

Competition in the British Domestic Gas Market: Efficiency and Equity

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I. INTRODUCTION

The British domestic gas market is to be opened to competition from April 1996; within 24 hours of enabling legislation being confirmed (Queen's Speech, 1994), British Gas (BG) announced the first significant change in gas tariff structure since it had been privatised nine years earlier. The changes introduced cheaper tariffs for some of those who paid promptly and so were cheaper for BG to supply. These are likely to be the first of many such changes, as the threat of competition leads BG to abandon its previous policy of charging similar tariffs to a wide range of consumers even when they incur different costs of supply. It is clear that competition will have a much more dramatic effect on domestic tariffs than did the flotation of the industry. While it retained its monopoly in the domestic market, even the privatised BG continued its policy of cross-subsidisation between consumers, using a single charging structure despite cost differences. (One reason for this may have been to avoid signalling cost

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differences to the regulator.) With competition in sight, it cannot afford to continue such a policy.

No other country has introduced competition into its domestic gas market, so the UK experience is inevitably experimental. Nor is it clear at present exactly how much competition will develop. Some consumers are clearly more lucrative than others, and it is probable that competition will not develop at the same rate in all markets. Some of the new entrants will be other utility companies, particularly from electricity supply, which have an advantage in knowing the domestic consumer base. Pressure from the government and regulator to achieve a rapid entry into the market also suggests that many entrants may not survive for long. Experience in the industrial market, where BG has lost most of its market share in many sectors, shows considerable scope for competition from other suppliers. However, it is clear that BG, at least, expects effective competition or its threat to develop, since it has reacted by such a sharp change in its pricing policies, choosing to restructure prices immediately the introduction of competition was confirmed in the Queen's Speech.

Whatever the long-term outcome of removing the monopoly (most probably an oligopolistic supply pattern), BG clearly views its domestic market as contestable at least, and is adjusting its prices in anticipation of entry to some areas from 1996. It seems likely that about 10 or a dozen companies will compete for domestic consumers in the south-west when that market is opened to competitors. The increasingly cost-reflective tariffs that result are likely to increase allocative efficiency, but their distributive effect is not neutral. Moreover, the cost basis of such changes has itself been subject to challenge by the Gas Consumers Council (GCC), which asked the regulator to examine whether the new tariffs discriminated against those who paid for gas in advance through prepayment meters.

Distributional considerations are of particular concern in the gas market. In cold climates, fuel is an essential commodity, vital for physical well-being. It typically accounts for a larger share of expenditure in poor households than in richer households and has low income and price elasticities of demand. Furthermore, paying for gas on credit with bills arriving quarterly can present budgeting problems, especially for those on tight budgets managing their money on a weekly or monthly basis. The result may be debt or, in fear of large bills, unduly low consumption levels. There are some groups in the population who have bodily requirements for greater-than-average warmth: elderly people, young children and those with disabilities. Poor housing may also exacerbate the difficulties low-income households can face in heating their homes.

Concern about 'fuel poverty' in general and the difficulties faced by elderly people in particular was highlighted over 20 years ago (Fox et al., 1973; Wicks, 1978). A recent study (Salvage, 1993) found that despite the benefits of more widespread central heating, elderly people still faced difficulties in heating their homes and paying fuel bills. There is particular public concern over one element,

the standing charge, which is paid by all consumers regardless of their consumption level. Standing charges have been unpopular with the public, especially those who consume small quantities of fuel for whom it forms a large part of their bill. Its political significance was emphasised when the government introduced a rebate scheme for 'small' users, announced at a Conservative Party conference, which ironically increased the incentive for reducing small levels of consumption still further (Gibson and Price, 1986). The scheme was later phased out for gas and electricity, but remains in force for telephones. When the price cap on gas was first reviewed in 1991, Ofgas considered the implications of rebalancing the tariff by reducing the standing charge, but found no convincing arguments on efficiency or equity grounds to do so (McKinnon, 1991).

This paper examines the consequences for efficiency, and the impact on different income groups and household types within the economy, of competition in the domestic gas market. The next section considers the trade-off that may exist between efficiency and equity, and Section III examines competitive pressure and cost structure in the gas market. Sections IV and V examine the effects of tariff changes already instituted and those likely to be in store, and Section VI concludes. The study is of early moves in one industry, but has obvious implications for other domestic fuel markets, especially electricity which will be opened to competition from 1998.

II. EFFICIENCY AND EQUITY

The Director General of Gas Supply, like other regulators, has a number of statutory duties under the 1986 Gas Act. Her duties, shared with the President of the Board of Trade, are primarily to secure supplies of gas for 'all reasonable demands' and ensure the finance of suppliers; and secondly to 'promote efficiency and economy', taking 'into account, in particular, the interests of those who are disabled or of pensionable age' (Gas Act, 1986).

Ideally, one might argue for separation of equity and efficiency, with the former achieved through the tax and benefit system and the latter through the price mechanism. However, such a separation is not straightforward, since true lump-sum taxes and transfers do not exist, and any change in taxation and benefits affects the structure of incentives and has the potential to distort efficiency.

Even on efficiency grounds alone, the correct policy is not clear. Ramsey pricing, based on marginal costs, presupposes that prices elsewhere in the economy do reflect marginal costs or that cross-elasticities of demand are zero. In practice, taxation, market failure (for example, in other fuel markets and in the market for energy efficiency) and externalities (in production of carbon dioxide) mean that other imperfections are relevant. But it does not seem appropriate for the gas regulator (or even the Secretary of State) to try to correct all these problems in the wider economy using only the gas industry as a policy

instrument. The appropriate focus for the industry's regulator would therefore seem to be on the industry itself, maximising producer and consumer surplus within gas, subject to the suppliers covering their costs, which leads back to Ramsey pricing. Some of the effects in other industries will be reflected through the demand and cost curves for gas, and so will influence the calculation of Ramsey prices.

The efficiency issue was raised directly by the GCC, which asked Ofgas to investigate whether the new tariffs constituted discrimination against consumers who paid in advance for their gas using prepayment meters. Since these consumers contain a high proportion of vulnerable households, the reference also contained an implicit distributional aspect. On economic efficiency grounds, there would be discrimination only if consumers did not cover their marginal costs of supply (which corresponds broadly to what Ofgas terms directly attributable costs), though the legal position on discrimination is unclear in practice (Ogus, 1994); Ofgas considered in its ruling that 'in the context of a price controlled monopoly business, *fairness* in the recovery of "joint costs" is one of the main issues' (Ofgas, 1995, our emphasis). This suggests that equity considerations might dominate those of efficiency, since the latter might dictate that costs that are unattributable should be recovered where demand is least price-responsive, possibly leaving some categories of consumers (with very price-sensitive demand) paying no such costs. Despite her broader interpretation of discrimination, the regulator ruled that the case for discrimination between the new and prepayment tariffs was not established.

What, then, of the regulator's specific responsibility for elderly and disabled people amongst gas consumers? She did not refer to such groups in her reference (quoted above) to fairness in allocating joint costs. Presumably their specific mention in the Gas Act imposes more responsibilities for these consumers than for other vulnerable groups, though the disparity between regulators in their responsibilities for specific groups of consumers makes this aspect seem somewhat arbitrary, and may depend merely on the political process by which the relevant privatisation act passed through Parliament. (For example, the electricity regulator, operating in the same sector, must take into account the 'protection of the interests of consumers of electricity in rural areas', as well as those who are disabled or of pensionable age.) Moreover, in interpreting their duties, regulators may feel that though they cannot *introduce* subsidies for vulnerable groups, sanctioning or encouraging their removal (through a move towards more efficient prices) is rather different, particularly if adequate compensation is not available. Can the gas regulator assume that any disadvantage experienced by vulnerable groups will be compensated through the benefit system?

There are two mechanisms through which the incomes of benefit recipients are or could be altered in response to gas price changes. The first is through the automatic annual uprating of benefits in line with general price inflation as

measured by the retail price index (RPI). The second is through special increases in the level of all or some benefits, or components of them (such as the premiums for more vulnerable groups in the rates of means-tested benefits). The general problems of relying on the automatic route have been set out elsewhere in the context of the imposition of value added tax (VAT) on domestic fuel (for example, Crawford, Smith and Webb (1993)). There are two main concerns. First, the adjustment is made with a considerable lag. Thus the price changes recently announced by BG were effective from (the first meter reading after) January 1995, but will not feed into benefit upratings until April 1996, under current arrangements.

The second limitation of the automatic route is that many benefit recipients spend a considerably larger share of their budgets on fuel than is implied by the weight given to fuel in the RPI. For example, the all-items RPI (used to uprate pensions and other non-means-tested benefits) currently gives changes in fuel prices a weight of 4.5 per cent; gas by itself has a weight of 1.8 per cent (Central Statistical Office, 1994). Poor households tend to devote larger shares of expenditure to fuel than richer households (Crawford, Smith and Webb (1993) and our Table 1). Fuel also forms a larger-than-average share of expenditure for pensioners (especially those living alone (Smeaton and Hancock, 1995)), single parents and those receiving income support. Furthermore, relying on automatic benefit uprating entails an additional problem in the context of a *restructuring* of prices: they will fall for some groups and rise for others. Depending on how this is reflected in the RPI, benefit recipients could be paying higher prices for gas but see their benefits uprated by less than would have been the case if gas prices had not been restructured.

A better route might be through discretionary increases in all or some benefits. However, neither of these routes helps those outside the benefit system.² Moreover, while the Chancellor did have some power to determine how benefit rates would be amended when he introduced VAT on fuel, the regulator of the gas industry does not. She does, none the less, have an explicit responsibility to consider the interests of pensioners and disabled people, and she may be under political pressure to mitigate adverse effects on any vulnerable group. How far regulators are independent of the government is still unclear, but there is evidently considerable political sensitivity about the privatised utilities. The recent furore over pay increases for utility and regulator executives is likely to heighten sensitivity to adverse effects for vulnerable households.

² Although they could benefit from small increases in income tax and National Insurance contribution thresholds, which are usually increased in line with the RPI (Redmond and Sutherland, 1993).

III. COMPETITIVE PRESSURE AND COST STRUCTURE IN THE GAS MARKET

The UK domestic gas market is the first in the world to be opened to direct competition. It is an unlikely pioneer, given its background as a nationalised monopoly and the government's rejection of the 1993 proposal to separate ownership of transportation network and supply services. Instead, British Gas is separating itself into different (commonly-owned) business units which include TransCo, the owner and operator of all the pipelines, and Public Gas Supply (PGS), which will supply the domestic market.

Until the end of 1994, most domestic gas consumers were charged a uniform two-part tariff, consisting of a standing charge and a running rate, both invariant with location and seasonality of demand. Some consumers used prepayment meters, with a lower standing charge and a declining block tariff, but these accounted for only 3 per cent of domestic consumers. Restructuring gas supply provides two sources of pressure to change prices from their present flat structure with in-built cross-subsidies from 'cheap to supply' to expensive consumers. First, the (still monopolised and regulated) transportation company, TransCo, introducing explicit transport charges for the domestic market, will reduce cross-subsidies in transport charges which are presently incorporated in final domestic prices. A profit-maximising firm would move in this direction, and though the structure of prices is complicated by the regulation (a revenue cap whose level is determined according to rate of return), even constrained profits are likely to be maximised by more cost-reflective tariffs than the present structure implies (Armstrong, Cowan and Vickers, 1994). Such a price schedule would, in particular, reflect the 'peakiness' of demand and the distance over which gas is carried, and eliminate the present subsidy from large to small consumers which arises from a standing charge lower than consumer-related costs. Secondly, competition itself will lead the supply arm of BG (PGS) to eliminate cross-subsidies between different types of consumers, in the first instance those who pay promptly and those who do not.

The impact on final consumers arises because such differential costs of supply are not presently reflected in tariffs. Domestic consumers pay by one of three means: quarterly in arrears, 'credit consumers' (the majority); by regular standing order, paying the same amount each month, about contemporaneously with gas used; or by slot meter as gas is needed. BG's costs of supplying each group, and the risk of bad debts, are different for each group. Before privatisation, British Gas had standardised its credit tariff, charged to both the first two groups. If final prices reflect costs more clearly, there will be some gains in allocative efficiency, as we discuss later, and a redistribution from those who are now subsidised to those who presently pay subsidies.

The British Gas Corporation had been an integrated nationalised industry, transporting, distributing and supplying gas, and was privatised in 1986 as a *de*

facto monopoly, with no competition in the supply of piped gas. The privatised industry, like its nationalised predecessor, was fully integrated both horizontally between regions and vertically between stages of transportation (unlike the later privatisation of electricity). The industry had a legal monopoly in supplying consumers who used less than a certain threshold amount per annum, and the revenue from this market was controlled by a price cap. This threshold was originally set to cover the domestic market and users of small to medium quantities in the commercial and industrial sector.

Gas followed the pattern of other UK privatisations in being subject both to general competition law and to regulation by an industry-specific regulator, in this case the Office of Gas Supply (Ofgas). The regulator was to monitor the price cap, to 'enable' competition in the non-capped market, and to take into account the interests of disabled people and pensioners. In the domestic market, the price cap determined the level of the tariff, and its structure has remained largely unaltered since privatisation (apart from some minor rebalancing between the standing charge and the commodity charge). However, the regulatory focus has shifted, largely as a result of two reports by the Monopolies and Mergers Commission (MMC) into the industry and the difficulties of developing competition in the uncapped sector. By 1994, the government had announced its plans to open all markets to competition, and to regulate directly the charge that British Gas made to potential competitors (and to itself) for access to the pipeline system. It is this charge which will determine competitors' costs and have the most immediate effect on final prices (though competitors do not have to reflect TransCo's charges in their own tariffs).

TransCo will charge suppliers of the domestic market for use of the gas pipes, and they are free to charge gas consumers whatever prices they wish. The prices of PGS (the BG-owned supplier to the domestic market) will remain subject to constraint, at least until the market is fully opened to competition in 1998. During the transition period from April 1996 to March 1998, it is expected that no BG published tariff will rise in real terms (Ofgas and DTI, 1994), which makes it all the more urgent for BG to undertake any necessary rebalancing (within the price cap) before then.

TransCo's transportation charges in the longer term depend partly on the industry's underlying cost structure, and because competition is likely to drive prices closer to costs, we need to describe BG's costs and its pricing policy to date. British Gas is essentially a wholesaler and retailer of gas: it buys gas from the North Sea and distributes it to consumers across Great Britain. We do not here consider the cost of buying gas (at present under long-term contracts with various indices to reflect changes in oil prices and currency movements). We first concentrate on the 'value added' in transportation to identify the present cross-subsidies inherent in the uniform tariff.

The main expense is in providing a fixed pipe network to transport the gas, and the size (and therefore cost) of this depends on the maximum capacity

required and its geographical extent. Thus the main cost of operating the system is peak-related. This part of BG's activities forms a natural monopoly, so that marginal costs are below average costs, and provides both the motivation for and some problems in regulation. Off-peak demand merely incurs small additional running costs. Similarly, places far distant from a beach-head, where gas is landed, are more expensive to supply because more pipeline is required. In addition, there are costs associated with supplying each consumer, such as metering and provision of service pipe, which are independent of their level of consumption.

TransCo's charges to domestic suppliers consist of a charge per unit of gas transported and a fixed charge per consumer supplied. The pricing mechanism is similar to that for non-domestic supplies, except for the cap on the per consumer charge imposed by Ofgas. Since BG argued for a higher cap on this element, we may suppose that it is binding, and that if it were able to, Ofgas would increase this charge. The unit charge will vary geographically, and BG estimates that if distance were fully reflected in tariffs, this would result in differences between regions of ± 4 per cent, though Ofgas considers that differences of only 2 per cent could be justified³ (Trade and Industry Committee, 1994). Initially, there will be no explicit peak-related charge, since present meters cannot distinguish day or time of consumption, and all domestic consumers will be assumed to have the same load factor. However, in markets where it can differentiate between peak and off-peak demand, TransCo intends to charge 50 per cent of its costs to peak demand and 50 per cent to 'off-peak' commodity charge, despite the doubts of the regulator (Ofgas, 1992). We would expect some similar move in the long run in the domestic market, since this encourages peak demand and the expansion of the asset base.

Ofgas has capped the charge (by TransCo to suppliers) for each consumer at £15 per annum, lower than BG's proposal and lower even than competitors' estimates of TransCo's consumer-related costs (Trade and Industry Committee, 1994). The additional revenue will be recovered through the variable charge. The present total standing charge for domestic customers, at £37 per annum, is below the total costs (transport and supply) of keeping them connected to the system, but higher than the total costs that competitors claim *they* would incur. The deliberate recovery of some of TransCo's consumer-related costs through a higher charge per therm of gas used relieves the pressure on PGS to revise its standing charge upwards closer to its true costs. Ofgas's cap on TransCo's standing charge perpetuates the subsidy to 'small' gas users inherent in BG's present final price structure, and can be seen as an (implicit) application of the efficient component pricing rule advocated by Baumol and Willig (Baumol and Sidak, 1994), though it is not clear that the regulator was consciously applying this idea. The rule charges new entrants the average incremental costs of supply

³ These percentages represent an annual cost of £6.87–£13.74 (1995 prices) for an average domestic consumer.

plus the profit of the market lost to the incumbent, and enables cross-subsidies to be maintained and new suppliers to enter the markets only if they are more efficient than the incumbent.

The first-best pricing policy for allocative efficiency would be for TransCo to set prices equal to marginal costs, assuming that prices in other related industries were similarly related to costs. However, the natural monopoly element of the fixed pipeline network means that some prices will have to be above marginal costs to cover the (higher) average costs. The second-best (Ramsey) prices would involve raising price above marginal cost for those services or elements for which (compensated) demand is least price-elastic. Unfortunately, very little is known about the responsiveness of final demand to different elements of the tariff, so elasticities of (derived) demand with respect to different parts of TransCo's charges can only be conjectured. In the short term, it seems plausible that the substitution effect of an increase in the standing charge will be small, being zero except for those who would respond by ceasing to remain connected to the gas supply. Demand with respect to the (off-peak) commodity charge is likely to be the most responsive to tariff changes. This would suggest the greatest mark-ups above marginal cost should be on the standing charge and the least on the commodity charge, ignoring considerations of equity.

Whatever the mark-ups, it is helpful to know the pattern of marginal costs; we can then identify the present cross-subsidies which competition is likely to end and identify the most efficient price structure as a baseline. It is difficult to obtain reliable estimates of BG's marginal costs, and the sparse information in the public domain is often inconsistent. Evidence given to the MMC reports of 1988 and 1993, and to the Trade and Industry Committee in 1994, shows BG allocating an increasing proportion of its costs to commodity rather than capital demand. BG still wishes to recover from commodity charges a higher proportion (50 per cent) of total revenue than it can justify even from allocating as many costs as possible to the commodity element. Such behaviour is consistent with a firm subject to rate-of-return regulation that wishes to encourage peak demand and justify a high capital asset base (Sherman, 1989). We are inclined to trust BG's earlier estimates (MMC, 1988) because we believe it was then more naïve about the effects of cost estimates on the regulator's decisions and therefore less likely to dissemble. On this basis, costs would be allocated to the demand drivers: commodity consumed, peak demand and number of consumers, in the ratio 19:30:18 (MMC, 1988; Price, 1991), leaving one-third of costs unallocated. Efficiency criteria outlined above suggest that this be recovered mostly on the standing charge and peak element. (If recovered proportionately, the ratio would be 28:45:27.)

However, we have seen that in the domestic market, BG makes no separate charge for peak, and only 11 per cent of revenue is raised from the standing charge. This is partly explained by cross-effects on revenue between the standing charge and the commodity rate which should be included in the Ramsey formula;

to achieve even the (adjusted) Ramsey balance, a significant increase in both standing charge and the (presently non-existent) peak charge is needed. But such adjustment is likely to be limited by BG's incentives (under rate-of-return regulation used to determine the price caps) to increase the size of the system by encouraging consumer connections and peak demand. On balance, some limited move towards peak pricing and an increase in standing charge seem likely in the long term. Ofgas's cap of TransCo's standing charge, probably at its estimate of 'efficient marginal cost', shows the regulator's aversion to substantial rebalancing at present, but raises the question (as did the Trade and Industry Committee) of future rebalancing. The cap is presumably at its present level partly to preserve the present cross-subsidies of small consumers on grounds of equity. This highlights questions of the regulator's responsibilities which were discussed earlier.

IV. EFFECT OF TARIFF CHANGES

Most domestic customers are billed quarterly in arrears, resulting in nearly three months' delay between consumption of gas and payment.⁴ For those who do not pay promptly when billed, PGS incurs further costs, both of interest and of debt collection. These costs make such consumers more expensive to supply than those who pay by monthly standing order, more or less contemporaneously with their gas use. Ofgas estimates this difference in total at about 2.7 pence per therm, about 5 per cent of price, including its 'fair allocation' of joint costs (Ofgas, 1995). New competitors in the market would be able to offer discounts to such customers, so BG must do likewise if it is not to lose its most profitable market.

BG's announcement of the new DirectPay tariff was made the day after the Queen's Speech confirming legislation to introduce competition. New standard tariffs were introduced which increased both the standing charge and the commodity charge. However, customers who pay by direct debit receive a discount of 2.8 per cent on the standing charge, and twice as much on the commodity charge. This simultaneously benefits customers who pay by direct debit and rebalances their tariff between standing charge and running rate, partially redressing the relative fall in standing charge since 1990. Although PGS benefits, like other suppliers, from the low cap on standing charge imposed on TransCo, it clearly recognises that the present charge may eventually have to be raised. Because the changes reflect cost differences in supplying different groups of consumers, they should increase efficiency.

⁴ Some consumers charged by the credit tariff buy 'gas stamps' to help spread the cost of consumption, and so pay earlier than it appears, possibly even in advance of consumption; however, such customers are difficult to identify and have been included with other credit consumers.

It is interesting that the standing charge has been raised relative to the commodity charge for direct debit consumers (through the higher discount on the commodity charge) but not for those who continue to pay by credit tariffs. As we show below, such customers have higher-than-average gas consumption and so are likely to be less sensitive to increases in the standing charge because it forms a smaller proportion of their total bill. This is the first time there has been more than one tariff for the domestic market since geographical differences were abolished in the 1980s.

One group pays for its gas in advance — slot meter users. They have a standing charge (lower than that for either credit or DirectPay consumers) and a two-part commodity rate — high for the first few units and then lower. Slot meters cost more to install and service (as well as incurring the risk of losses through vandalism); their users include some of the most vulnerable members of society. It is on behalf of these consumers that the GCC referred the question of discrimination between tariffs to the regulator.

Who gains from the changes already implemented and the others that can be anticipated (considered in the next section), and which groups are most vulnerable in the rebalancing that competition will bring? In particular, how might it affect disabled people and those of pensionable age for whom the regulator has a specified responsibility?

To address these questions, we use data from the 1991 Family Expenditure Survey (FES). The FES is a representative UK survey which achieves a sample of around 7,000 households a year. It collects details of income (levels and sources) and expenditure of all adult members of each participating household, along with their personal characteristics. The FES therefore provides a means of examining household gas consumption according to attributes such as income, presence of elderly or other vulnerable people, receipt of state benefits and region of residence.

The levels of fuel expenditure of households that participate in the FES exhibit seasonal variation according to when in the year they are interviewed. Averaging over the whole year's sample yields valid estimates of *average* annual gas consumption, but we are also concerned with the *distribution* of annual consumption; any rebalancing of tariffs will have different consequences for households with low and high annual consumption levels. Some adjustment for seasonality is therefore needed to obtain estimates of annual gas consumption for each household. Details of this adjustment and other aspects of estimating gas consumption from recorded expenditure levels are contained in the appendix.

In our analysis, we adopt a measure of disposable income that is what remains of total household income, net of income tax etc., after meeting housing costs. It is adjusted for differences in household composition.⁵ Where we refer to

⁵ Using the OECD equivalence scale of 1 for the first adult in the household, 0.7 for each subsequent adult or child aged 14 years or over, and 0.5 for each younger child.

quintiles of the distribution of such income, these relate to the distribution for all households, including households that do not use gas. The 1991 FES yields a sample of 5,301 households with positive gas expenditure living in Great Britain.⁶ Of these, 62 per cent are credit customers, 35 per cent pay by monthly payments and 3 per cent use slot meters (Table A1 in the appendix, which also shows other characteristics).

Table 1 shows the main characteristics of gas and fuel as a part of household expenditure. While *levels* of fuel and gas expenditure generally increase with income, expenditure as a proportion of income falls as income rises. The distributional effect of increases in gas prices is therefore equivalent to that of a regressive tax.

We analyse first the implications of the tariff changes already introduced, and, in the next section, the effect of likely subsequent changes on tariffs and households as competition develops.

TABLE 1
Gas and Fuel Expenditure as a Percentage of Net (After-Housing-Costs) Income
 (all values in pounds, 1991 prices)

	Gas-consuming households			Non-gas-consuming households
	<i>Average gas expenditure (£ per week)</i>	<i>Average gas expenditure / income (%)</i>	<i>Average fuel expenditure / income (%)</i>	<i>Average fuel expenditure / income (%)</i>
Poorest quintile	5.79	12.0	24.3	25.5
2 nd quintile	5.79	5.5	10.7	12.0
3 rd quintile	6.42	3.6	6.9	8.0
4 th quintile	6.65	2.7	5.1	5.3
Richest quintile	7.23	1.9	3.6	3.8
Pensioner household	5.41	6.3	12.9	11.4
Single parent	6.21	7.8	12.4	14.2
On income support	5.90	7.3	15.2	15.7
Disabled	6.37	4.8	9.4	10.5
All	6.40	4.9	9.6	10.0

Note: Pensioner households are those containing one person of state pension age (65 years for men, 60 years for women) or two people both of whom are over state pension age. Lone parents are households containing one adult and at least one dependent child (aged under 16 years, or 16-18 and still in full-time non-higher education). Households in receipt of income support are households where at least one member receives income support. 'Disabled' households are those containing at least one person in receipt of a disability benefit.

⁶ We exclude households living in Northern Ireland since they are not supplied by BG.

Access to Bank Accounts

British Gas has already instituted cheaper prices for those who pay by DirectPay. Consumers vary in their ability to take advantage of this change according to their present method of payment and their access to a bank account. Those who already pay by direct debit are automatically transferred to the cheaper tariff, and so *will* benefit from its lower prices. Those who have paid by slot meter or credit tariff and have access to a bank account could transfer to the new tariff, and so *may* benefit. Those without bank accounts⁷ are unable to transfer to the DirectPay system and therefore *cannot* benefit (though BG's new PromptPay tariff, available from September 1995, could benefit them). Of those who cannot benefit from DirectPay, well over half are in the poorest households, over a half depend on means-tested income support and more than 40 per cent are pensioners (Table 2). Lone parents are over-represented by a factor of over three: they make up 4 per cent of all domestic gas users but 13 per cent of those without bank accounts currently paying by credit or slot meters. Disabled people are also over-represented in this category of customer: 16 per cent of households that do not have a bank account and pay by slot meter or credit contain a disabled person, compared with 9 per cent of all gas-consuming households. Some additional details are reported in Hancock and Waddams Price (1995).

To see how significant the potential gains from the DirectPay tariff were, the average savings in each category were calculated in absolute values (pounds per year in 1995 prices) and as a percentage of income for each category of consumers concerned (Table 3). For those using monthly payments, this shows the amount they save through being transferred from the standard tariff. For those paying by slot meter or standard credit tariff, it shows the potential gain from switching to DirectPay, and therefore the savings forgone by those without bank accounts. We do not take account of any changes in gas consumption in response to changed tariffs.

We can see that forgone savings are high in the first column of Table 3, i.e. for the consumers who 'cannot benefit'. This is partly because many of them pay by slot meter, which is more expensive than the other tariffs.⁸ Though the absolute amounts may seem small, such sums are often crucial to families on low incomes. Moreover, the savings are generally a higher percentage of income for these vulnerable households, which cannot benefit, than for those that might or will benefit from the changes, especially amongst pensioner households, those on income support and disabled people. The exclusion of these customers from the benefit of DirectPay, coupled with the increase in standard credit and

⁷ Defined here as those in which neither the head of household nor his or her spouse has a current bank account or a building society account of any kind. The FES does not distinguish building society accounts that provide current account facilities from other forms of accounts.

⁸ Average forgone savings in this group were £26.75 per household for slot meter users and £6.75 for those on a credit tariff.

TABLE 2
**Characteristics of Households according to Method of Payment and
 Access to Bank Account**
 (percentage of each characteristic within each payment method)

	Gas-consuming households, paying by:				Non-gas-consuming households
	<i>Credit or slot meter, no bank account</i>	<i>Credit or slot meter, has bank account</i>	<i>Monthly payments</i>	<i>All</i>	
Poorest quintile	59	16	15	18	23
Richest quintile	1	23	22	21	16
Pensioner household	42	26	17	24	32
Single parent	13	2	5	4	4
On income support	53	8	11	12	16
Disabled	16	8	10	9	11
Sample size	360 ^a	3,103 ^a	1,838	5,301	1,440

^a Of those with no bank account, 67 used slot meters (column 1); of those with a bank account, 111 used slot meters (column 2).

prepayment tariffs, may cause real hardship, particularly since, as we have shown in Section II, any state benefits are adjusted only by the average change in gas prices, while Table 1 shows that gas is a much higher proportion of expenditure for these households than for the average. The Gas Consumers Council's pressure to hasten the introduction of discounts for prompt payment other than through direct debits is clearly in the interests of a number of these vulnerable groups.

V. OTHER POTENTIAL CHANGES IN TARIFF STRUCTURE

The only changes in tariffs so far announced are those based on payment method and regional differentiation (which will become effective when more than one region is opened to competition in 1997). But the pressures described in Section III indicate that other changes are likely. These changes are identified, and their distributional effects are discussed, in this section.

1. Regional Price Variations

Using TransCo's charges for September 1994 (which form the basis of domestic carriage charges), the greatest possible difference in prices on the methodology it has announced would be 3.32 pence per therm. But BG may wish to practise some cost absorption, and the regulator has cast doubt on differentials as large as

TABLE 3
Average Savings from DirectPay for Each Category of Gas Consumer

	Gas-consuming households, paying by:							
	Credit or slot meter, no bank account		Credit or slot meter, has bank account		Monthly payments		All	
	£ p.a., 1995 tariffs	Percentage of income	£ p.a., 1995 tariffs	Percentage of income	£ p.a., 1995 tariffs	Percentage of income	£ p.a., 1995 tariffs	Percentage of income
Poorest quintile	11.63	0.4	8.81	0.4	9.52	0.4	9.62	0.4
Richest quintile	*	*	10.09	0.1	11.47	0.1	10.56	0.1
Pensioner household	7.48	0.3	7.91	0.2	8.64	0.2	8.04	0.2
Single parent	12.08	0.3	9.24	0.3	9.85	0.2	10.14	0.3
On income support	12.33	0.3	9.91	0.2	9.92	0.2	10.64	0.3
Disabled	13.47	0.3	10.05	0.2	9.81	0.1	10.38	0.2
All	10.44	0.3	9.51	0.1	10.27	0.1	9.84	0.2

* Sample size too small for meaningful estimate.

3 pence per therm (Trade and Industry Committee, 1994). In these circumstances, a maximum difference in transport charges to different geographical areas of 2 pence per therm seems more likely. Prices are likely to go up in Wales and the south-west and come down in Scotland,⁹ the north-east, the east Midlands and East Anglia. Households in Wales that use gas tend to be poorer than average (22 per cent are in the lowest quintile of the income distribution and only 16 per cent in the highest) whereas those in the south-west are richer (25 per cent have incomes in the highest quintile).

2. High and Low Levels of Gas Consumption

It is generally agreed that the standing charge understates the cost per consumer of keeping gas consumers attached to the distribution network (see, for example, Price (1991)). The subsidy has been reinforced by the regulator's ruling on charges per consumer supplied to be levied on shippers of gas to the new domestic market. However, in the longer term, we are likely to see some increase in standing charge relative to running rate of the kind already introduced in the DirectPay tariff. Such rebalancing would harm low-consumption users and benefit those with high usage. Figure 1 plots a kernel estimate of the density function of annual gas consumption, showing that the distribution is quite skewed.

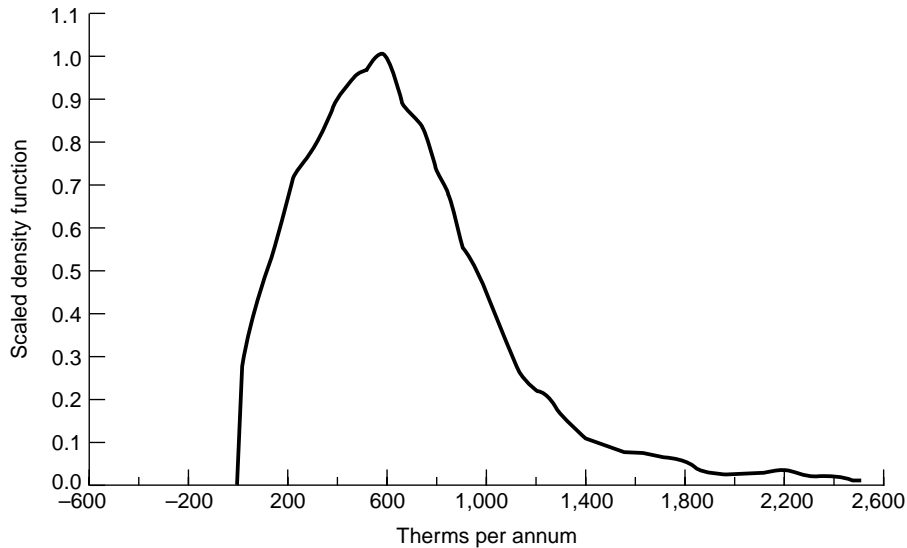
The characteristics of households in the extremes of the distribution are shown in Table 4.

We estimate that 5 per cent (corresponding to roughly 900,000 households) of gas-consuming households use no more than 100 therms per year. (This group includes those who use gas for cooking only, who consume about 44 therms, a bench-mark used by the Trade and Industry Committee (1994).) Twenty-six per cent of them are amongst the poorest 20 per cent of households. Nearly a third are pensioner households. Lone parents and households in receipt of social assistance are also over-represented. We can see that in protecting small consumers by capping TransCo's standing charge for domestic consumers, Ofgas is helping (some of) those of pensionable age to whom it has a responsibility, and that future pressure to raise the domestic standing charge would harm these groups.

Tariff rebalancing may accompany regional differentiation, perhaps through increasing standing charges relative to commodity charges in regions where transport costs are high. The proportions of households that consume low and high volumes of gas do not vary greatly by region, although it is noticeable that households in the south-west are unlikely to consume more than 1,500 therms per year and households living in Greater London are relatively likely to consume no more than 100 therms per year (Table 5). Regional price

⁹ Gas-consuming households in Scotland appear relatively rich, perhaps because of the limited geographical availability of gas supplies, which are confined mainly to urban areas.

FIGURE 1
Estimated Distribution of Annual Gas Consumption



differentiation is likely to be a particularly sensitive political (and electoral) issue, as the Trade and Industry Committee (1994) has already noted.

3. Seasonal Pricing

We examined the effect of introducing a seasonal charge, another change that is

TABLE 4
**Characteristics of Households that Consume Small and Large Amounts of Gas
 (percentage in each group)**

	Annual gas consumption		
	<i>100 therms or less</i>	<i>Over 1,500 therms</i>	<i>All</i>
Poorest quintile	26	17	18
Richest quintile	21	32	21
Pensioner household	31	13	24
Single parent	6	6	4
On income support	16	13	12
Disabled	7	7	9
Sample size	264	218	5,301

TABLE 5
Low- and High-Volume Gas Consumers, by Region

<i>Standard region</i>	Annual gas consumption		<i>Sample size (all gas-consuming households)</i>
	<i>100 therms or less</i>	<i>Over 1,500 therms</i>	
North	3	3	334
Yorkshire and Humberside	5	5	487
North-west	4	5	668
East Midlands	4	5	418
West Midlands	6	4	525
East Anglia	5	4	172
Greater London	9	4	619
Rest of south-east	4	4	1,050
South-west	6	1	408
Wales	4	5	249
Scotland	5	5	371
All households	5	4	5,301

likely as competition develops. Gas consumed in winter at high system demand would be more expensive than gas consumed in summer, and we used as the basis of calculations the differential charged by BG to industrial consumers under its optional seasonal tariffs. These sell gas in summer at 85 per cent of the cost of winter gas, and fuel taken in spring and autumn at 95 per cent. Figure 2 shows that the seasonal pattern of consumption depends on the household's type of central heating. Those with gas central heating have much more seasonal variation in their gas consumption than those with 'other central heating', and the variability for those with no central heating is between the two.

The effect on gas bills of introducing such differentiation into domestic tariffs, with the same (weighted) average price and assuming current patterns of consumption continued, was surprisingly small: about 0.5 per cent or £1.93 annual increase for a typical owner of gas central heating; those with 'other central heating' would gain about 0.2 per cent (of their lower bills), an average of only a few pence, while the bills of those with no central heating would increase by a similar amount.

Table 6 shows that those with gas central heating contain a high proportion of the rich and a low proportion of vulnerable households, so such rebalancing, which would in effect increase charges more to owners of central heating, would seem to have few adverse distributional effects on average, and might have some

FIGURE 2
Average Monthly Gas Consumption, by Month of Interview:
Credit Customers with/without Central Heating

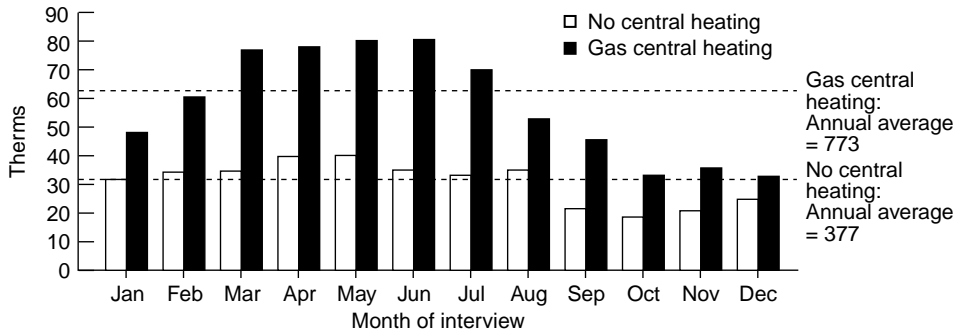


TABLE 6
Characteristics of Households with Different Forms of Heating
(percentage in each category for each type of heating)

	Gas-consuming households			All
	Gas central heating	No central heating	Other central heating	
Poorest quintile	16	27	23	18
Richest quintile	24	10	19	21
Pensioner household	22	33	26	24
Single parent	3	5	5	4
On income support	10	21	16	12
Disabled	8	12	9	9

efficiency benefits, though some poor and vulnerable families would be adversely affected. However, the small sums imply that greater differentials might be needed to have a significant effect on consumption balancing. (Very few industrial consumers have chosen these optional tariffs, suggesting that they too saw few advantages.)

VI. CONCLUSION

Competitive forces will reduce cross-subsidies in the domestic gas market. We have shown that this is likely to increase allocative efficiency but is not neutral in its impact on consumers with different incomes and other characteristics that

indicate vulnerability. The changes already implemented (related to method of payment) have a regressive distributional effect. Competitive forces will inevitably exert pressure to eliminate other cross-subsidies, and we have examined the distributional effects of their removal. An increase in standing charges would be regressive, on average, while the effects of differentiating regional and seasonal charges would be mixed. This raises important questions about the regulator's responsibility for efficiency and equity which are at the centre of the present regulatory debate. We have shown that allowing competition to remove the present cross-subsidies is likely to 'promote efficiency' but at the expense of many vulnerable households, especially those 'of pensionable age' for whom the regulator has a special responsibility.

These issues are crucial not only to gas consumers and the industry regulator, but also to policymakers with wider responsibilities. Moreover, the patterns established in gas will be followed in electricity as its domestic market is opened up to competition from 1998 (there is already a fixed rebate given to consumers who pay by direct debit in some regions). The existence of 12 independent Regional Electricity Companies makes the details more difficult to analyse, but should provide the regulator with important information.

Much criticism of the UK nationalised industries has centred on their levels of productive efficiency, with little discussion of the tradition of cross-subsidy between consumers that has developed. The example of British Gas shows that competition in domestic markets exerts pressure to abolish such cross-subsidies. While this is allocatively efficient, it is not distributionally neutral, particularly where discounts depend on access to bank accounts. With both gas and electricity markets being opened to competition in the next three years, and general disquiet about the powers of privatised utilities and their executives' pay, this is an important issue both for every domestic household and for the government.

APPENDIX: DETAILS OF ANALYSIS

1. Estimation of Gas Expenditure

Most households receive quarterly bills, paying for their consumption in arrears. In the FES, the gas expenditures of such households will relate to consumption in a three-month period which could end as much as three months before the interview date. Others pay by equal monthly payments, fixed by British Gas to correspond to one-twelfth of the customer's expected annual gas bill. For such households, it is these monthly payments which are recorded in the FES. A small minority of households pay for their gas through a slot meter, and their gas expenditure over a two-week period is what is shown in the FES. We convert recorded expenditures into consumption (in therms) using prevailing tariffs.

Some approximation is involved here since we cannot be certain which prices were applicable to the latest payment. This is for two reasons: we do not know the precise date of the latest bill; and when BG increases prices, they are effective from the date of the next meter reading (which varies from consumer to consumer, and is not recorded in the FES). Since gas price changes in 1991 were small, the error from this approximation is unlikely to be significant in practice.

2. Seasonal Adjustment

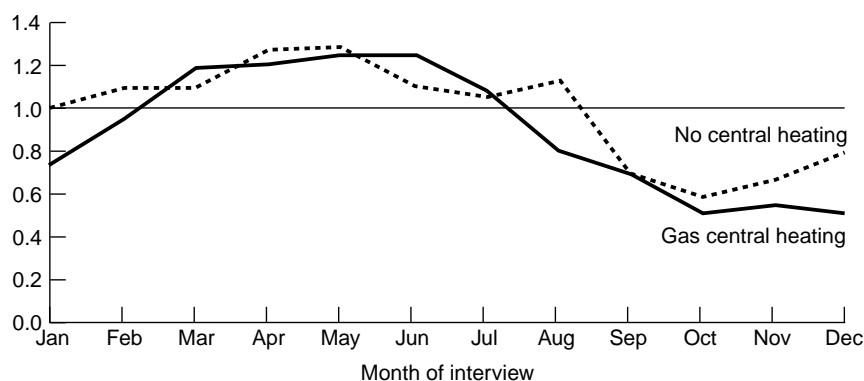
Our estimated gas consumption levels will vary seasonally for credit and slot meter customers, tending to be highest when payments correspond to winter consumption. This seasonal pattern is likely to be different for credit and slot meter customers because they use gas in a different mix of appliances, and may also be different for households with and without central heating. The seasonal nature of gas consumption is illustrated in Figure A1 for credit customers with gas central heating and with no central heating. While the chart is based on the average consumption of a set of different individuals each month, we can think of it as indicative of the annual pattern of consumption for an 'average' consumer. It is clear that this 'average' consumer would appear to be a low consumer of gas if interviewed in, say, October, but a high consumer if interviewed in, say, May or June. Furthermore, as Figure A1 indicates, there are some differences in the seasonal patterns of those with and without gas central heating. For those without central heating, average monthly consumption of households interviewed in January¹⁰ is almost exactly one-twelfth of average annual consumption, whereas for those with gas central heating, the average consumption level in January is about 25 per cent below their equivalent annual average rate of consumption. Since households are interviewed evenly throughout the year, *average* expenditure levels, constructed from a year's sample of the FES, provide a valid basis for estimating annual expenditure. However, we are interested particularly in the *distribution* of consumption. So we must make some adjustment for seasonal variation.

This adjustment is made as follows. The first step is to convert monthly consumption levels to annual equivalents by multiplying by 12. For households paying by fixed monthly payments, no further adjustment is made since the regular (equal) payments over the year should already have removed the seasonal element. For other households, consumption levels are multiplied by the ratio of annual consumption averaged over the whole year's sample, to consumption averaged over all households interviewed in the same month. These averages are calculated separately for slot meter and credit customers and also separately for households with gas central heating, some other form of central heating and no central heating. (For slot meter customers, for whom sample sizes are small, the

¹⁰ Note that this is the average monthly consumption of the three months covered by the most recent bill, not consumption in January.

FIGURE A1

Ratio of Average Monthly Gas Consumption, by Month of Interview, to Overall Average: Credit Customers with/without Central Heating



adjustment is done on a quarterly rather than a monthly basis.) Formally, the seasonally adjusted consumption of household i , in heating/payment category j , interviewed in period t , is given by

$$\tilde{x}_{ijt} = x_{ijt} \frac{\bar{x}_j}{\bar{x}_{jt}}$$

where j indexes a six-way classification of households according to their payment type (credit or slot meter) and their central heating type (none, gas or other), x_{ijt} is unadjusted gas consumption, \bar{x}_j is the mean unadjusted consumption over all households of type j , and \bar{x}_{jt} is the mean for all households of type j interviewed in period t . For credit customers, the adjustment is done on a monthly basis ($t = 1, \dots, 12$); for slot meter users, it is done quarterly ($t = 1, \dots, 4$).

3. Characteristics of Gas Consumers

Seventy-seven per cent of gas consumers have gas central heating, 19 per cent have no central heating and 4 per cent have some other form of central heating. Households with gas central heating are the most likely to pay by monthly payments (39 per cent), while those with other central heating are least likely (13 per cent) (Table A1). Nine per cent of households with no central heating and 11 per cent with non-gas central heating pay for their gas through slot meters, compared with just 1 per cent for those with gas central heating. It is surprising that those who pay monthly have higher-than-average consumption, since those with large consumption have most money to gain from delayed payments

TABLE A1
Characteristics of Gas-Consuming Households

	Method of payment			
	<i>Credit</i>	<i>Monthly payments</i>	<i>Slot meter</i>	<i>All</i>
Percentage of all gas-consuming households	62	35	2	100
Mean annual gas consumption (therms)	610	730	640 ^a	650
Percentage with gas central heating	75	86	34	77
Sample size	3,285	1,838	178	5,301

	Heating type			
	<i>No central heating</i>	<i>Gas central heating</i>	<i>Other central heating</i>	<i>All</i>
Percentage of all gas-consuming households	19	77	4	100
Mean annual gas consumption (therms)	420	730	310	650
Percentage paying by monthly payments	24	39	13	35
Sample size	984	4,085	232	5,301

^a The mean annual consumption for slot meters is likely to be an overestimate because we have not been able to take account of slot meter rebates.

permitted by the credit tariff. This appears to be outweighed by the budgeting benefits of monthly payments.

The proportion of households that have gas central heating rises with income, from two-thirds in the lowest 20 per cent of the income distribution to 87 per cent in the highest. In the top quintile, only 9 per cent have no central heating of any kind, while in the lowest quintile, 27 per cent of domestic gas consumers do not have central heating.

The estimated average annual consumption of our sample is around 650 therms (compared with BG's figure of 648 therms). Consumption is highest for those who use gas central heating (around 730 therms on average) and lowest for households with some other type of central heating (310 therms). Those who pay by monthly payments have higher average consumption (730 therms) than those who pay by slot meter (640) or by credit (610).

At 590 therms, the median consumption level is 10 per cent lower than the mean level. The lower quartile is 350 therms; the upper quartile is 850. Ten per

cent of households consume less than 180 therms per year; 10 per cent consume more than 1,150 therms per year.

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