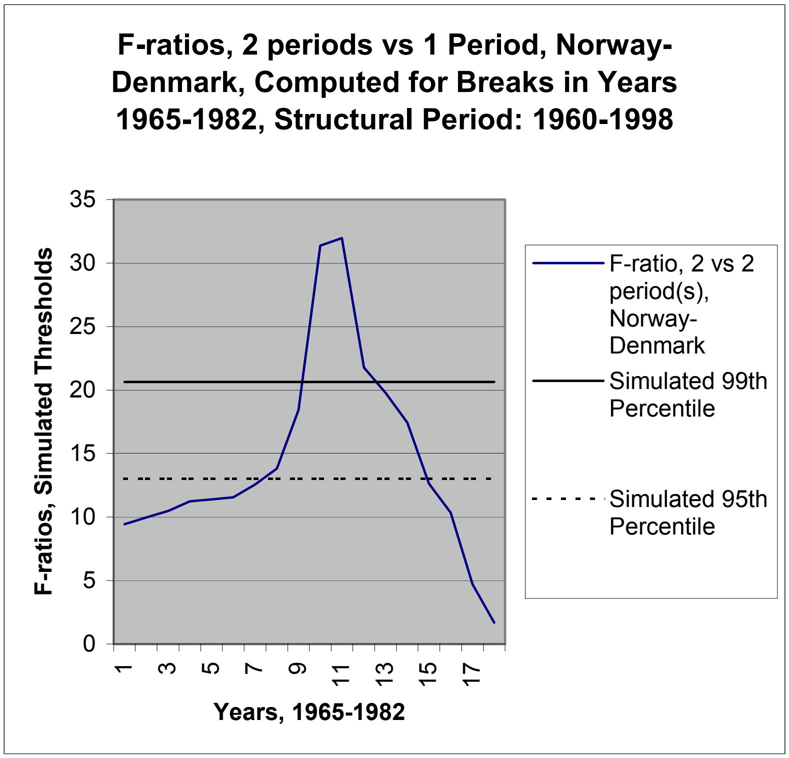


Note: Linear regression of GDP/cap for each country on time

Acceleration After Oil and Before Parity

Let us turn to the issue of breakpoints. We are interested in investigating whether and locating when breaks occurred before and after parity. This article performs the standard structural break technique by splitting the sample into two periods, and then computes a linear regression of GDP per capita differences for Norway vs. Denmark and Norway vs. Sweden on time for each of the two periods separately.

Figure 3: F-ratios, Norway-Denmark, Computed for Breaks in Years 1965-1982, Structural Period: 1960-1998



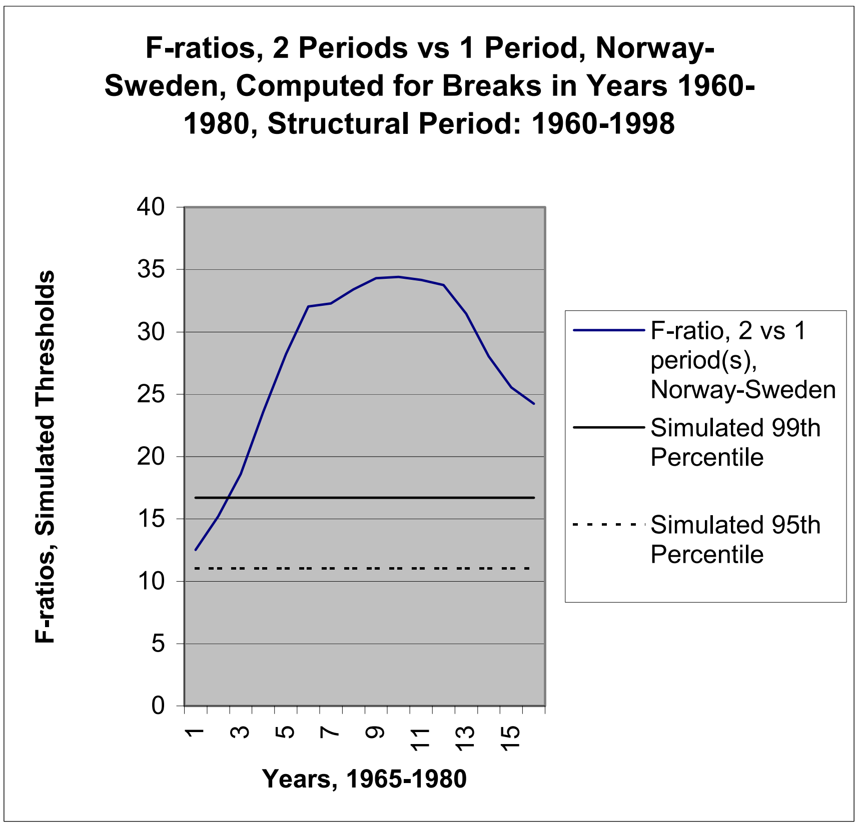
Note: The most likely breakpoint year occurs when F-statistic reaches its maximum: 1975.

Figure 3 shows a computation of F-ratios as given by equation (7) for the null hypothesis versus the alternative for candidate breakpoint years occurring in the period 1965-1982. The full period (the sum of the two split periods) ranges from 1960 to 1998. The F-ratio reaches 31.97 in 1975, and thus identifies 1975 as the most likely breakpoint year for the relative development of Norway compared to Denmark. A non-parametric bootstrap Monte-Carlo simulation of the distribution of the F-ratio yields a 99th percentile of 20.64 and a 95th percentile of 13.00. The maximum of 1000 simulations is 26.08; see the Appendix for a description of the simulation rationale and algorithm. Thus, observing Figure 3 there can be little doubt that a structural break occurs between the development in GDP per capita in Norway and Denmark in the middle of the 70s. In fact, by rejecting the null hypothesis of no structural breakpoint year we typically make a type-I error (rejecting a true null) less frequently than in 1 out of 1000 times.

The change in F-ratios is arresting. The year 1975 emerges as a very likely candidate for a breakpoint. The slope coefficient for the *difference* between Norwegian and Danish GDP per capita for the period under the alternative hypothesis 1960-1974 was -52 U. S. dollars per capita. Thus, until 1975 it does not seem as if Norway was on a path to overtake Denmark. On the other hand, the Danish trend appears gradually to outdistance the Norwegian. However, the slope coefficient for the Norwegian-Danish difference for the period 1975-1998 changes dramatically to 106 U.S. Dollars per capita, clearly indicative both of a change of pace and of a relative slope that would eventually lead to parity, and subsequently to Norway passing Denmark. Thus, a clear breakpoint is identified, before which the Norwegian performance was increasingly falling behind the Danish performance and after which a role-reversal is observed. This evidence supports the notion of an oil-induced spurt.

In consequence, it is tempting to reject the hypotheses that Norway's catch-up started before the oil-era. Possibly and probably, a catch-up would not have happened without oil. Of course, the fact that events occur simultaneously or with an intriguing time lag does not imply that the relationship is causative. If anything, reversed causality arrows are sometimes possible, even plausible. However, in the present case we realize that the oil receipts entered the computation of the GDP, and thus the GDP per capita, and that they started doing so in a dominant way at the same time that we have identified the break point. We conclude that there was a structural break in GDP per capita, and that it was most likely caused by revenue from oil exports.

Figure 4: F-statistics, Norway-Sweden, Computed for Years 1965-1980, Structural Period: 1960-1998



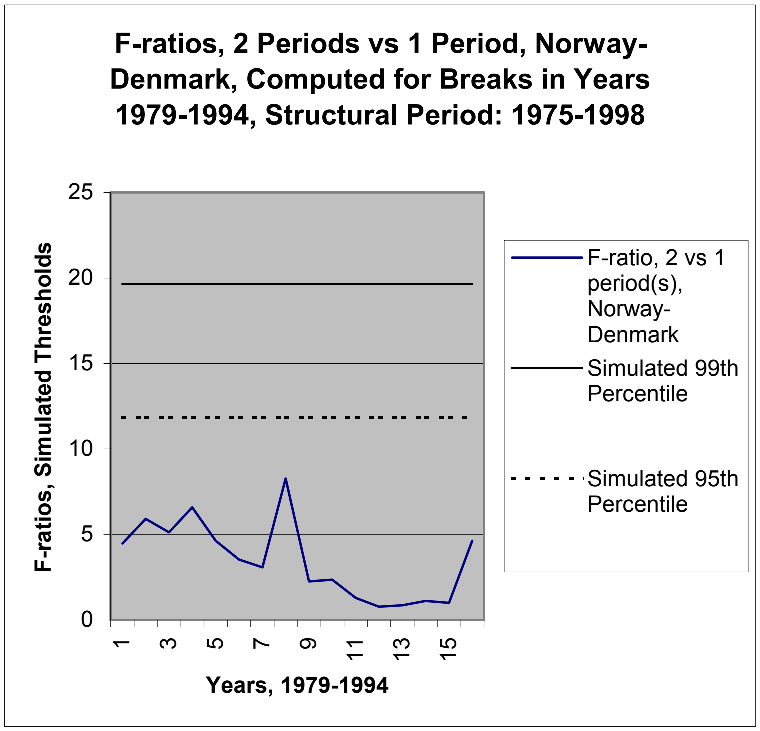
Note: The most likely breakpoint year occurs when F-statistic reaches its maximum: 1974.

This is confirmed in the evidence from the relative development between Norway and Sweden. Inspecting Figure 4, we find that the F-statistic for the Norwegian-Swedish performance reaches its maximum in the 1974. The simulated critical thresholds for the F-ratio are 16.69 for the 99th percentile and 11.05 for the 95th percentile. The maximum simulated F-ratio for 1000 simulations under a true null hypothesis is 31.53. Rejecting the null hypothesis involves committing a type-I error less than 1 in 1000 times. Thus, we may conclude that Norway's relative performance to Sweden changes in a structural break, and that the breakpoint occurs only a year before the breakpoint in the relative performance to Denmark.

Continued Growth After Parity

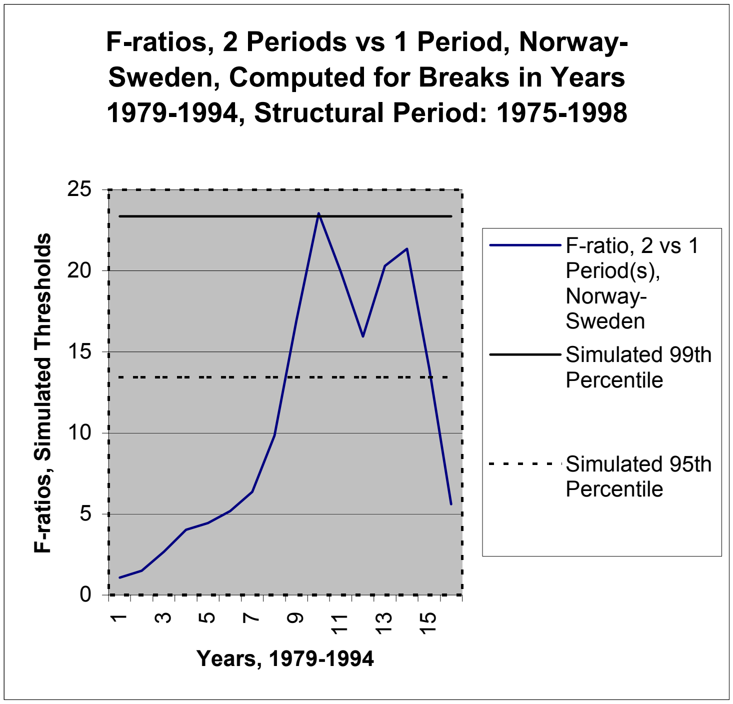
The Norwegian catch-up appears to have been induced by oil, in itself a valuable finding. However, that finding alone does not illuminate the whole picture of a resource curse possibility. If a Midas hand of riches touched Norway, the curse should manifest itself by economic paralysis in the shape of an increasingly visible slow-down in GDP per capita relative motion. A curse forces the relative acceleration to change sign and become a relative deceleration and leave Norway with a lower pace than its neighbors. Thus, sometimes after parity the spurt should stop. In technical terms, a curse entails a structural break after 1980 in which the slope changes sign from positive to negative. Figure 5 shows that we do not observe a deceleration breakpoint occurring after the acceleration breakpoint in 1975.

Figure 5: F Statistics, Norway-Denmark, Computed for Years 1979-1994, Structural Period: 1975-1998



In Figure 5 we present the computed F-ratios for the breakpoint candidate years in 1979-1994 when the full period investigated for structural breaks is 1975-1998. I simulate the distribution of the statistics by the semi-parametric Monte Carlo bootstrap, and find that the 95th percentile is 11.85, that the 99th percentile is 19.65, and that the maximum of 1000 simulated ratios of breakpoint at mid-period is 33.34. Inspecting Figure 5, we see that even the maximum F-ratio at 8.27 observed for 1986 is clearly below the simulated 95th percentile. Thus, we cannot reject the null hypothesis of one process governing the development over the full period 1975-1998. In fact, close examinations, not reported here, of the individual regressions shows non-negative slope coefficients for all pairs of sub-periods after the acceleration year 1975. At no point does the estimated slope of difference between Norway and Denmark become negative. In other words, the resource curse seems absent. There is no clear breakpoint, and the Norwegian pace remains higher than the Danish.

Figure 6: F Statistics, Norway-Sweden, Computed for Years 1979-1994, Structural Period: 1975-1998

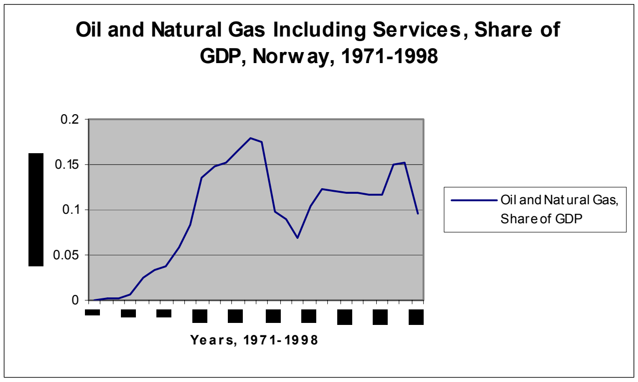


In Figure 6 I present the computed F-ratios for the relative Norwegian-Swedish development for the candidate breakpoint years 1979-1994 when the full period investigated for structural breaks is 1975-1998. When simulating the distribution of the statistics by the semi-parametric Monte Carlo bootstrap, I find that the 95^{th} percentile is 13.45, that the 99^{th} percentile is 23.37, and that the maximum of 1000 simulated ratios of breakpoint at mid-period is 42.06. Inspecting Figure 6, we observe that the maximum F-ratio of 23.56 observed for 1988 is approximately identical to the simulated 99^{th} percentile. Thus, we may reject the null hypothesis of one process governing the development over the full period 1975-1998 at a p-level of 0.01. Does this mean that we find traces of a curse when comparing Norway to Sweden? No. The breakpoint is of the opposite kind. The change in sign is not from positive to negative, but from positive to more positive. Norway speeds up even more relative to the Swedes late in the 80s. Or put more correctly, Sweden slows down. As is well known, the Swedish economy was put under rigorous restructuring, and a major overhaul of the welfare system took place in the early 90s. Sweden thus experienced a period of some increased inactivity and vacant capacity.

The Dutch Disease: Oil versus Non-oil Sectors

As we saw in Table 1, an economy may escape the curse but still suffer from the Dutch Disease. Brunstad and Dyrstad (1997) find some evidence for the presence of Dutch Disease, but Bjørnland (1998) convincingly demonstrates, using a vector autoregressive technique, that not only did Norwegian manufacturing not suffer from the resource discovery, it may actually have benefited from oil production. This is in accordance with simulations in Cappelen, Eika, and Holm (2000) to which I shall return below. The manufacturing sector seems to benefit from the oil-discover, which is an interesting possibility, and may be related to the theoretical findings of Torvik (2001). He shows that in a plausible model of learning by doing spillovers between sectors can lead production and productivity in the traded and non-traded sector to go up and down. Ultimately, he shows, displacement is an empirical question. Building on Bjørnland; Cappelen, Eika, and Holm; and Torvik, let some pieces of evidence suffice to demonstrate the absence of a prolonged, major Dutch Disease. These pieces are: oil's share of GDP over the period, oil's shares of exports over the period, recent productivity statistics for oil and gas extraction and mainland-Norway, and oil's share of total labor hours.

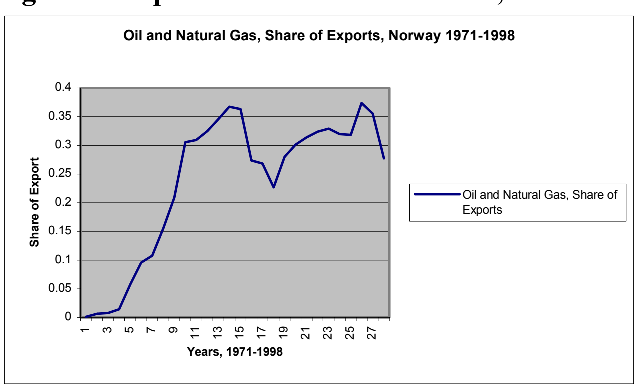
Figure 7. Oil and Natural Gas Production as Share of GDP, Norway, 1970-1998, Domestic Prices



Source: National Accounts, Statistics Norway. Online: http://www.ssb.no/emner/09/01/nr. Table 13.

From Figure 7 we see that initially oil production did displace other production since the resource sector developed as a significant part of GDP. The value of oil production increasingly dominated the GDP until 1984 when it almost represented 19 percent of economic activity. However, after the OPEC III shock in 1986 oil's dominant position in Norwegian economic performance diminished and has since fluctuated between 10 and 15 percent. Norway's National Accounts[2] show that extraction of oil and gas, including services, never exceeded 1.3 percent of total labor hours in the period 1971-1998. Thus, the extraction activity does not occupy a large share of Norwegian laborers nor does it increase its share. On the other hand, the sector is highly capital intense. In fact, Cappelen, Eika, and Holm inform us that the oil sector has a capital intensity that is 33 times that of the manufacturing sector. Interestingly, this capital intensity may involve important technology and knowledge spillover effects along the lines Torvik suggests.

Figure 8. Export Shares of Oil and Gas, 1971-1998



Source: Norwegian National Accounts, 1971-1998. Online: http://www.ssb.no/emner/09/01/nr/. Table 34.

[2] National Accounts, Statistics Norway, Table 21. Online: http://www.ssb.no/emner/09/01/nr.

Moreover, we observe in Figure 8 that even as much as two decades after the discovery of oil, Norway's dependency upon oil was not increasing, if anything is was decreasing. The export of oil doubled in volume from 1989 to 1998; from 65 134 000 tons to 131 268 000 tons and exports of natural gas increased approximately 50 percent from 28 674 million cubic meters to 42 665 million cubic meters.[3] On the other hand, from Figure 8 we observe that the value share of oil and gas exports were 28 percent for both 1989 and 1998. Of course, the value of oil and gas critically depend on world prices of oil, and these prices fluctuate. Nevertheless, we do observe over the period that high or low prices, the value share does not seem to surpass its early peak, contrary to a Dutch Disease hypothesis.

Table 3. Growth 1993-1998, Norwegian National Accounts, Sector Production and Hours, Domestic Prices[1]

	Oil and Natural Gas[2]	**Industry**	**Government Adm./ Services**	**Mainland[3], Norway**
Production or GDP	19.8%	38.1%	34.5%	35.2%
Total Labor Hours	11.1%	11.4%	4.2%	9.1%

Sources and Notes: [1]Statistics Norway, National Acccounts. Online: http://www.ssb.no/emner/09/01/nr. Tables 13 (GDP) and 21 (Hours). [2]Includes services. [3]There is overlap. Fourth colum includes second and third.

Table 3 offers statistics on the resource movement and spending effects named central to the disease in the literature. First, production value of Oil and Natural Gas increased less than other sectors. Second, industry is not dismantling. Its value production value has the largest increase. Third, industry's labor hours also show the largest increase in the recent period, thus the resource allocation effect is not present in this period. Fourth, governmental administration and services has a large increase in production value compared to total labor hours, which may be indicative of real appreciation and perhaps of the presence of a spending effect.

In summary, Norwegian manufacturing is still producing, is still productive, and is still delivering export receipts from a diverse export base. Resource extraction is not increasingly dominating GDP or exports even when absolute volumes of production have increased rapidly. It appears that Norway is not suffering from the disease.

5. Why did Norway escape the curse?

Having established that Norway escaped the curse and the disease leads to the question of how. But answering how presupposes the existence of an accepted framework within which to understand growth. This framework is absent, and its absence complicates attempts at offering a full and satisfactory explanation of Norway's escape. Sachs and Warner summarize the challenge: "Just as we lack a universally accepted theory of economic growth in general, we lack a universally accepted theory of the curse of natural resources." Naturally, we lack a consensus explanation for why Norway succeeded in managing its resources when so many have failed. I shall rely on a foundation of three approaches in presenting how to understand the foundations for Norway's successful policies. One easy explanation would be to say that Norway escaped the curse because it was an industrialized modern country, implicitly saying that the curse only affects industrializing countries. But that is not really an explanation since

[3]Table 360, Statistical Yearbook, 2002, Oslo: Statistics Norway.

it naturally leads to the question of what features of a developed country prevents the curse. In the remainder, I shall point towards facets of the Norwegian economy and Norwegian policymaking that probably contributed to the escape. The story will resemble Rodrik's (1995, 1997) explanation of growth in Asia by focusing on favorable initial conditions upon oil discovery such as educated labor force, an equal society with strong norms for equity, and well-targeted governmental interventions that allowed, even invited, a symbiosis between the state and markets. The explanation will also make use of societal features akin to "social capabilities" in Abramovitz (1986). A special focus of attention shall be put on the notion of social contract similar to the one highlighted by Eichengreen (1995). This notion involves a willingness among workers to refrain from distribution conflicts as long as employers and owners show equal restraint and manage a continuous growth of total output. Moreover, it requires an institutional set-up to achieve coordinated wage negotiations that ensure moderate wage increases linked to productivity performance, not labor conflicts and rent-seeking.

In general, the literature on the curse and the disease has focused attention on two major effects that countries are exposed to when they find a valuable resource. First, the presence of valuable resource may lead to disruptive conflicts over redistribution. Second, the extraction of a valuable resource displaces other economic activities and some of those other activities may play crucial roles in the overall development path. The former may cause the curse and the latter the disease.

In understanding how Norway managed the former effect, I emphasize institutions and norms in the Norwegian society. To explain how Norway was able to protect itself against the latter, I shall rely on the channels of Norwegian wage formation and deliberate polices. Both explanations, however, share common themes: the separation of resource revenues from the rest of the economy, the maintenance of a variegated productive capacity, and a sense of fair distribution of wealth. As an interesting consequence of the argument, we shall see that an economy that features some degrees of collective action and coordination may have certain advantages in resource management over an economy that is characterized by individual, atomistic action and decentralization. As a corollary, when there are inertia, rigidities, irreversibilities, and path-dependencies in the endogenous determination of the inter-temporal profile of comparative advantage, and when a country may experience a time-limited presence of a valuable resource, then deliberate policies that target the inter-temporal profile of comparative advantage and general industry variation may be socially preferable to leaving the adjustment processes alone.

Let me address first the conflicts over redistribution, then the displacement of manufacturing activities. There exists a large literature on why conflicts over redistribution are disruptive to economic performance; here there is not sufficient space for a review. Let it suffice to mention Auty's (2001a) use of predatory behavior and factional fights in some political states to explain stagnation and Auty (2001b) who argues that rent-seeking degenerates into corruption, which discourages investment and limits growth. Moreover, Gylfason (2001b) emphasizes the quality of management and efficacious institutions in handling resource gifts and Baland and Francois (2000) argue that the opportunity costs of rent-seeking is foregone entrepreneuship. For example, Paldam (1997) demonstrates how rent-seeking has affected Greenland negatively.

Such conflicts, especially in the shape of rent seeking, involve coalition formation to prey on victimized weaker groups in a non-transparent way, affecting the country's production, labor effort, trust, and investment. Norway has been able to maintain low frequencies and small amplitudes of conflicts. The following two factors may help understanding why: First, oil revenues befall the government. Thus, any attempt at securing for oneself a larger share of the pie has to go through negotiations with the government. Second, the avenues that ensure access to oil revenues for individuals are in fact limited. To see how oil revenues are channeled through the government, recall the following structural relations: the government taxes profits of private oil companies, the government owns its own oil company, and the government owns the ground from which oil is extracted. The avenues to revenue access then may take two forms, illegal and legal.

Illegal confiscation through corruption, theft, and misreporting is infrequent due to the transparency of a small country, a well functioning legal system, media scrutiny, and strong social norms. Table 4 below shows comparatively low levels of corruption in Norway. A norm for equality has been found empirically to receive much popular support in Norway, and is documented by Barth and Moene (2000), and is the foundation upon which both the deterrence of rent-seeking and coordinated wage negotiations are built. When norms fail, a strong and swift judicial system appears to detect and thus deter individual, fractional, and unlawful enrichment. The latter may then be seen to be one of the reasons why, possibly, developed countries are less prone to be affected by the curse.

Legal persuasion is possible for any Norwegian citizen through negotiation. The negotiation may take the form of direct wage negotiation or through lobbying in parliament for subsidies and support, tariffs, and tax relief. There are some examples of powerful unions securing favorable wage increases and pressure groups that have been quite successful in lobbying for transfers, subsidies, and other benefits, but overall this activity does not seem widespread.

Moreover, since the public sector employs a large share of the Norwegian labor force, and since the government may finance this service stream by converting oil assets denominated in dollars into Norwegian kroner, it is at any time possible that individuals or fractions seek to appropriate larger parts of the oil wealth either by persuading the public sector to employ them favorably or by persuading the public sector to accept large wage raises. This would be especially acute in situations where individual employees negotiated with an individual public servant and where the latter would not face the costs of yielding to pressure, thus yielding moral hazard possibilities. This principal-agent problem is largely avoided, however, since most wage negotiations go through a collective and transparent forum, results of which are reported daily in the media. In Table 4 below we observe that Norway has the most centralized wage formation system among countries Wallerstein (1999) inspected, and it is upon this background we can understand collective control of resources and collective restraint. It is well worth to note that the underlying acceptance for wage moderation and equality is based on popular support for egalitarian goals. Barth and Moene (2000) demonstrate empirically that this support finds fertile soil in Norway, and row 4 in Table 4 below show that Norway is among the most equally paid laborers in the industrialized world.

Let us now turn to how the government disposes of the receipts. There are at least two categories and three ways it can utilize such receipts, all affecting overall growth. In the first category the government simply keeps the receipts as financial positions abroad denominated in foreign currencies. In the second category the government converts all or some of the oil wealth into Norwegian kroner and uses them as any other budget post. In this class, the government can utilize the command over real resources in growth-friendly or growth-unfriendly ways. Of course, it is tempting to classify the former as investment and the second as consumption, but growth theorists know that is too simplistic. Much governmental consumption is growth-friendly because it amounts to coordination of and facilitation for private production. Some governmental investment is growth-unfriendly because it directs resources to misplaced positions. Additionally, two different capacity-utilization environments may occur. First, there may be full employment so that the economy is at full capacity utilization. Second, there may be excessive, involuntary unemployment so that the economy has idle capacity. In the second environment, governmental investment and consumption do not necessarily crowd out private sector. Whether there is crowding-out or not depends on which sector is involved and inter-sector mobility. In the first environment, governmental investment and consumption do crowd out private ones.

Note that economic efficiency, in the absence of inertia, path-dependence, distributional concerncs, rigidities, externalities and inflexibility, entails transfer of labor from manufacturing. Thus, the Dutch Disease may be a misnomer. Rather, such adjustment is an optimum adjustment, and in the static general equilibrium framework is thought to reverse quickly when the resource streams diminish. However, in the presence of the mentioned inter-temporal effects, combined with learning-by-doing in the manufacturing sector, there may exist externalities that call for intervention. Moreover, distribution and efficiency may not be orthogonal to one another and thus allow governments to consider real world trade-offs. Governmental correction is called for if adjustments constitute an inter-temporal market failure. The government must then "save" manufacturing during the intense competitive pressure during the resource boom or else irreversible or hard-to-acquire investments may be lost in the form of human capital and organization; or rent-seeking and other behavior bring detriments to norms, distribution, and economic mechanisms. It is, for example, a stylized fact that overall growth success is related to success of tradable sector. Thus, governments may be wise to seek to keep this sector vibrant.

Table 4. Comparative Development, International Statistics, Selected Countries, 2001

	Norway	**Denmark**	**Sweden**	**Germany**	**United States**	**Japan**
Labor Force Participation rate[1]	80.5	80.0	76.8	69.0 (Euro-area)	74.9	78.2
Corruption Index, Rank[2]	12	2	5	18	16	20
Human Development Index[3]	1	15	4	17	6	9
Wage Differences[4]	4.5	5.4	4.1	6.6	17.0	-
Index of Centralization in Wage Formation[5]	2.7	2.58	2.53	1	0.14	0.67

Source. [1]OECD. Online: http://www.oecd.org/xls/M00037000/M00037562.xls. [2]Transparency International. Online: http://www.transparency.org/cpi/202/cpi2002.en.html. [3]Human Development Index, United Nations. Online: http://www.undp.org/hdr2001/. [4]Barth and Moene (2000), Table 3.1, quoted statistics show standard deviation of relative wage differences between branches of the private sector comparing employees with identical level of education, gender, and work experience. [5]Wallerstein (1999). Index ranges from 0 to 3, in which 3 represents centralized negotiations on national level and 0 represents local wage formation within individual firms.

Thus, policy and governmental action matter. This attitude characterized Norwegian planners in the early 70s and Cappelen, Eika, and Holm point out that e.g. dangers of Dutch disease were known among governmental officials who suggested deliberate counteracting policies. Several types of hands-on management were first contemplated then implemented. One type is deliberate deployment of factors to ensure an inter-temporal smoothing of comparative advantage profiles. This can come in the form of the "Big Push" type of Sachs and Warner (1999) or result from a thinking based on what Gylfason (2001b) terms the four varieties of capital: physical, human, social, and natural. Both lead to investments in education, knowledge creation, research and development, and to an allowance for industry protection. Wijnbergen (1984) provides another rationale for these policy types in which a diversified export base simply is a good future insurance because learning-by-doing and spillovers makes diversity preferable to singularity. Since information and knowledge is a public good, there is need and room for intervention. Torvik's (2001) model of spillover effects lead to similar ideas of management. Overall, this kind of management addresses the trade-offs between short-term efficiency and the long-term export base when there exists a resource movement effect in a resource boom.

Another policy type addresses the spending effect, and involves urging fiscal restraint on budgets and moderation in wage negotiation. A third type is directed at lowering the natural rate of unemployment using the special revenue situation resource countries find themselves in. A fourth type targets capacity utilization by employing aggressive counter-cyclical policies.

Norway embarked on ambitious combination of these general types. First, it used price subsidies, transfers, and tariffs to shield and support certain domestic industries. Second, it invested heavily in education and know-how. Third, it followed counter-cyclical polices probably more enthusiastically than would have been feasible without the resource to increase employed laborers share of the labor force. Fourth, labor market reforms were implemented to increase the labor force's share of the population. Fifth, wage control and income coordination programs were followed in nation-wide negotiations. The programs fell into an umbrella framework later named "The Solidarity Alternative". Sixth, an expenditure-limitation policy of fiscal prudence directed to shield the economy from spending effects was institutionalized through the establishment of the Petroleum Fund and the so-called "Usage Rule" that limits exploitation to an annual four percent of the Petroleum Fund.

The first is evidenced by the large yearly budgetary transfers and the second is exemplified by findings in Hægeland and Møen (2000) who show that while Norway in the 50s were at the OECD mean at 8 percert in regard to people with university education, today Norway has a share at 20 percent when the OECD mean is 15 percent. Research and development in 1963 amounted to 4 500 annual workloads, and it soared to 14 500 in 1995.

The third is discussed in Cappelen, Eika, and Holm (2000) and Bjørnland (1998) mention the fourth and Chatterji and Price (1988) construct a model in which oil discovery may lower long-term equilibrium unemployment. In the first row of Table 4, we observe the remarkably high labor force participation rate in Norway, a testimony to the success of these structural policies. This article shall emphasize the importance of the fifth, wage control and income coordination, and follows Huchison (1994) who points to key role played the centralized system of pay determination and Cappelen, Eika, and Holm who go through the facets of Norwegian wage formation. In the literature, there is consensus that the Dutch Disease works through two main mechanisms, resource movement and spending. Resource movement taps non-resource industry for labor by bidding up wages and spending leads to real appreciation through the costs of non-traded goods relative to traded. Both mechanisms work slowly when a large proportion of wages are set in highly centralized and coordinated fashion such that general productivity indices are computed first by technical agencies and used as a basis for negotiations. Wallerstein (1999) demonstrate that Norwegian wage formation is the most centralized among OECD countries; tabulated in row 5 in Table 4. In Norway, the wage rate in manufacturing is the wage leader and Cappelen, Eika, and Holm show that this rate is dependent on the unemployment rate, income taxes, unemployment benefits, prices, and productivity in line with the model of Chatterji and Price (1988). The wages in this sector and productivity computations are fundamental in the pay coordination and negotiation system. In essence, these efforts and institutions limit wage competition dominated by a booming sector and thus de-industrialization. Evidence for the sixth is tabulated in Table A1 in the appendix, the growing size of a public Petroleum Fund kept in foreign financial assets, shielding the Norwegian economy.

Thus, the story of governance, public ownership and management, structural policy, and income coordination in wage formation may explain why Norway avoided conflicts over redistribution and an accelerated de-industrialization. A key point in Norway's development was the public demand and the policy goal that wealth be distributed equitably among citizens. A strong public sector, perceived as just, efficient, and efficacious, ensured wide support for keeping the converted natural wealth in foreign financial assets instead of bringing it home in an attempt to increase consumption. This laid out a social contract between citizens and government, and the success of increasing standards of living ensured its acceptance and popularity. Norway followed a trajectory resembling Auty's model for competitive industrialization without private or public actions that distorted relative prices, the development of productive capacity, or enjoyed excessive consumption. It is noteworthy to observe that already in 1971, a unanimous Norwegian parliament accepted a policy formulated as "The Ten Oil Commandments" (Teknisk Museum (2000)) sketching the contours of the above mentioned policy dimensions. In 1974, governmental analysis presented to the Parliament discussed Dutch Disease even before it became commonplace in economic literature; see Cappelen, Eika, and Holm (2000). In 1975, the parliament decided that several structural reforms be implemented as a result of the growing oil sector, for example intensified agricultural activities and industrial production. Thus, Norwegian policymakers deserve honor for prescience.

Finally, we may ask what would have happened had Norway *not* found oil. The answer, if possible, serves as a yardstick for measuring the benefits and burdens of the resource. Cappelen, Eika, and Holm attempt a simulation of the effects oil have had on the resulting Norwegian performance. In their simulation, they use carefully calibrated models designed to capture the uniqueness of Norwegian wage formation, the core element in understanding oil-era development. They then compare the Norwegian factual oil-trajectory with the counterfactual path without oil. The results listed in Table A2 in the appendix show that without oil Norway would have developed similarly to Western Europe. They find in row five that the real GDP growth for a quarter of a century may have been as low as 1.8 percent per year without oil compared to 3.3 percent with oil. In the first row we observe the growth in real wage for the manufacturing sector. It has been 47 percent, but would have been only 33 percent without, given the simulation.

In summary, Norwegian institutions and policy managed to make oil a blessing. It avoided the natural resource curse and grew strongly. It avoided the Dutch Disease and maintained a diverse non-oil manufacturing sector. This was achieved through a complex mix of policies that shielded the economy from overheating, displacements, wage pressure, and productivity reductions. It was possible since the resources were publicly owned and publicly managed. Social norms, centralized wage formation, and an affinity towards equality ensured that the populace rested assure that the oil wealth would be distributed equitably, thereby preventing disrupting rent seeking.

6. Concluding Remarks and Policy Implications

Norway became a candidate for contracting the resource curse and the Dutch Disease when oil was discovered off its coast in 1969, but appears to have escaped both. A curse would have made itself evident by first leading to an oil-driven acceleration of aggregate output value then a subsequent deceleration. Using a structural break technique this article demonstrates that Norway accelerates without decelerating, compared to highly similar Scandinavian neighbors. Symptoms of the disease, on the other hand, include de-industrialization and a more lump-sided export base. Even if oil extraction necessarily did displace other activities in the 70s and the 80s, oil's importance in GDP and exports is not overly dominating nor does it appear to strangle manufacturing. In fact, I argue along with other authors that there are reasons to believe that Norwegian manufacturing may have benefited from the oil discovery.

The reasons why Norway escaped the curse and the disease are multifaceted. Since there is no consensus on what causes growth in general there is no readily applied framework to explain Norway's escape straightforwardly. I argue that conflicts of distribution were avoided because the revenues were publicly controlled and evenly distributed. Legal and illegal confiscations of rents were difficult in a transparent and accountable bureaucracy at the same time as a popular social contract and strong social norms helped to prevent time-consuming and disruptive rent seeking. As a consequence, Norway's aggregate output grew to one of the highest in the world.

But even if aggregate output is large, its current composition portends long-term consequences. The fear of a Dutch Disease is founded on the belief that in a real world, adjustments are slow and painful, benefits and burdens are asymmetrically distributed, developments may be path-dependent, and some know-how losses near permanent and irreversible. Policymakers wanted to avoid a booming sector dominating the export base, and embarked on ambitious policies. The core element of the Norwegian approach lies in wage formation and income coordination. Norway has the most centralized pay negotiating system in the world, and it is based on notions of equity and technical computations of productivity. This helped prevent the booming sector from creating intense wage pressures. Moreover, Norwegian oil extraction is extremely capital intense; 33 times more so than average manufacturing. Thus, extraction does not command a large share of the labor force and the sector may not lead wages or create pay competition in the same way it may do in other places. Furthermore, off shore oil extraction is based on advanced technology and know-how, and this emphasis on knowledge leads to valuable spillover effects to other sectors.

Norway thus seems to be a country that not only survived an era of sudden oil riches with the basic economic structures intact, but also a country that utilized the riches to grow. I hypothesize that at least two factors have contributed to this success. First, Norway was in a favorable position to find oil. An educated populace could start an intensely technological extraction that also gave birth to expertise build-up and innovative research. To the extent that developed countries share these qualities, it may be possible that developed countries are less likely to contract the curse. However, Norway is a special case in its fervently egalitarian society that cultivates strong social norms. This may have prevented pressure from vested interests in rent seeking and allowed a centralized Second, Norway's oil policy was patient, realistic, and modest. This management of resources is of interest to other resource owners because although providence cannot be replicated, proper policies can.

This article offers an interesting final twist on its own premises. It claims that Norway differed from its otherwise similar neighbors because Norway was unique in its position as a large oil exporter. It shall be interesting, then, a few decades from now to assess Denmark's development. Denmark has recently started its own oil production, and production passed consumption in the mid-90s, rendering Denmark as a net exporter. Even if production in 2003 is only about one tenth of that one in Norway[4], after some years have passed it should be possible to test the validity in the explanations put forward here. In short, if this article is right, Danes should escape the resource curse and the Dutch Disease as well since they share many common institutions with the Norwegians and are well posed to pursue identical policies.

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[4]Danish production is in the order of 364 thousand barrels a day in 2000 (Danish Energy Authority (2001)) compared to 3.3 million barrels a day in 2001 in Norway (Official Statisics of Norway (2003)).

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Appendix

A. Data

Real GDP per capita converted to U.S. Dollars using the notion of purchasing power parity (1998 US Dollars) can be found in Table 1 at page 8 in "Comparative Real Gross Domestic product Per Capita and Per Employed Person. Fourteen Countries. 1960-1998", U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, March 20 2000. Online access is possible through the web page: http://stats.bls.gov/flshome.htm.

Gross domestic products measuring in national currencies are converted to comparable entities using the purchasing power parity (PPP) notion. For a given country, a ratio is computed that consists in the numerator of the monetary units needed to purchase a common basket of goods and in the denominator the monetary units needed to purchase the basket in the United States. This ratio is then used to compute an international equivalent of a country's gross domestic product.

B. Semi-parametric Monte Carlo Bootstrap Simulation

The field of structural breaks in time series is a highly active field of research so let us devote a few words on background and modeling choices made in this article. The field emerged when Chow (1960) introduced a methodology to check whether a *given* point was a break point. However, more realistically, analysts do not know a priori which point would be a breakpoint, so Quandt (1960) suggested a more general method, in which the breakpoint was unknown; in essence introducing a search algorithm to find the most likely candidate. The difference between Chow's analysis and Quandt's algorithm is important. If theory leads an analyst a priori to suspect that a given year represents a breakpoint then she may test the null against the alternative for that specific year, and make rigorous inferences from the obtained statistic since the statistic's distribution then is known. If, however, one searches for a candidate year by looking at data before testing, one cannot a posteriori perform the same test after having identified the most likely candidate because then the analyst does not know the distribution of the test statistic. As Hansen (2001) explains, the fact that if the breakpoint is unknown beforehand, but is found by inspecting the data, disallows use of the usual distribution of computed F-statistics. The distribution is different from the statistic of an a priori test, *not* involving data inspection. Andrews (1993) and Andrews and Ploberger (1994) provide tables of critical values based on simulations for tests when data inspection yields candidate breakpoint years. This article, however, performs its own tailor-made semi-parametric Monte Carlo bootstrap simulations of critical thresholds under the null for the observed series of F-ratios. These simulations will allow statistical inference, and the computation of p-levels. Here is a brief outline of the rationale.

In order to simulate the critical levels of the computed F-ratios, I perform semi-parametric Monte Carlo bootstrap simulation. This algorithm is used:
1. Under the null hypothesis, the full period 1960-1998 is governed by one development mechanism. It consists of a trend and a stationary noise component. By identifying the trend through linear regression, we may obtain residuals that represent the noise distribution. Under the null, this noise is stochastic and identical throughout the period. Thus, to obtain a simulated sample of another realization of the same process, we may keep the trend and relocate the residuals.
2. Relocate the residuals by sampling a same-size collection of residuals by replacement. Add the shuffled residuals to the trend.
3. Obtain a simulated manifestation of the same process in a same-size sample.
4. Divide the simulated same-size sample 1960-1998 into 2 periods with breakpoint at the most interesting year.
5. Compute linear regressions for both periods.
6. Compute the sum of squared residuals for both periods, and add them into a sum of squared residuals for the alternative hypothesis of a breakpoint model.
7. Compute the F-ratio for the restricted model (null) against the unrestricted model (alternative).
8. Repeat step 2-7 one thousand times.
9. Obtain an estimate of the distribution of the F-ratio under the null hypothesis consisting of one thousand simulated F-ratios under the null. The 99th percentile uncovers the threshold F-

ratio value, above which an observed F-ratio can be rejected at a p-value of 1 percent. Notice that for the first two simulations, I use the most interesting breakpoint year, namely the candidate breakpoint year when the F-ratio was observed highest. For the last two simulations, I simply use period midpoint as breakpoint year.

Notice that all such simulations make use of a true null to estimate the probabilities of making type-I-errors, or alpha-levels.

C. Additional Tables

Table A1. The Norwegian Petroleum Fund, 1996-2001

Year	Gross Domestic Product[1], Billion NOK	Petroleum Fund[2], Billion NOK
1996	1017	47,6
1997	1096	113,4
1998	1115	171,8
1999	1197	222,4
2000	1424	386,4
2001	-	613,7

Source: [1]Statistical Yearbook, 2002, Table 331, Base Prices. [2]Central Bank of Norway. Online: http://www.norges-bank.no, use: petroleum fund.

Table A2. Economic Development in Norway, actual (with oil) and counterfactual (without oil), 1974-1999, Compared to EU

	EU	Norway, actual (with oil)	Norway, counterfactual (without oil)[1]
Total growth, real hour wage, manufacturing, 1974-1998	7.4[2]	47.1	32.5
Unemployment, 1998	10.0	3.3	6.3
Governmental Net Financial Assets, Percentage of nominal GDP, 1999	-55.6[3]	48.5	-65.8
Growth, Real GDP, 1974-1999	2.2	3.3	1.8
Growth, Real Private Consumption, 1974-1999	2.4	2.7	1.4
Growth, Real Public Consumption, 1974-1999	2.0	3.4	2.1

Source: Cappelen, Eika, and Holm (2000) and OECD. Notes: [a]Simulations in MODAG, a large-scale macroeconometric multisectoral input-output model of the Norwegian economy; see Cappelen (1992) for documentation and Cappelen, Eika, and Holm (2000) for computations. [2]EU15. [3]Except Greece, Ireland, Luxembourg, and Portugal.