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EXPLAINING WAITING-TIME VARIATIONS FOR ELECTIVE SURGERY ACROSS OECD COUNTRIES

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INTRODUCTION

Waiting times for publicly-funded elective surgery are a controversial and, at some times puzzling, phenomenon. An interesting feature of OECD countries is that while some countries report significant waiting, others do not. Waiting times are a serious health policy issue in the 12 countries involved in the OECD Waiting Times project (Australia, Canada, Denmark, Finland, Ireland, Italy, Netherlands, New Zealand, Norway, Spain, Sweden, and United Kingdom). Waiting times are not a policy concern in a second group of countries (Austria, Belgium, France, Germany, Japan, Luxembourg, Switzerland, and the United States) where they are anecdotally (informally) reported to be low. This paper contains a comparative analysis of these two groups of countries and addresses what factors may explain the absence of waiting times in the second group.

THE WAITING TIME PHENOMENON

Key aspects in the provision of surgery. It is desirable to consider briefly certain key aspects of the provision of publicly-funded surgery before turning to the problem of waiting for elective surgery. First, there will be a *hierarchy of need* for surgery at any one time, ranging from emergency procedures (such as repairing a ruptured abdominal aortic aneurysm) through urgent interventions (such as operating on colon cancer with obstruction) through non-urgent, elective procedures which can be scheduled (such as hip replacement) to discretionary procedures which may be routinely excluded from public programmes (such as much cosmetic surgery).

Secondly, whereas the patient demands health (reduction of symptoms, improvement in prognosis) it is the physician who, as the patients' agent, turns that into a demand for medical care. Hence, the demand for surgery will always be surgeon-managed and may even be surgeon-led. However, third, there seem to be large differences in opinion across surgeons about the thresholds for need and the indications for surgery. Such "clinical uncertainty" may arise in part from the relative absence of clinical trials for many surgical procedures (Horng and Miller, 2002). There is indirect evidence of this uncertainty in the large variations that are found in elective surgery rates across small and large geographical areas – variations which are inexplicable in terms of demographic or morbidity variations (Wennberg and Gittelsohn, 1982 and McPherson, 1989). Fourth, there have been dramatic changes in the technology of surgery and anaesthesiology in recent

decades which have greatly increased the range of procedures that can be offered and the range of patients to whom surgery can be safely administered.

Lastly, it is generally the case that under public programmes, surgery is provided within an ethical framework in which payment is in accordance with ability to pay and treatment (at zero or heavily subsidised prices) is in accordance with need. In pursuit of these aims, there are a variety of different mechanisms for offering publicly-funded surgery across OECD countries. At one extreme, there are some countries where the funding and supply of public surgery are respectively relatively demand-led and relatively autonomous, with few if any controls on surgical expenditure and capacity, with surgeons paid mainly by fee for service and with mainly private hospitals paid by activity-related payments. At the other extreme, there are some countries in which the supply of most surgery is relatively constrained by central or local government, with surgeons paid by salaries and with public hospitals funded by global budgets, fixed annually. However, a significant number of countries have mixed arrangements.

D*efining waiting times*. Defining and measuring waiting times for surgery is not a simple matter. There are a number of choices both about the starting point and the end point of waiting. A hypothetical starting point would be the moment in time when a patient with a condition that could benefit from surgery would be assessed by a representative surgeon as reaching a certain threshold of "need" for a given procedure, defined by a hypothetical set of accepted clinical guidelines (assuming the patient would agree to such surgery). A more readily observable starting point is the time when a patient is first referred by a general practitioner (or by a non-surgical specialist working in a primary care capacity) to a surgeon for assessment for surgery. The period which elapses between such a referral and assessment by the surgeon will be referred to as the "outpatient" waiting time.

A third possible starting point is the time at which the patient is assessed as requiring surgery by a surgeon and is booked for future treatment or placed on a formal waiting list for an operation – having agreed to undergo such a procedure. The time which elapses from placement on the list to the time that the patient is admitted for the procedure to be carried out, will be referred to as "inpatient" waiting time or the "waiting time of the patients admitted" (the term "inpatient", here, should be taken as including day case treatment). This measure will exclude patients who join the list but who do not receive treatment – because, for example, they recover their health, change their minds about surgery, move house, or die while on the waiting list. An alternative measure of "inpatient" waiting which takes account of such patients, involves taking a census of the patients on the waiting list at a point in time and calculating the average time elapsed between patients' placement on the waiting list and the census date. That will record incomplete waits. Such a measure is available in some countries and will be

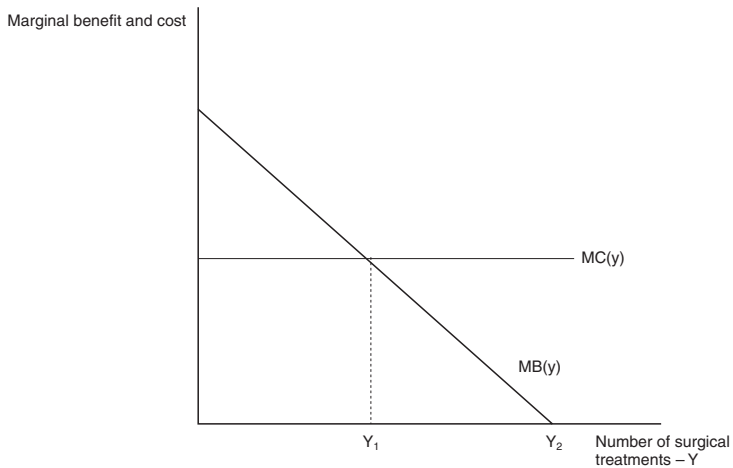
referred to as "the waiting time of the patients on the list" (for a more detailed discussion, see Annex 2 of Hurst and Siciliani, 2003).

Optimum rates of surgery. In principle, there will be an optimal, or socially desirable, rate of surgery in any publicly-funded health programme. The socially optimal rate of surgery from the point of view of a hypothetical "informed" policy maker will be that which balances the marginal benefits of surgery (based on the *hierarchy of need*) with the marginal costs (Y_1 in Figure 1). However, from the point of view of patients, surgeons and providers, the optimal rate of surgery will be at the higher level, ($Y_2 > Y_1$), if the price of surgery to the patient is zero and if the surgeons act as perfect agents and (in the case of fee-for-service payment) fees are set to cover marginal cost.

If policy makers can set the rate of surgery at the socially optimal level Y_1, there will be excess demand equal to $Y_2 - Y_1$. The lower is the quantity of surgery supplied, the higher will be excess demand. Under such circumstances, waiting times can take over from prices as the rationing mechanism. The higher is excess demand, the higher will be waiting time.

An important question is what effect do longer waiting times, brought about by lower rates of surgery, have on patient welfare. Health status is likely to deteriorate (on average) with waiting and welfare will be lower if there is postponement of the benefit from surgery (time preference). However, the OECD Waiting Times study

Figure 1*a.* **Optimal surgery rate**



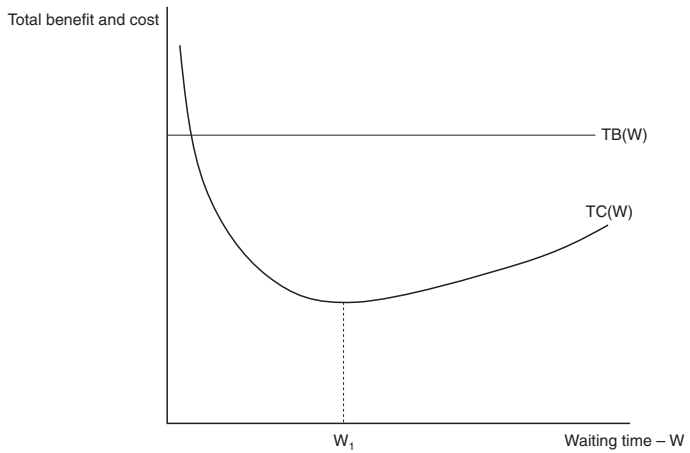
found surprisingly little evidence, from a review of the medical literature, of significant deterioration of health or worsening of surgical outcomes as a result of waiting for elective surgery in those countries where waiting times are up to three or six months, depending on the condition (Hurst and Siciliani, 2003, Annex 1). Surgeons seem to be good at triage – that is at re-prioritising patients whose conditions become unstable or deteriorate while they wait. Longer waiting may be more problematic. A study of patients on the waiting list for total hip replacement at one hospital in the United Kingdom, using a health status score specific to hip pathology, found evidence of significant deterioration and that the deterioration was greater the longer the wait. The median wait, here, was about one year (Kili *et al.*, 2003). Similarly, a study of patients waiting for varicose vein surgery in the United Kingdom found "considerable deterioration" in their condition while waiting for surgery (Sarin *et al.*, 1993). In this case, the median wait was 20 months.

In general, policy makers are not well informed about marginal benefits and costs. Also, there are important differences between countries in the way that surgery is funded and supplied. Some countries have chosen funding and delivery mechanisms where surgery is relatively "demand-led" and autonomous, as well as free of charge at the time of use. Supply can expand along the marginal cost curve (if the level of fee payments makes that profitable). Here, the risk will be that the supply of surgery may exceed the optimum level by moving beyond Y_1 towards Y_2. Other countries have chosen "supply-led" mechanisms, with firm constraints on surgical expenditure and capacity. Here, supply might be at Y_1 (with good guesswork by policy makers), might be to the right of it, or might be to the left.

In addition, different countries may have different propensities to convert excess demand into waiting times – because of different incentives to form queues and the possibility of adopting different clinical thresholds for adding patients to the lists. In other words, the management of demand may vary. For example, under competitive fee for service, there may be disincentives for surgeons to form visible queues because such queues may deter future patients and "money follows the patient". Meanwhile, in systems which use global budgets which are set administratively each year in accordance with perceptions of "need", there can be incentives to form queues because "money follows the queue". When surgeons are allowed dual practice in the public and private sectors, surgeons' private earnings will also "follow the queue".

Optimum "inpatient" waiting times. The suggestion can be made (following Cullis and Jones, 1986 and Iversen, 1993) that for any given rate of surgery there is a socially optimum mean waiting time for patients on the inpatient and day case waiting lists. Figure 1b depicts hypotheses about the effect of different waiting times on the health benefits and costs of surgery. Mean waiting time is shown on the horizontal axis. The total benefits and costs of surgery are shown on the vertical axis. The total benefits of surgery will be constant at a given rate of surgery,

Figure 1*b.* **Optimal waiting time**



which might, or might not, be the optimum rate. That is because waiting times can only be varied for a given rate of surgery if surgeons vary their clinical thresholds for admitting patients to lists. This will not in itself affect benefits because changes in formal waiting must be offset exactly by equal and opposite changes in hidden waiting. Only if the surgery rate changes, will the benefit curve depicted in Figure 1 change – by shifting upwards or downwards.

Meanwhile, the total costs of supplying surgery for different waiting times are assumed to be roughly U-shaped. At first, costs fall as waiting times increase. That is because there can be considerable savings in surgical (and, in general hospitals, bed) capacity if a waiting list is formed and additional elective patients are called in for treatment when there are lulls in the flow of emergency patients (Cooper, 1981; Goddard, Malek, Tavakoli, 1995). This reduces the probability that supply exceeds demand, leaving capacity unused. However, the administrative costs of a well-managed waiting list will increase with the length of the list and waiting times, as will the diversion of clinical resources into regular reassessment of patients on the list (Iversen, 1993). Beyond a certain point, rising administrative and clinical costs are likely to outweigh falling capacity costs, as the length of the list increases.

It can be deduced that there is a socially optimum waiting time, above zero, at the point, W_1, where the slopes of the total benefit and total cost curves are equated – that is where marginal benefit and marginal costs are both zero. However, it is easy to imagine that financial incentives may discourage attainment of

this optimum. Under a social health insurance system, where "money follows the patient" and there is competition between providers, the total revenue curve facing a surgical unit may slope downwards. Although some surgeons, with high reputations, may build up long waiting lists there are likely to be other surgeons, with lesser reputations, who will seek to make a living by offering rapid access to procedures (Iversen and Luras, 2002). Under such incentives, marginal revenue and marginal cost will be equated somewhere to the left of W_1. However, under public integrated health systems, "money may follow the queue" and surgeons often work in both the public and private sectors, which gives them incentives to maintain long waiting lists for public patients (Iversen, 1997). Under these circumstances, the total revenue cost will rise with waiting times and the point at which marginal benefits and marginal costs are equated may lie somewhere to the right of W_1. By altering the propensity to generate waiting, different financial incentives may lead to quite different visible waiting times, for a given level of surgery, across different types of health system.

EVIDENCE ON COMPARATIVE WAITING TIMES ACROSS OECD COUNTRIES

E*vidence from existing literature*. There is a small amount of comparative waiting-time data available from international surveys. One advantage of international surveys is that they report evidence for countries where waiting times are not a policy concern. However, they are often based on small samples of respondents. Fleming *et al.*, (1992) collected data on waiting for surgery in eight European countries. It provides figures on the proportion of patients, who in 1990 waited longer than 12 weeks between specialist assessment and surgery, as reported by samples of GPs for samples of their patients in each country. It reports Portugal as the country with the highest percentage of patients waiting longer than 12 weeks (58.1 per cent), followed by the United Kingdom (41.7 per cent), Italy (36.3 per cent), Norway (28 per cent), Germany (19.4 per cent), Spain (18.5 per cent), Switzerland (16.1 per cent) and the Netherlands (15.2 per cent). A limitation of this survey is that the information was reported by GPs (and not directly by the patients). Moreover, as the survey dates back more than ten years, the waiting times which were reported may not reflect the current situation. Also, in the case of countries like Germany and Switzerland, where patients have direct access to specialists, the data may be unrepresentative and potentially misleading.

More recently, Blendon *et al.* (2002) provide data for five English-speaking countries, which record the percentage of respondents to a phone survey in 2001, who had experienced elective surgery in the last two years and who said they had waited longer than four months for elective surgery. It was found that 38 per cent of patients had been waiting for at least four months in the United Kingdom, 27 per cent in Canada, 26 per cent in New Zealand, 23 per cent in Australia and 5 per cent in the United States.

Carroll *et al.* (1995) focused on waiting times for cardiovascular procedures in four countries. They found that the percentage of the respondents in need of elective coronary bypass who had been waiting for more than three months was 88.9 in the United Kingdom, 46.7 in Canada, 18.2 in Sweden and 0 in the United States. For elective coronary angiography the percentage was 22.8 in the United Kingdom, 16.1 in Canada, 15.4 in Sweden and 0 in the United States. Similarly, Coyte *et al.* (1994) found that surveyed patients in need of knee replacement had a median waiting time of eight weeks in Canada (Ontario) and three weeks in the United States.

Finally, for some OECD countries, there is anecdotal evidence that waiting times are low. Imai, Jacobzone and Lenain (2000; p. 2) report that "the health system in France is regarded as delivering high quality services, with freedom of choice and generally no waiting lists for treatments". For Belgium, WHO (2000; p. 33) reports that "Patients do not usually have to wait long, if at all, for access either to general practitioners or specialists". A feature article in a British newspaper in October 2003, which noted waiting times of six to nine months for major elective procedures in the United Kingdom, reported that: "patients could be seen in a week for CABG in Berlin; there was no waiting for hip replacements in Lille (France); there was less than a week's waiting for hysterectomy in Grenoble (France), there was no waiting for hernia repairs in Recklinghausen (Germany), and there was three weeks waiting for cataracts in Antwerp (Belgium)".

Data collected in the OECD *Waiting Times Project*. In this study, data on waiting times from administrative sources were requested by questionnaire for ten elective procedures in 12 countries in which waiting times are reported to be a policy concern. The results are shown in Tables 1 and 2. The preferred definition of waiting times was "The time elapsed for a patient on the elective surgery waiting list from the date they were added to the waiting list for the procedure, after specialist assessment, to the date they were admitted to an inpatient or day-case surgical unit for the procedure". This definition is commonly referred to as "the waiting time of the patients admitted" or "inpatient waiting time". The main reason for choosing this measure is that it is the one most widely available in OECD countries. This measurement is available in eight countries, at least for some surgical procedures. Alternative measures such as the "waiting time of the patients on the list" or "total waiting" (inpatient plus outpatient) were available for few countries. Measures of the inpatient waiting time of the patients on the list were available for Spain (Insalud; mean), Ireland and Sweden (percentage of patients waiting longer than 12 months). Measures of total waiting (from GP referral to treatment) were available in Denmark and Norway (see Annexes 2 and 3 of Siciliani and Hurst, 2003 for more details).

Tables 1 and 2 report, respectively, the mean and median inpatient waiting time of the patient admitted. The countries with highest waiting times were the United Kingdom (England) and Finland, followed by Denmark, Norway, Australia and Spain

Table 1. **M*ean* inpatient waiting times of patients admitted by surgical procedure**

Year 2000. Number of days

	Hip replace-ment	Knee replace-ment	Cataract surgery	Varicose veins	Hyste-rectomy	Prosta-tectomy	Cholecy-stectomy	Inguinal and femoral hernia	CABG	PTCA
Australia	163	201	179	216	54	69	83	87	44	
Denmark	112	112	71	99			75	73		
Finland	206	274	233	280	100	81	159	125	42	30
Norway	133	160	63	142	64	75	103	109	46	53
Netherlands	96	85	111	107	61	60	71	75		18
Spain (Insalud)	123	148	104	117	102	62	107	102	39	81
Sweden			199							
United Kingdom (England)	244	281	206	227	159	52	156	150	213	80

N*otes*: Australia: includes Queensland, South Australia and Western Australia; Norway: cataract waiting time refers to 2001. CABG = Coronary Artery Bypass Grafting; PTCA = Percutaneous Transluminal Coronary Angioplasty.
S*ource*: More details on "Sources and methods" are contained in Annex 2 of Siciliani and Hurst (2003).

Table 2. **M*edian* inpatient waiting times of patients admitted by surgical procedure**

Year 2000. Number of days

	Hip Replace-ment	Knee Replace-ment	Cataract surgery	Varicose veins	Hyste-rectomy	Prosta-tectomy	Cholecy-stectomy	Inguinal and femoral hernia	CABG	PTCA
Australia	98	120	120	94	38	24	48	46	22	
Canada	112 (BC)	136 (BC)								
	105 (MN)	105 (MN)							23 (ON)	
	162 (SK)	291 (SK)	80 (BC)						10 (SK)	
Denmark	87	90	36	69			57	46		
Finland	148	202	189	155	70	39	90	74	34	20
Norway	99	132	28	110	37	47	63	74	25	18
United Kingdom (England)	211	261	182	178	110	37	97	95	191	58

N*otes*: Australia: includes Queensland, South Australia and Western Australia; Canada: BC = British Columbia, MN = Manitoba, ON = Ontario and SK = Saskatchewan; Norway: cataract waiting time refers to 2001. CABG = Coronary Artery Bypass Grafting; PTCA = Percutaneous Transluminal Coronary Angioplasty.
S*ource*: More details on "Sources and methods" are contained in Annex 2 of Siciliani and Hurst (2003).

(Insalud). The country with the shortest waiting times was the Netherlands. It is interesting to note how the waiting times for less urgent procedures (for example hip and knee replacement, cataract surgery) are systematically higher than the waiting times for more urgent procedures (for example hysterectomy, CABG, PTCA). This provides evidence that specialists do prioritise patients according to their urgency.

As the waiting-time distributions tend to be positively skewed, the mean and median can be significantly different. The mean is consistently larger than the median. This is because there is a small proportion of patients with very long waits (Sanmartin, 2001). Comparing waiting times in Tables 1 and 2, the difference between mean and median varies between 22-43 per cent, depending on the procedure considered. Finally, although in this study we focus on *inpatient* waiting time, a significant part of the total waiting experienced by the patients includes outpatient waiting (the time from GP referral to the specialist visit). Preliminary evidence from three countries [the United Kingdom (England), Denmark and Norway] suggests that outpatient waiting accounts for at least one-third of total waiting (see Annex 3 of Siciliani and Hurst, 2003, for more details).

EVIDENCE ON CAUSES OF WAITING-TIME VARIATIONS ACROSS OECD COUNTRIES

In this section we provide a tabular and graphical analysis of the cross-country evidence on waiting times and determinants collected within the OECD Waiting Times Project. Ideally, the investigation of waiting times for elective surgery would utilise data on surgeons, number of surgical beds, surgical expenditure and surgical need. However, these data are not yet available, mainly due to cross-country comparability problems. Hence, the analysis below falls back on *total* numbers of specialists and doctors, as a proxy for the number of surgeons, the *total* number of acute care beds, as a proxy for the number of surgical beds, and the *total* public and private health expenditure as a proxy for surgical expenditure. Also, it is difficult to find good measures of need for elective surgery. For example, for cataract surgery a good indicator of need would be the incidence of the population affected by cataract. Such data are not available at an international level. Consequently, in this study we look at the percentage of the population older than 65 and 80 years. Finally, since we do not have waiting-time data for the countries where waiting times are not a policy concern, the graphical analysis presented below will arbitrarily *assign* a value equal to zero for those countries. This is an underestimate of the true waiting time, which is positive, but low.

D*o countries which do not report waiting times spend more*? In the light of the above discussion, we may advance the hypothesis that, higher health expenditure per capita is associated with higher rates of surgery and, for a given demand, a lower waiting time for surgery across countries. Table 3 shows that total and public

Table 3. **Comparison between countries with and without waiting times (average values)**

	Countries with waiting times[1]			Countries without waiting times[2]			Difference
	A			B			B-A
	1998	1999	2000	1998	1999	2000	1998
Total health expenditure per capita, US$ PPP	1 851	1 974	2 092	2 452	2 606	2 750	601**
Public health expenditure per capita, US$ PPP	1 403	1 492	1 585	1 647	1 745	1 842	244*
Acute care beds/1 000 population	3.5[3]	3.4[4]	3.2[5]	5.8[6]	5.7[6]	5.5[6]	2.3***
Practising physicians/1 000 population	2.6[7]	2.7[7]	2.8[7]	2.9	3.1[8]	3.1[9]	0.3**
Practising specialists/1 000 population	1.4[10]	1.3[11]	1.5[12]	1.7[8]	1.7[6]	1.9[13]	0.3*
Surgical inpatients/1 000 population	61.8[14]	64.1[15]	65.1[15]	103.8[16]	97.6[16]	105.8[17]	42***
Surgical inpatients per physician	20[18]	20.7[19]	21.2[19]	37.7[16]	37.7[16]	46.8[20]	17.7**
Surgical inpatients per specialist	38.4[21]	38.8[22]	35.8[23]	62.9[16]	62.6[16]	76.5[24]	24.5
Surgical inpatients per acute care bed	18.2[25]	19.8[26]	20.3[26]	18.2[16]	19.8[16]	20.3[17]	0
Percentage of population 65 years old and over	14.4	14.5	14.6	15.2	15.4	15.6	0.8
Percentage of population 80 years old and over	3.5	3.5	3.6	3.6	3.6	3.6	0.1
Deaths/100 000 population	658[27]	653[28]		632[29]	609[30]		–26

*** = 1 per cent significance level; ** = 5 per cent significance level; *** = 10 per cent significance level.

1. Includes Australia, Canada, Denmark, Finland, Ireland, Italy, Netherlands, New Zealand, Norway, Spain, Sweden, and the United Kingdom.
2. Includes Austria, Belgium, France, Germany, Japan, Luxembourg, Switzerland and the United States.
3. Excludes New Zealand.
4. Excludes New Zealand and Spain.
5. Excludes New Zealand, Spain and Denmark.
6. Excludes Belgium and Japan.
7. Excludes Italy.
8. Excludes Japan.
9. Excludes the United States.
10. Excludes Ireland, Italy, Netherlands and Sweden.
11. Excludes Ireland, Italy, Netherlands, Sweden and Spain.
12. Excludes Ireland, Italy, Netherlands and Spain.
13. Excludes Belgium, Japan and the United States.
14. Excludes Norway and the United Kingdom.
15. Excludes Spain and the United Kingdom.
16. Excludes Belgium, France, Japan and Switzerland.
17. Excludes Belgium, France, Japan, Switzerland and Germany.
18. Excludes Italy, Norway and the United Kingdom.
19. Excludes Italy, Norway, Spain and the United Kingdom.
20. Excludes Belgium, France, Japan, Switzerland, Germany and the United States.
21. Excludes Ireland, Italy, Netherlands, Norway, Sweden and the United Kingdom.
22. Excludes Ireland, Italy, Netherlands, Spain, Sweden and the United Kingdom.
23. Excludes Ireland, Italy, Netherlands, Spain and the United Kingdom.
24. Includes Austria and Luxembourg only.
25. Excludes New Zealand, Norway and the United Kingdom.
26. Excludes New Zealand, Spain and the United Kingdom.
27. Excludes Canada.
28. Includes Australia, Finland, Netherlands and United Kingdom only.
29. Excludes Belgium and Switzerland.
30. Excludes Belgium, France, Switzerland and the United States.

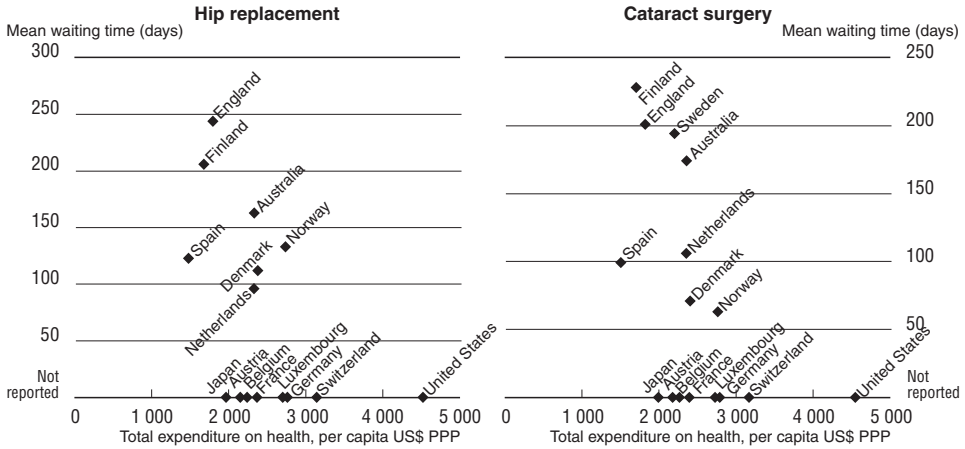
Source: OECD Health Data 2003; more detailed tables can be found in Siciliani and Hurst (2003).

health expenditure per capita (US$PPP), were respectively 32 per cent (19 per cent, excluding the US) and 17 per cent higher in the countries not reporting waiting times in year 1998. A t-test suggests that the difference in the health expenditure means for the two groups is different from zero at a significance level below 5 per cent in the case of total health expenditure and 10 per cent in the case of public health expenditure.

Figure 2 plots the mean waiting time for two common surgical procedures (hip replacement and cataract surgery) against total health expenditure per capita in 2000. We focus on these two procedures as they are representative of the waiting times within a country and tend to be correlated with the waiting times for other procedures. The countries considered may be classified into three categories: countries with low expenditure (less than $1 900), average expenditure (between $1 900-2 500) and high expenditure (more than $2 500). Countries with low expenditure are the United Kingdom, Finland and Spain; countries with average expenditure are Austria, Belgium, France, Australia, Denmark, and the Netherlands; countries with high expenditure are Germany, Luxembourg, Norway, Switzerland and the United States.

The figure suggests that countries like Finland and the United Kingdom have low expenditure and report generally the highest waiting times. On the other hand, countries like Germany, Luxembourg, Switzerland and the United States, have highest expenditure and do not report waiting times. However, Spain is a

Figure 2. **Mean waiting times and total health expenditure per capita**
Year 2000



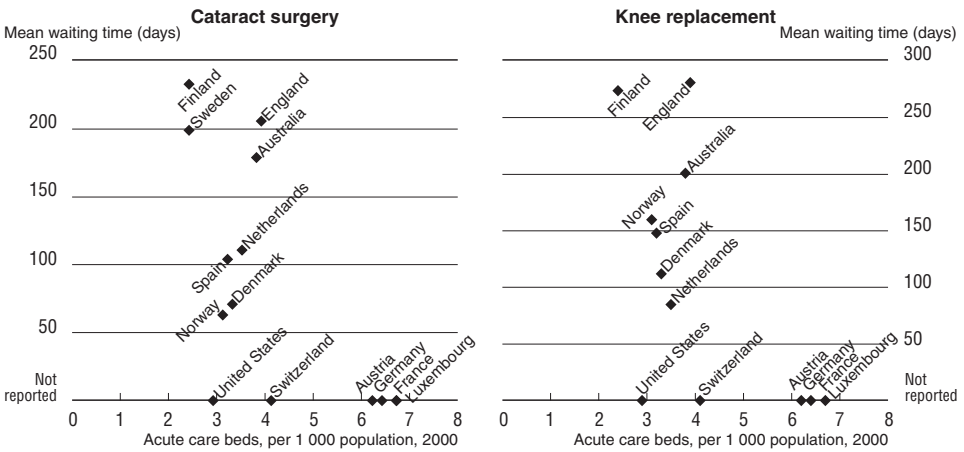
low-expenditure country but reports relatively low waiting times (similar to Denmark and Norway). Norway is a high-expenditure country (similar to Germany and Luxembourg) but reports waiting times.

More equivocal is the middle-expenditure category. It is interesting to note that, despite these countries being characterised by a similar level of expenditure, waiting times are reported in Australia, Denmark, the Netherlands and Sweden, but are not reported in Austria, Belgium, and France. A similar picture may be obtained by plotting waiting times against *public* health expenditure per capita. Similar results may also be obtained by using *median* waiting times as opposed to *mean* waiting times for both total and public health expenditure (see Siciliani and Hurst, 2003, for further details).

D*o countries which do not report waiting times have higher capacity* (*beds*, *doctors*)? The two main inputs in the hospital production function are personnel and beds (often considered a rough proxy for capital). Table 3 shows how countries not reporting waiting times had in 1998 on average 66 per cent more acute care beds (per 1 000 population) compared with countries reporting waiting times. A t-test suggests that the difference in the acute beds means for the two groups is different from zero at a significance level below 1 per cent.

Figure 3 provides the relationship between waiting times (for two surgical procedures) and the number of acute care beds (per 1 000 population) in year

Figure 3. **Mean waiting times and acute care beds**
Year 2000



N*ote*: France and Luxembourg have the same value (6.7).

2000. Countries, which do not report waiting times, with the exception of the United States, have systematically higher numbers of acute care beds compared with countries with waiting times. The countries with the highest number of beds are France, Luxembourg, Germany and Austria (6.2-6.7 per 1 000 population), followed by Switzerland (4.1 per 1 000 population). A notable exception among the countries without waiting times is the United States, with a very low number of acute care beds (2.9 per 1 000 population). This may be explained by the large share of activity that is carried out within the ambulatory care as opposed to the acute care sector (Docteur, Suppanz and Woo, 2003). It may also be explained by the remuneration system, usually based on payment per case by Diagnosis Related Groups (DRGs), which encourages reductions in length of stay.

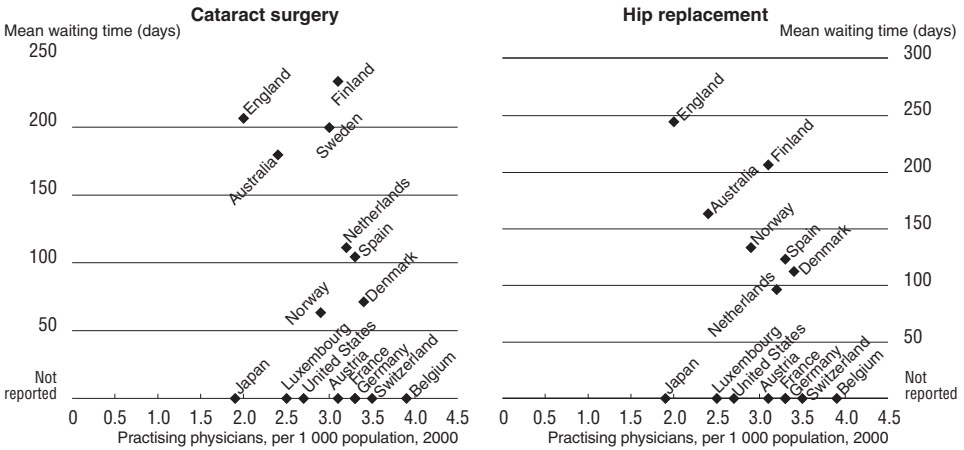
Among the countries with waiting times, only a weak negative pattern is found between waiting times and acute care beds. Most of the countries with waiting times have a number of beds ranging in the interval 3.1-3.9 per 1 000 population (Norway, Spain, Denmark, Netherlands, Australia and the United Kingdom). The two countries with the lowest number of beds are Sweden and Finland (2.4 beds per 1 000 population). They report relatively high waiting times. Overall, we may conclude that availability of acute beds differs markedly between the two groups of countries but to a lower extent within each group.

Another important set of inputs to the hospital production function is provided by personnel (doctors, nurses, and administrative staff). For elective surgery, the more appropriate measure (among the available ones) of the labour input is the number of "practising specialists". However, in this section we also consider the total number of "practising physicians" on the ground that the data may be more comparable across countries and are available for a larger number of countries (the underlying assumption is that the proportion of GPs and other doctors as opposed to specialists does not vary greatly across countries).

Table 3 shows that countries not reporting waiting times had on average in 1998 respectively 12 per cent and 21 per cent more practising physicians and practising specialists. A t-test suggests that the difference in the doctor's means for the two groups is different from zero at a significance level below 5 per cent in the case of the practising physicians and 10 per cent in the case of practising specialists. Figure 4 shows the relationship of waiting times with the number of practising physicians (per 1 000 population).

Among the countries with waiting times, the availability of physicians shows a negative pattern with variations in waiting times. From Figure 4, the panel which refers to cataract surgery, we can see how Sweden and Finland have considerably higher waiting times given the amount of doctors, compared with the other countries with waiting times. A possible explanation is that these countries are also characterised by a low level of acute care beds. On the other hand, countries without

Figure 4. **Waiting times and practising physicians**
Year 2000



Note: France and Germany share the same value (3.2).

waiting times often have similar levels of doctors compared with countries with waiting times. For example, Austria, France, Germany and Switzerland have a number of physicians which vary in the interval 3.1-3.3 per 1 000 population. That is very similar to the level reported by the Netherlands and Spain, 3.2 and 3.3 per 1 000 population, respectively. However, the first group of countries has a considerably higher number of acute care beds. Countries with the highest availability of physicians (Belgium and Switzerland) also report no waiting times, 3.9 and 3.5 per 1 000 population respectively.

D*o countries which do not report waiting times treat more surgical inpatients*? One straightforward way to measure activity, is to look at the *total* volume of surgical inpatients. However, information on day-surgery is generally not available for the countries that do not report waiting times (see for details Siciliani and Hurst, 2003, p. 52). A comparison based on total surgical activity is therefore not possible and we consider inpatient activity only. Table 3 suggests that in 1998 inpatient surgical activity (per 1 000 population) was on average 68 per cent higher in the countries without waiting times. A t-test suggests that the difference in the inpatient activity for the two groups is significantly different from zero.

It is also interesting to compare volume of activity for individual surgical procedures. Available evidence on nine surgical procedures in year 2000 suggests that countries with no reported waiting times have on average higher levels of

activity (see for details Siciliani and Hurst, 2003, pp. 55-56). The average rates are 57 per cent higher for hip replacement, 84 per cent for knee replacement, 43 per cent for prostatectomy, 53 per cent for hysterectomy; 44 per cent for CABG, 56 per cent for inguinal and femoral hernia, 17 per cent for cataract surgery, 72 per cent for cholecystectomy and 91 per cent for varicose veins. A t-test suggests that the difference in the means for the two groups of countries is different from zero at a significance level below 5 per cent for hip replacement, knee replacement, prostatectomy, inguinal and femoral hernia, cholecystectomy and varicose veins. The difference is not significant for hysterectomy, CABG and cataract surgery.

D*o countries which do not report waiting times have higher productivity*? It seems clear from the above evidence, that countries which do not report waiting times are characterised by a higher level of capacity (doctors, beds), and a higher level of spending which translates into higher production. But are these countries also characterised by higher productivity, driven for example by financial incentives such as fee for service?

Table 3 provides three productivity indicators based on the number of "surgical inpatients". It suggests that the number of surgical inpatients per acute care bed look similar across the two groups of countries, as confirmed by a t-test. However, in 1998 the number of surgical inpatients per practising specialist and practising physician were respectively 64 per cent and 88 per cent higher on average in the countries with no reported waiting times. The countries with the highest productivity are Austria, Luxembourg followed by the United States. However, a t-test suggests that the difference in the productivity means for the two groups is not significantly different from zero for the first measure (inpatients per specialist) and it is different at a significance level below 5 per cent for the second measure (inpatients per physician). One limitation of this comparison is that it does not include day-surgery activity, as data are not available for the countries with no reported waiting times.

A*re countries which do not report waiting times characterised by different remuneration systems for doctors and hospitals*? As the productivity indicators have at this stage some limitations, it is interesting to investigate also the structural constraints and incentives provided by different remuneration and budgeting systems for specialists and hospitals respectively. These are summarised in Table 4.

S*pecialists*. It is commonly thought that one of the reasons underlying the presence of waiting times is the lack of incentives for hospital doctors to deliver higher productivity. If hospital doctors are paid by salary, there may be little incentive for them to increase activity. On the contrary, doctors paid by fee for service may adopt a faster pace of work. In ten of the 12 countries with waiting times considered in this study, hospital specialists were remunerated according to salary in year 2000 (as in Denmark, Finland, Ireland, Italy, New Zealand, Netherlands, Norway,

Table 4. **Potential constraints on the supply of surgical treatments**
Year 2000

Constraints on activity	Strong	Medium	Low
Specialists working for publicly-funded hospitals	***Salary***	***Mixed payment or* FFS *with restrictions on volumes***	***Mainly* FFS (*with no restrictions on volumes*)**
Countries not *reporting waiting times*	Japan, Germany, France (public hospitals)	Austria (salary + extra charges), Switzerland (salary + additional payments), The US (Managed Care)	Belgium, France (publicly-funded private clinics) Germany (ambulatory care) Luxembourg, the US
Countries reporting waiting times	Denmark, Finland, Ireland, Italy, New Zealand, Netherlands, Norway, Sweden, UK	Australia (either salary or FFS), Spain (Insalud, salary + bonuses)	Canada
Payments for publicly funded hospitals	***Mainly fixed budgets* (*including case-mix adjusted budgets through* DRG, HRG)**	***Mixed financing* (*part of the budget is directly related to activity*)**	***Mainly activity-based funding* (ABF) (*with no restrictions on volumes*)**
Countries not *reporting waiting times*	France (public hospitals)	Belgium (mixture of fixed budgets and ABF), Germany (ABF with penalties for high volumes of activity) Luxembourg, Switzerland (per diem) The US (HMOs)	Austria (ABF based on modified DRGs), Japan (ABF based on cases and bed-days); France (private hospitals). The US Medicare (ABF based on DRG prospective tariff)
Countries reporting waiting times	Denmark, Finland, New Zealand, UK	Australia (varies among States and Territories), Canada (varies among Provinces), Ireland, Italy (varies among regions), Norway (50% of budget is activity-based), Netherlands, Spain, Sweden	

Notes: ABF = Activity-based funding; FFS = Fee for service; HMO = Health maintenance organisation; DRG = Diagnosis Related Group.

Sweden and the United Kingdom). Increasingly, bonus systems have been also introduced to encourage increases in productivity, especially in Spain. In Australia, the remuneration system differs across States and Territories while in Canada specialists tend to be remunerated by fee for service but ceilings may be placed on the volume of activity.

Among the countries without waiting times, different remuneration systems are also used. In three of the eight countries considered, specialists are salaried,

as in Japan, Germany (but not in ambulatory care) and in France within public hospitals. At the other extreme, specialists are remunerated purely by fee for service in Belgium, Luxembourg, the United States (not necessarily for Medicare) and France within publicly-funded private hospitals (which account for 30 per cent of the beds). Two intermediate situations are represented by Austria and Switzerland, where the salary is combined with the possibility of obtaining additional payments related to the activity performed. To summarise, countries not reporting waiting times are more likely to reward specialists according to the activity performed, but this is not always the case.

H*ospitals*. Another claimed reason underlying the presence of waiting times is the lack of incentives towards higher productivity at *hospital* level. If hospitals are paid according to fixed budgets, there may be little incentives for managers to work towards increased activity. On the contrary, hospitals paid in proportion to the activity performed will be rewarded for the higher volumes provided.

In practice, hospital payment arrangements can be often quite complex to describe and may differ remarkably across OECD countries. Table 4 attempts to identify the main features and classify countries in year 2000 according to three categories (mainly fixed budgets, mixed financing, mainly activity-based funding). In four of the twelve countries with waiting times considered in this study, hospitals were remunerated according to mainly fixed budgets. This was the case for Denmark, Finland, New Zealand and the United Kingdom. Mixed financing was present in several countries either because of differences in regions or because only a share of the budget was based on activity-based funding. For example in Australia, Canada, Italy and Sweden remuneration systems varied according to Provinces, Territories, Regions and Counties. In Norway, more than 50 per cent of the funding was related to activity through the use of DRG schedules. In the Netherlands, hospital budgets consisted of a fixed component (based on location, infrastructure, buildings, beds and specialists) and a variable component (derived from nursing days, number of admissions, number of first outpatient visits and volume of day care). In Spain additions to regular budgets were made for hospitals which increased the volume of elective activity. In Ireland public hospitals were remunerated according to fixed budgets for publicly-funded patients.

Among the countries not reporting waiting times, hospital budgets have been in general more often related to the activity performed. Countries that have mainly implemented activity-based funding are: Austria, Japan, France (for private hospitals) and the United States (for Medicare). The exact financial arrangements may differ across countries. The United States and Austria have been using mainly DRG-based prospective tariffs to remunerate activity. In Japan, funding was related to both cases performed and number of bed-days. Countries with mixed financing were Belgium, Germany, Luxembourg and Switzerland. In Belgium and Luxembourg the budget for hospitals was partly fixed and partly based on activity.

In Germany, for example, despite the link between revenues and activity, activity-based funding was accompanied by financial penalties when actual volumes were higher than the pre-negotiated ones. In Switzerland a method based mainly on per diem was used (which does not necessarily induce the treatment of a higher number of patients). An interesting case is provided by France, where public purchasers remunerate public hospitals through fixed budgets and private hospitals through a per diem. To summarise, it is more likely for countries which do not report waiting times to be characterised by a lower degree of restriction on the volume of activity performed.

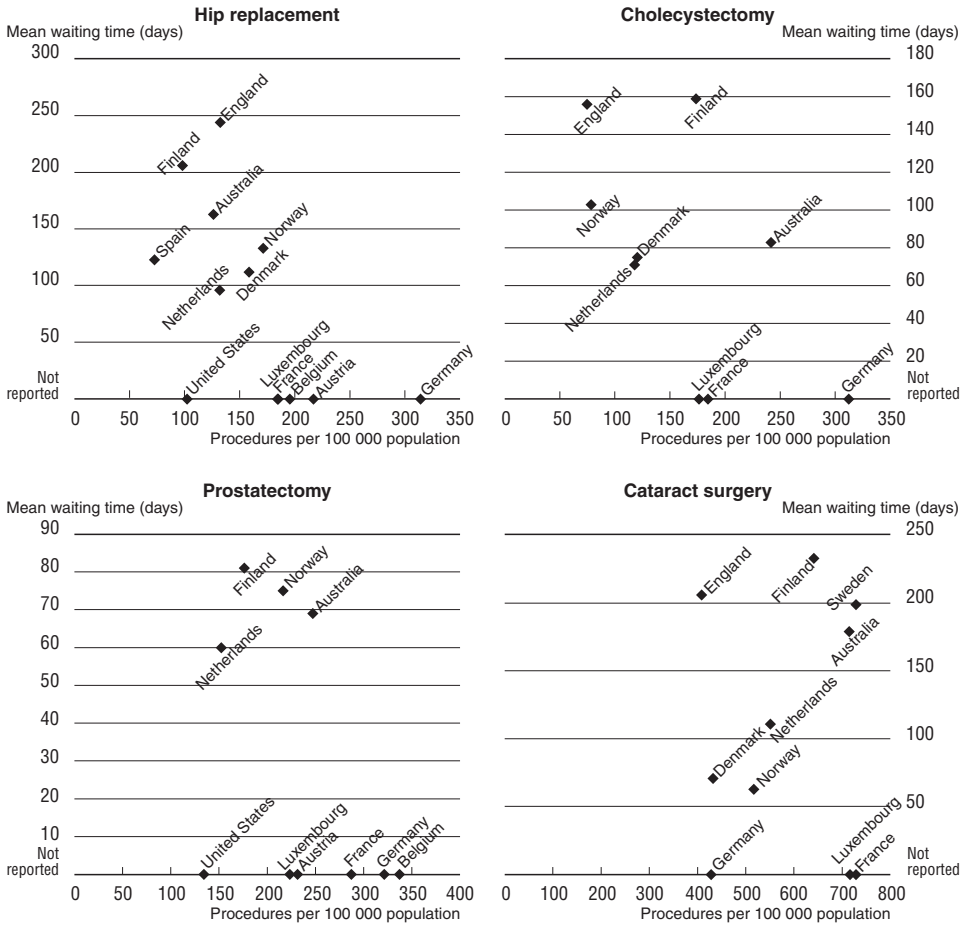
A*nd does the higher surgical activity lead to lower waiting times*? In this section we investigate to what extent higher activity is associated with lower waiting times. This is shown in Figure 5 which refers to four surgical procedures (hip replacement, hysterectomy, prostatectomy, inguinal and femoral hernia, cholecystectomy, varicose veins, cataract surgery and knee replacement).

It is important to point out how the relationship between waiting time and activity for individual surgical procedures is a complex one. The level of activity is determined by supply factors (like beds and doctors) but also by demand factors (such as the level of need). If the level of demand is constant across countries but supply varies, then the association between activity and waiting times is likely to be negative. If capacity is constant across countries but demand varies, then the association between activity and waiting times is likely to be positive. In other words, some countries may have high supply and high waiting times compared with other countries, simply because they have higher need. In addition, for a given level of activity provided and for a given level of need, countries may have different propensities to add patients to the list. In other words, thresholds for adding patients to the list may differ across countries. A low waiting time may be a sign of a high threshold rather than a sign of any differences either in need or in supply.

At the aggregate level, proxies for the level of need might be the percentage of elderly people in the population or mortality rates. With respect to these two variables, countries with no reported waiting times do not differ significantly from countries with waiting times (see below). However, countries may differ in the level of need at surgical procedure level. For example, numbers of people in need of cataract or affected by arthritis may differ across OECD countries. At this stage, there is not enough evidence at international level to measure and control for the level of need (or disease incidence) at surgical procedure level for a significant number of OECD countries.

Figure 5, the panel referring to hip replacement, shows among the countries with waiting times a weak negative pattern. On the other hand, countries who do not report waiting times always report higher activity, with the exception of the

Figure 5. **Waiting times and surgical activity**
Year 2000



United States (as already mentioned, it is likely that in the United States a much larger share of surgical activity is conducted not as inpatient but in day surgery). A very similar picture can be obtained for "inguinal and femoral hernia" and varicose veins. We may then be tempted to conclude that a negative relation exists between activity and waiting times.

However, a different picture may be obtained for cholecystectomy, prostatectomy and hysterectomy (see Figure 5, panels 2 and 3 for the first two). For these procedures, although on average, countries which do not report waiting times have higher activity, several countries without waiting times can be identified that report similar levels of activity to countries with waiting times. Figure 5, panel 4, shows that for cataract surgery, a *positive* pattern between activity and waiting times can be found for countries with waiting times. An analogous figure can be obtained for knee replacement. As already mentioned, these figures may be explained by different levels of need or by different propensities to add patients to the list. Finally, it is worth stressing how difficult it is at this stage to obtain fully comparable figures on surgical procedure rates. A variety of methodological problems may bias our measurements (hospital activity classification system, first-listed or all-listed procedures, double counting, measures of treatments as opposed to patients).

D*o countries which do not report waiting times have younger populations*? It may be argued that countries which do not report waiting times do not because they have a lower demand for treatments. One driver of need and demand is the share of the population which is elderly. Table 3 shows that the percentage of the population older than 65 in 1998 was on average equal to 14.4 for the countries with waiting times as opposed to 15.2 in the countries without. A t-test suggests that this difference is not significantly different from zero. The percentage of the population over 80 years old is between 3.5 and 3.6. The age structure of the population seems to be similar across the two groups of countries.

D*o countries which do not report waiting times have sicker populations*? Another aggregate indicator of need is the mortality rate. Table 3 suggests in year 1998 a lower rate for the countries reported to be without waiting times, but, excluding Japan from the sample, the rates look very similar. Moreover, mortality rates may not be a very satisfactory indicator for measuring the need for elective surgery at a point in time unless there is a good correlation between the factors causing chronic illnesses and the factors causing premature mortality across countries, and account is taken of the proportion of the population at risk that has already been treated surgically.

A*re countries with no reported waiting times characterised by higher levels of co-payment*? A final factor that may influence the demand for treatments is the presence of cost-sharing. There is a pronounced difference between the two groups of countries. In most countries which do not report waiting times there are co-payments. In most countries which do report waiting times, inpatient care is free of charge to patients, or characterised by very low co-payments (as in Sweden and in Ireland for Category II patients; for more details see Table A.11 of Siciliani and Hurst, 2003, p. 60). However, the co-payments in non-waiting time countries seem to be too

low to suggest that price rationing could be playing a major role in preventing queues from forming.

A MULTIVARIATE REGRESSION ANALYSIS

This section contains cross-sectional, regression analyses that explore the partial statistical associations between waiting times and several determinants. The first sub-section investigates certain determinants of *variations in mean waiting times* for several surgical procedures, pooled together, across the eight countries from which we collected waiting-time data (Australia, Denmark, the United Kingdom, Finland, Norway, the Netherlands, Spain and Sweden). The second sub-section explores certain determinants of *the probability of reporting waiting times* across a much larger group of countries including all 12 in the OECD study and eight OECD countries which do not report waiting-time problems (Austria, Belgium, France, Germany, Japan, Luxembourg, Switzerland and the United States).

Explaining variations in waiting times among the countries which report waiting times

The empirical equation to be estimated is the following:

$$w_{ijt} = \text{constant} + \Sigma_j \delta_j \alpha_j + \Sigma_t d_t \alpha_t + \mathbf{x}_{1(it)}\beta_1 + \mathbf{x}_{2(ijt)}\beta_2 + \text{error term} \qquad [1]$$

where w_{ijt} denotes the mean waiting time, the subscript "i" indicates the country (i = 1,…,8), "j" the type of surgical procedure (j = 1,…,11) and "t" the year. d_j and d_t correspond to the dummies associated to surgical procedure "j" and year "t". $\mathbf{x}_{1(it)}$ is a vector of explanatory variables that vary across time and country but not at the "surgical procedure" level (for example total and public health expenditure, acute care beds per 1 000 population, practicing physicians per 1 000 population, percentage of the population over 65 years old). $\mathbf{x}_{2(ijt)}$ is a vector of explanatory and control variables which vary across time, country *and* type of surgical procedure (for example, the percentage of surgical procedures performed as day-surgery, age and sex of the patients treated).

The results of the regression analysis are provided in Table 5 and are based on a sample size of 224 observations. We consider four different models. In Model 1 we include among the explanatory variables the acute care beds and physicians, but not health expenditure (to avoid multicollinearity). As expected, countries with more physicians and beds are associated with lower levels of waiting times. The results suggest that, at the sample mean, a marginal increase of 0.1 acute care beds (per 1 000 population) is associated with a marginal reduction of mean waiting times of 5.6 days. A marginal increase of 0.1 practicing physicians (per 1 000 population) is associated with a marginal reduction of mean waiting time of 8.3 days.

Table 5. **Multivariate regression analysis**
Dependent variable – mean waiting time

	Model 1	Model 2	Model 3	Model 4
	Coefficient	Coefficient	Coefficient	Coefficient
Acute care beds	**–55.8*** **	**–9.5***		
Physicians	**–82.5*** **			
Specialists		**–63.5*** **		
Total health exp.			**–0.066*** **	
Public health exp.				**–0.056*** **
Percentage of day-surgery	**–69.8****	**–72.0****	**–6.5**	**–15.6**
Percentage of population over 65 years	**0.3**	**26.5*** **	**2.2**	**11.3*** **
Mean age of the patients	**2.4****	**–1.4**	**–0.5**	**–1.1**
Percentage, female	**–63.7**	**–149.0****	**–145.8****	**–145.1****
Dummy variables				
Cataract	183.0***	259.5***	204.7***	211.5***
Cholecystectomy	152.6***	145.7**	153.3***	141.9**
Coronary bypass	23.5	24.4	25.0	22.6
Hip replacement	153.8***	197.4***	192.4***	191.0***
Hernia	141.0***	77.2**	66.4**	57.4**
Knee arthroscopy	201.1***	124.2**	104.6**	91.4
Knee replacement	180.2***	234.0***	227.7***	227.0***
PTCA	24.5	16.3	21.5	16.7
Hysterectomy	141.4**	159.4**	172.2**	160.7**
Varicose veins	252.0***	234.2	215.3***	206.5***
Year 1997	5.0	16.9	13.1	13.2
Year 1998	6.2	26.7**	24.8**	24.1
Year 1999	16.7	34.7***	36.0***	33.2*
Year 2000	7.2	17.7**	30.1**	20.4*
Year 2001	16.9	31.5	59.1***	45.3***
Constant	292.9***	–132.4	165.6**	33.0
Sample size	224	224	224	224
R^2	0.75	0.64	0.65	0.63

Notes: ***1% significance level; **5% significance level; *10% significance level.

In Model 2 we include as an explanatory variable the number of specialists as opposed to the number of physicians. In this case a marginal increase of 0.1 acute care beds (per 1 000 population) is associated with a marginal reduction of mean waiting times of only 0.95 days, which is significant at 10 per cent level. A marginal increase of 0.1 practicing specialists (per 1 000 population) is associated with a marginal reduction of mean waiting time of 6.4 days.

Both Models 1 and 2 report that countries with a higher percentage of procedures carried out in day-surgery are also associated with lower waiting times. An increase of 1 per cent in the percentage of day-surgery is associated with a reduction in mean waiting times of 0.7 days.

Models 3 and 4 include among the explanatory variables respectively the total and public health expenditure, but not the acute care beds and physicians (to avoid multicollinearity). The results suggest that, at the sample mean, an increase in total and public health expenditure per capita of $100 reduces the mean waiting times, respectively, by 6.6 and 5.6 days. Unlike Models 1 and 2, the coefficient of the percentage of day-surgery is not significant.

In all models, the coefficient on the percentage of older population is always positive but significant only for Models 2 and 3, suggesting a weak positive association between waiting times and elderly populations. The two control variables (age and sex of the patients) emerge as significant in Models 1, 2 and 3. The parameters associated with the year dummies (dummy = 1, if year = 1997, 1998, 1999, 2000, 2001) are positive and are generally increasing over time suggesting an upward trend in waiting times. However, the dummies were significant for years 1998, 1999 and 2000 for Models 2 and 3 and for years 1999, 2000 and 2001 for Model 4.

Among the different variables, we have also considered the inclusion of two dummy variables, one for countries whose hospitals are partly paid through activity-based funding (as in Norway) and one for countries whose doctors are partly paid on a fee-for-service basis (as in Australia). However, sensitivity analysis suggests that the coefficients associated with the two dummies are not robust and for this reason they were finally dropped from the final model specifications. The analysis has also been replicated using as dependent variable the *median* waiting time, which suggests similar results (see Siciliani and Hurst, 2003 for details).

Explaining the probability of observing waiting times across OECD *countries*

This sub-section analyses a sample of 20 OECD countries to investigate the factors associated with the probability of reporting waiting times, measured through a binary/dummy variable. Define Y as a *dummy* variable to indicate that "a country reports significant waiting times". Then Y = 1 for the 12 countries involved in the Waiting times project. Y = 0 for eight countries where waiting times are not reported (Austria, Belgium, France, Japan, Germany, Luxembourg, Switzerland, and the US). Note that the "0" value does not imply that the country has zero waiting times, but simply that it does not report any. The waiting time may be positive but low. We estimate the following Probit model:

$$\text{Prob}(Y_{it} = 1) = \Phi(\beta' \mathbf{x}_{it}) \quad i = 1,\ldots,n \quad t = 1,\ldots,T \qquad [2]$$

where $\Phi(.)$ is the standard normal distribution. $\mathbf{x}_{it}$ is a vector of independent variables which may explain the probability of observing waiting times. β reflects the impact of changes in **x** on the probability of observing waiting times. "i" indicates the country, while "t" the year. The data cover the period 1992-2000. Sample

Table 6. **Probit estimates**

Dependent variable is the dummy variable Y, with Y = 1 if there is presence of significant waiting times

	Model 1	Model 2	Model 3	Model 4
	Coefficient	Coefficient	Coefficient	Coefficient
Acute care beds	**0.88*** **	**–1.25*** **		
Physicians	**–0.87**			
Specialists		**–4.56** **		
Total health expenditure per capita			**–0.0028*** **	
Public health expenditure per capita				**–0.0019*** **
Percentage of population older than 65	**0.20** **	**0.60** **	**–0.73*** **	**–0.26*** **
Hospital remuneration	**–0.83**	**–0.39**	**–2.52*** **	**–1.59*** **
Specialist remuneration	**–1.03*** **	**–1.14*** **	**–1.45*** **	**–1.01*** **
Time trend	–0.05	–0.03	0.26***	0.14***
Constant	92.6	6.9	–509***	–279***
Sample size	148	135	197	193
Pseudo R^2	0.62	0.72	0.63	0.43
Log likelihood	–38	–26	–49	–73
LR chi^2	125	133	166	110
Prob. > chi^2	0	0	0	0

Notes: ***1% significance level; **5% significance level; *10% significance level.

size for the different specifications varies according to data availability. The results are presented in Table 6.

Models 1 and 2 suggest that the availability of acute care beds decreases significantly the probability of observing waiting times. This is also true for the availability of practising specialists, as shown by Model 2. This is not the case for the availability of practising physicians in Model 1. Despite the coefficient being negative (as expected), it is not significantly different from zero. Similarly, Models 3 and 4 show that higher health expenditure (public and total, respectively) reduces the probability of observing waiting times. The coefficient associated with the percentage of older populations is not robust across the different specifications.

We also specify in all four models two categorical variables related to the remuneration system of hospitals and specialists. For hospitals, a value equal to "0" is assigned to countries with strong constraints on hospital activity (mainly fixed budgets); a value equal to "1" for countries with medium constraints; and a value equal to "2" for countries with low constraints (mainly activity-based funding) (see Table 4 for more details). This variable is significantly different from zero in Models 3 and 4, suggesting that countries with lower constraints on activity have a lower probability of reporting waiting times. However, the significance of this variable is not confirmed by Models 1 and 2.

For specialists, a value equal to "0" is assigned to countries that remunerate doctors mainly on the basis of salary; a value equal to "1" is assigned to countries with mixed systems; and a value equal to "2" is assigned to countries that remunerate doctors mainly by fee for service (see Table 4 for more details). This variable is always significantly different from zero in all the four models considered. This suggests that countries that implement a fee-for-service remuneration system for doctors have a lower probability of reporting waiting times compared with countries remunerating doctors by salary.

CONCLUSIONS

This study has added to the limited evidence on variations in waiting times across OECD countries for publicly-funded elective surgical procedures and on their possible determinants. It is based on a questionnaire submitted to twelve countries which provided data on waiting times from administrative databases. Countries with the highest waiting times were the United Kingdom (England) and Finland, followed by Denmark, Norway, Australia and Spain (Insalud). The country with the shortest waiting times was the Netherlands.

We have compared key statistics for the group of countries where waiting times are a major health policy concern (Australia, Canada, Denmark, Finland, Ireland, Italy, Netherlands, New Zealand, Norway, Spain, Sweden, and United Kingdom), with another group where waiting times are not a concern (Austria, Belgium, France, Germany, Japan, Luxembourg, Switzerland, and the United States). It is found that countries which do not report waiting times, on average spend more in health care, have higher capacity (measured in terms of acute care beds and doctors), and implement more frequently forms of activity-based funding for hospitals and fee-for-service systems for doctors (as opposed to salary). On the demand side, the two groups of countries do not differ markedly in need, as measured through the proportion of elderly in the total population or mortality rates, and in the degree of cost sharing (co-payments for surgery).

We also conducted two econometric analyses. The first multivariate analysis suggests that, across the countries which report waiting times, the availability of physicians, specialists, acute beds, the amount of total and public health expenditure are significantly *negatively* associated with waiting times. A Probit analysis also suggests that the availability of acute beds and specialists, and the amount of public and total expenditure are significantly negatively associated with the *probability* of reporting waiting times. Also, the use of fee-for-service remuneration, as opposed to salaried remuneration of specialists is negatively associated with the probability of reporting waiting times.

F*urther research*. Although this study has shed some additional light on the causes of international variations in waiting times for publicly-funded elective sur-

gery, more research is desirable. Better information on surgery rates (in particular day surgery) is needed for benchmarking levels of elective surgery both within and between countries. Data are also needed on inputs to the surgical process such as surgeons, theatre nurses, surgical inpatient beds and surgical day case beds. This would allow the possibility of improving international comparisons on productivity. Coupled to this, is a lack of evidence on prices and costs of surgery across countries. Finally, there would seem to be merit in extending the possibility for international benchmarking of waiting times. This project has shown that reasonably comparable data on waiting times are now available for 7 or 8 member countries for at least ten procedures, from administrative sources. The measure which seems to be most widely available is the mean waiting time of the patients admitted to surgical units, measured from the time that patients are put on the waiting list. Several other countries might be able to provide similar data at moderate cost with only modest modifications to their existing data collection methods. An alternative approach would be to commission sample surveys of patients who received surgery in a wider range of countries.

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