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**The Distortionary Effects of Taxes on Trade in Border
Areas:
The Case of the Republic of Ireland - United Kingdom
Border.**

by

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1 INTRODUCTION.

The necessity of harmonising indirect taxes within the European Community (EC) does not arise from any desire to improve the efficiency of the tax system but rather as a vital stage on the path to abolishing economic frontiers. The very diversity of the indirect tax systems within the EC means that tax harmonisation will have implications for both government finances and the distribution of income within each member state.

While the final form of tax harmonisation will be decided at a political level, it must take account of the extent to which small differences in tax rates between countries can give rise to distortionary trade flows. In the Commission White Paper *Completing the Internal Market, 1985*, it was suggested, on the basis of experience in the United States, that there could be up to 5% difference in VAT rates between countries. The feasibility of maintaining such differences within a European context needs to be tested by examining the sensitivity of cross-border trade flows to differences in price. It also depends on the extent to which purchasing power parity will hold even after indirect taxes are harmonised.

While it is not possible to carry out a controlled experiment to discover the sensitivity of cross-border trade to minor tax differences, very useful information can be obtained by examining the existing situation in the border areas of neighbouring states with very different tax regimes. Examples are the border between the Republic of Ireland and Northern Ireland (part of the United Kingdom) and the border between the Federal Republic of Germany and Denmark¹.

This paper discusses the results of a number of studies carried out into the Irish economy². It considers the extent and sensitivity of cross-border trade along the common land border between the Republic of Ireland and the United Kingdom in the period to the end of 1986. It also examines the factors driving this trade: the difference in prices, whether due to indirect taxes or other factors.

Section 2 examines the differences in prices between the Republic of Ireland and the United Kingdom and discusses the extent to which these differences in prices are due to tax differences. Section 3 sets out the results a detailed household survey undertaken in border areas of the Republic of Ireland and the United Kingdom (Northern Ireland). Section 4 models the demand for certain key products on which tax differences were greatest and estimates the extent to which these tax differences gave rise to both legal and illegal cross-border trade. Finally Section 5 discusses the implications of these results for tax harmonisation in a post 1992 Europe.

2 PRICING IN THE IRISH MARKET.

The vital factor driving cross-border trade in the past has been differences in prices between the Republic of Ireland and the UK. It is important to establish firstly how large these price differences have been and how they have changed over time to allow us examine the sensitivity of cross-border trade to this factor. However, in formulating policy for a post-1992 Europe, it is also important to establish how these differences have arisen. To the extent that they have arisen from tax differences, they are likely to disappear as a result of tax harmonisation and the reduction in distortionary trade flows arising from tax harmonisation can be estimated. To the extent that the price differences are due to other factors, tax harmonisation may not be a sufficient condition to end distortions.

While tariff barriers between Ireland and the EC were dismantled progressively in the 1970s this did not ensure that prices were identical in different countries. The existence of customs barriers has allowed wide differences in retail prices across national boundaries to persist. The fact that purchasing power parity does not hold between major countries is well established³.

Table 1 sets out the results of a comparison of consumer prices carried out by the Statistical Office of the European Communities (SOEC). The results are based on a detailed study carried out every five years which is revised at more frequent intervals in the light of changes in the consumer price index and exchange rates in each country. For each year the prices in each country are expressed as a percentage of the Irish price level. (For example, prices in Denmark in 1975 were 151.9% of the level of prices in Ireland.)

The position of Ireland within the EC deteriorated over the period 1975 to 1985. Whereas in 1975 the price level in Ireland was lower than in the 9 other member states, by 1985 it was significantly higher than in Italy, the UK, the Netherlands and Luxembourg. While the position has improved somewhat since 1985, the price level in the UK was still only 93.4% of the Irish price level in June 1988. However, these data make no allowance for differences in rates of indirect taxation and, as a result, are not a direct test of whether purchasing power parity holds.

1 For a study of the Danish - German border see Bygvra S., C.Y.Hansen, K. Restad, and S. Soltoft, 1987, *Den Dansk-Tyske Grænsehandel - og dens prisfølsomhed*, Arbejdspapir nr. 37, Institut For Grænseregionsforskning, Denmark.

2 In particular it draws on the results presented in Fitz Gerald J.D., T.P.Quinn, B.J.Wheelan, and J.A. Williams, *An Analysis of Cross-Border Shopping*, General Research Series No.137, Economic and Social Research Institute, 1988.

3 For example, see Frenkel, J.A., "The Collapse of Purchasing Power Parities During the 1970s", *European Economic Review*, Vol 16, 1981.

Table 1
International Comparison of Price Levels
Ireland = 100

	1975	1980	1985	1987 May	1988 June
Denmark	151.9	141.7	126.3	140.6	142.7
Germany	139.5	134.5	108.8	118.3	117.4
France	137.0	128.6	105.0	109.3	109.1
Belgium	134.6	126.2	97.5	106.0	104.2
Netherlands	124.7	122.6	95.0	103.4	102.3
Ireland	100.0	100.0	100.0	100.0	100.0
Italy	108.6	89.3	87.5	94.3	94.7
UK	103.7	115.5	95.0	87.3	93.4
Luxembourg	123.5	115.3	90.0	95.9	93.4
Spain	NA	NA	68.8	70.2	77.1
Greece	NA	85.7	72.5	69.9	72.9
Portugal	NA	NA	57.5	56.0	56.9

Source: SOEC

In the major study by Emerson et al. on the effects of 1992 on the EC⁴ the SOEC PPP data were adjusted for tax differences. While this adjustment reduced the measured dispersion of prices, there were still major differences left to be explained by other factors. For consumer goods, excluding energy, the standard deviation for the EC in 1985 was reduced from 19.4% to 15.2% by excluding taxes from measured prices.

In a detailed study of the factors affecting cross-border shopping in Ireland, published in March 1988⁵, we examined the effects of differences in indirect taxes on prices in Northern Ireland and the Republic. The results suggested that in February 1987, for the basket of goods examined, tax inclusive prices were over 20% higher in the Republic than in Northern Ireland while net of tax prices in the Republic were over 10% higher than in the North. However, as shown in Table 1, the movement in the SOEC purchasing power parity (PPP) data since that date would suggest that much of this difference in net of tax prices has since been eliminated. However, it still remains true that for significant periods in the 1980s, the level of net of tax prices in the Republic was different from that in the UK while tax inclusive prices have shown even greater differences.

The movements in the purchasing power parity data for other countries, which have had minimal changes in their indirect tax systems in recent years, also indicates that the failure of absolute PPP is not an unusual phenomenon in the Community. For example, the price level in Germany in 1988 was 17.4% higher than that in Ireland whereas it was only 8.8% higher in 1985, a period over which there was little change in tax rates in either country.

The failure of PPP, at least in the short term, may reflect the fact that costs of selling in different markets may differ: transport costs to different markets may account for differences in the price of imported goods; profit margins may differ from country to country. What is clear is that the position of consumers varies significantly from market to market and that the difference in purchasing power is not just affected by variations in rates of indirect taxation. An important part of the benefits of 1992 are forecast to come from the reduction in these price differences. Thus, in considering the effects of the abolition of economic borders, it is important to understand how these net of tax price differences arise and how they can persist in the face of relatively free trade in goods in the EC. The possible reasons for these price differences are many and are discussed below.

A large number of studies have been carried out over the last 15 years into the determination of prices in Ireland. The studies carried out in the 1970s showed that Irish prices generally followed closely those in the UK⁶. However, since the break in the link with Sterling after Ireland joined the EMS in 1979, the situation has changed.

⁴ Emerson, M., 1988, op. cit.

⁵ Fitz Gerald J.D., T.P. Quinn, B.J. Whelan, and J.A. Williams, *An Analysis of Cross-Border Shopping*, General Research Series No.137, Economic and Social Research Institute, 1988.

⁶ For example, see Geary, P.T., "Lags in the Transmission of Inflation: Some Preliminary Estimates", *Economic and Social Review*, Volume 7, 1976 and Bradley, J., "Lags in the Transmission of Inflation", *Economic and Social Review*, Volume 8, 1977.

A recent study⁷ indicates that the output price of manufacturing industry is still determined in the long run by movements in prices in the rest of the world, primarily by prices in Germany and the UK⁸. However, it also showed that exchange rate changes led to a significant temporary divergence of Irish output prices from those in the UK and Germany. This *temporary* divergence could persist for a number of years as firms are slower to adjust their prices to changes in exchange rates than to changes in foreign currency prices. When the same model was applied to data for output prices in Belgium similar results were obtained indicating that the behaviour of firms in Ireland is by no means abnormal and that temporary deviations from purchasing power parity are partly due to exchange rate instability.

The results presented in our study of cross-border shopping suggest that consumer prices behave in a similar fashion to wholesale prices, showing a slow adjustment to exchange rate changes. Taken together, these results indicate that a very important reason for the difference in the price of similar goods across the EC at any point in time is the slow response of prices to exchange rate changes. However, it is also clear that exchange rate changes are not the only factor and that micro-economic evidence is required to fully understand the reasons why purchasing power parity does not hold at any given point in time.

On the basis of micro-economic evidence another study⁹ concluded that the higher net of tax prices observed in Ireland in periods in the 1980s were probably primarily due to differences between the price charged by manufacturers in the North and in the Republic. While part of this difference can be explained in terms of slow adjustment to exchange rate changes in the 1986-7 period some of it must be attributable to market differentiation by manufacturers. Little evidence of inefficiency or undue margins at the retail level was found.

This evidence from a number of sources indicates that indirect taxes are the single biggest reason for the continuing difference in prices between the Republic of Ireland and the UK over the 1980s. However, net of tax prices have also differed significantly primarily due to exchange rate fluctuations and the ability of firms to discriminate between the two markets in their price setting behaviour. Thus the harmonisation of taxes will not, on its own, be sufficient to eliminate distortionary trade flows after 1992.

3 SURVEY DATA

In this section I present the main findings of a detailed survey of households undertaken in early 1987¹⁰. The survey of households in the Republic was carried out in two parts: a survey of 2000 households living in border areas and a survey of 4000 households covering the whole of the Republic of Ireland. A more limited survey was carried out of 1000 individuals living in Northern Ireland. (The results of the more limited survey of residents of Northern Ireland indicated a low volume of shopping in the Republic due to the higher prices.)

The National Survey showed that a total of 12% of households in the Republic had done some shopping in the North during the six months covered by the survey. Approximately 835,000 shopping trips were made over that period¹¹. As can be seen from Table 2, the number of trips per household was greatest for households living close to the border. Of these trips, 89% were solely or mainly for shopping, 3% mainly for business but with a shopping element, and 7% were mainly holiday trips on which some shopping was done.

From the Border Survey we found that 46% of households in the six border counties had made a shopping trip to the North in the period covered by the survey. Sixty-four per cent of these shopping trips were major trips on which more than £20 Sterling was spent. A further 30% were smaller shopping trips on which less than £20 Sterling was spent. Only 2% were mainly business trips with a shopping element and 4% were holidays on which some shopping was done. As shown in Table 2, the average number of shopping trips per household in the six border counties was 13.5, ranging from 21.5 trips for households living within five miles of the border to 4.1 trips for those living in excess of 30 miles from the border.

Average expenditure on each trip was IR£41.50. This figure was strongly and positively related to distance from the border. The average trip expenditure for those within five miles of the border was IR£35.30. This figure increased to IR£98.84 for those living over 30 miles from the border.

7 Callan T. and J. Fitz Gerald, "Price Determination in Ireland: Effects of Changes in Exchange Rates and Exchange Rate Regimes", *Economic and Social Review*, Volume 20 No.2, 1989.

8 These prices generally exclude indirect taxes.

9 Fitz Gerald, J., "1992: The Distribution Sector", in J. Bradley Ed. *The Economics of 1992*, Economic and Social Research Institute, forthcoming, 1989.

10 Fitz Gerald, J.D., T.P. Quinn, B.J. Whelan, and J.A. Williams, 1988, *An Analysis of Cross-Border Shopping*, Economic and Social Research Institute, Dublin, General Research Series, Paper 137.

11 There are about 935000 households in the Republic of Ireland.

TABLE 2

*Average number of trips per shopping household in the 6 border counties
classified by type of trip and distance from border,
6 months ended January 1987*

Type of Trip	Distance to Border with N.Ireland, in Miles				
	0-5	6-15	16-30	31+	Total
Solely for shopping: more than Stg£20 spent	12.45	10.03	5.54	3.15	8.62
less than Stg£20 spent	7.23	4.50	2.04	0.84	4.05
Business trip + shopping	0.51	0.24	0.05	0.02	0.24
Mainly holiday/transit	1.12	0.34	0.44	0.08	0.56
All Trips	21.51	15.11	8.07	4.09	13.48
Average no. trips a week	0.82	0.58	0.31	0.13	0.52

In reply to direct questions on shopping in Northern Ireland the answers suggested that IR£42m was spent in the North by residents of the Republic as a whole in the period covered by the survey¹², of which £29m was spent by residents of the six border counties. This would give a rough estimate for annual expenditure in the region of IR£84 million.

We believe this to be a conservative estimate for a number of reasons. Firstly, when asked about the proportion of total expenditure on certain items accounted for by cross-border shopping (see Table 3) the responses indicated that total cross-border shopping may have amounted to about £150 million in 1986. Households reported buying a very high proportion of their alcohol North of the Border while only admitting to a relatively small absolute expenditure¹³. Secondly, in such retrospective survey work respondents often may have serious memory or recall problems. Thirdly, we found that respondents seemed prone to framing their replies within the limits set by the legal restrictions in force at the time. Fourthly, the data collected did not include purchases by commercial smugglers.

TABLE 3

*Proportion of Border Households' Expenditure Spent North of the Border
Classified by Commodity and by Distance of Household from the Border.
%*

Item	Miles from Border				
	0-5	6-15	16-30	31+	Total
Food	40	32	21	11	28
Other Groceries	62	61	44	27	52
Petrol	91	75	47	15	66
Beer	97	81	80	83	89
Spirits	97	93	84	83	90
Wine	96	94	90	79	92
Tobacco/Cigarettes	64	39	29	8	40
Womens Clothes	61	55	50	41	52
Mens Clothes	64	53	54	33	54
Childrens Clothes	57	51	44	36	47
Toys	87	83	76	72	79
TV/Video	-	-	-	-	62
Kitchen Electric	-	-	-	-	61
Other Electric	85	87	85	80	85
Non-Electric	72	66	52	52	64

¹² The 6 months ending January 1987.

¹³ This is in line with the experience of the CSO *Household Budget Survey* where households consistently underreported their expenditure on alcohol.

TABLE 4

*Consumer Expenditure by Shopping Households,
Classified by Items Purchased*

% of Total Expenditure in Northern Ireland on each item

Item	Survey of Republic of Ireland	Survey of 6 Border counties
Food	26.6	29.99
Other Groceries	11.2	10.75
Petrol	26.4	32.01
Beer	4.4	1.70
Spirits	4.4	2.60
Wine	1.3	0.59
Tobacco/Cigarettes	1.6	1.68
Womens Clothes	4.5	4.53
Mens Clothes	2.0	1.81
Childrens Clothes	2.5	2.02
Toys	6.4	4.35
TV/Video	0.6	0.51
Kitchen Electric	0.7	0.97
Other Electric	2.8	2.23
Non-Electric	1.4	1.42
Other	3.1	2.82

As can be seen from Table 4, the major items accounting for the expenditure North of the border were Petrol (32%), Food (30%) and Other Groceries (11%). When allowance is made for underreporting of alcohol expenditure, using the data in Table 3, it is clear that this commodity was also important in cross-border shopping. In the case of petrol and alcohol there is a major difference in price between the UK and the Republic of Ireland due to differences in tax rates.

The survey in border counties examined shoppers' knowledge of price differentials between the two jurisdictions. The most noteworthy feature of this analysis was the high level of awareness of the current exchange rate between the IR£ and £Stg. It found that almost 66% of shoppers were able to state the level of the exchange rate accurate to within 1 per cent of the actual rate.

When asked directly to estimate the price of a number of items in both the Republic and Northern Ireland we found, not surprisingly, that a much higher percentage of shoppers were able to estimate the price of goods in the Republic than in Northern Ireland. The Republic's prices of five items were estimated to within a few pence accuracy. As regards prices of goods in the North, those who could make an estimate were correct to within a few pence in the case of seven items (including petrol).

The survey conducted among residents of Northern Ireland showed that only 17% of people from Northern Ireland visited the Republic in the six months ending February 1987 and only 5% of the Northern population shopped in the Republic over that period. Approximately IR£3.6 million was spent in the Republic by residents of the North in the six months prior to the survey. The bulk of this, 72%, was spent on clothes, which are liable to a lower rate of VAT in the Republic than in Northern Ireland.

4 TIME SERIES DATA

Because of the general absence of time series data on the volume of sales of individual consumer goods in regions of the Republic, in particular in border areas, it is difficult to carry out a study along the lines of that undertaken for the border regions of the state of Tennessee in the US¹⁴. The volume of cross-border trade in most consumer goods is likely to be relatively small compared to the national sales of such commodities. As a result, given the limited number of observations available it is generally very difficult to identify the magnitude of cross-border trade using econometric methods with time series data.

¹⁴ Fox, W.F., 1986, "Tax Structure and the Location of Economic Activity Along State Borders", *National Tax Journal*, Vol. XXXIX, No.4.

The exceptions are goods liable to excise taxes where the difference in prices between the Republic of Ireland and Northern Ireland tends to be greatest. The survey evidence quoted above and informed media speculation suggests that the volume of cross-border trade in some of these goods accounts for a significant percentage of national sales. We analysed the time series data for sales of spirits and beer, TV sets and petrol in the Republic of Ireland. The results for spirits were statistically very significant and are discussed below. The results for TV sets and petrol also indicated significant cross-border trade, while the results for beer were inconclusive.

4.1 CROSS - BORDER TRADE IN SPIRITS - BACKGROUND

For some time it has been known that a considerable cross-border trade has existed in spirits. The Government, recognising this problem made a substantial reduction in the rate of excise duty chargeable on spirits in October 1984. However, in spite of this change, the tax content of a bottle of spirits sold in the Republic is substantially higher than in Northern Ireland. Because of the high value for a given weight or volume of spirits, transport costs are low and it remains an attractive purchase North of the border for all those living in the Republic. However, restrictions on the quantity which can be imported legally by any one individual, without paying additional duty, mean that the potential savings from legal imports of spirits would not, on their own, warrant travelling long distances due to the opportunity cost of shoppers time. Taken together with potential savings from other goods the situation is rather different and spirits are likely to form an important component of all goods purchased in Northern Ireland by shoppers from the Republic. In addition, given the problems controlling illegal traffic, the potential profit from smuggling such a high value item are considerable. Evidence from customs seizures reported in the media indicates that there is a significant level of such illegal trade.

In the light of these considerations, the magnitude of cross-border trade in spirits can be expected to be quite large and should show up as a perceptible fall in domestic sales of spirits below the level they would otherwise have attained. The approach taken to such problems of cross-border trade in other studies has been to estimate the share of total sales on either side of the relevant border as a function of relative prices and incomes in the two jurisdictions. In the case of this study good data on sales of spirits are only readily available for the Republic.

4.2 DATA

There is no single major source of consistent quarterly data for consumption in the Republic. As a result quarterly indicators on sales of spirits, the volume of total consumption and the prices of spirits and other goods are used from a range of sources. Data on sales of spirits were supplied by the Revenue Commissioners. These data cover clearances from bond and they generally give a good indication of domestic sales.

These quarterly data were scaled so that the value of total sales in 1980 was equal to the National Accounts figure for domestic consumption of spirits. The price of a bottle of whiskey in the Republic was obtained from a range of sources¹⁵. The price of a bottle of spirits in Northern Ireland was obtained from the UK Report of Her Majesty's Commissioners for Customs and Excise (various issues). The price of beer for the period 1975 to 1982 was obtained from the National Prices Commission surveys. From 1982 onwards the data were obtained from the file in the CSO databank on the consumer price index. The price of total consumption was proxied by the consumer price index. The volume index of retail sales was used as an indicator of the volume of total consumption. These last two series were taken directly from the CSO databank.

4.3 THE MODEL

The basic tenets of consumer theory indicate that the volume of consumption of any individual commodity is a function of tastes, the price of the relevant commodity, the prices of all competing commodities and the level of income (volume of total consumption). Obviously there are a vast range of goods competing for a share of each consumer's budget so that it is not feasible to incorporate the prices of all competing goods into the demand function for each individual commodity. Instead it is necessary to omit the prices of a range of different commodities or to aggregate the competing commodities into groups or sub-groups. In the case of spirits, because of the potential importance of cross-border trade in recent years, we include the price of spirits in Northern Ireland as the most obvious competitor for domestic consumption of spirits. In addition we experimented with the inclusion of the domestic price of beer, the domestic price of other alcohol and the price of all other domestic consumption treated as an aggregate.

The fact that reliable data on the magnitude of cross-border trade are not available requires a slightly different approach in this study than that taken in many other studies of consumer demand in Ireland. It means that we can not estimate the domestic demand for alcohol as part of a full consumer demand system. It also means that, to the extent that the measures of domestic income or consumption do not take account of the volume of cross-border purchases, the estimated coefficients may be biased. This is a particularly important consideration if it is desired to model consumption as a two stage decision making process where consumers first decide on their consumption

¹⁵ See Fitz Gerald, J., et al., 1988.

of alcohol and then decide on how they allocate their expenditure across the different categories of alcohol¹⁶. In such a case the measure of domestic consumption of alcohol is likely to be seriously biased in the presence of significant cross-border trade. As a result, a log linear model was preferred to the theoretically more attractive AIDS¹⁷ model as it is less prone to bias in the presence of doubtful income data.

A second potential problem with the presence of cross-border trade in spirits is that it is a potentially two way process. In the 1960's and the early 1970's there were times when the price differential would have favoured purchases of spirits in the Republic by residents of Northern Ireland. The measured domestic consumption of spirits would have included this trade. As a result, the measured domestic consumption of spirits would have to be modelled as a function of prices, income levels and populations North and South of the border. An example of such an approach is given in Fox, 1986, where the share of consumption taking place on either side of a border is a function of relative prices and relative incomes in the two tax jurisdictions. In the case of this study, this problem has been overcome by confining the estimation of the relevant models to the period when the incentives were uniquely in favour of purchases in Northern Ireland, that is from 1978 onwards.

The log linear model took the form:

$$\text{LOG(CSP)} = A1 + A2 \cdot \text{LOG(PCSP)} + A3 \cdot \text{LOG(PCSPNI)} + A4 \cdot \text{LOG(PCB)} + A5 \cdot \text{LOG(PCO)} + A6 \cdot \text{LOG(C)} + S1 \cdot D1 + S2 \cdot D2 + S3 \cdot D3$$

where:

- CSP = consumption of spirits at constant 1980 prices, £ million.
- PCSP = price index for domestic consumption of spirits.
- PCSPNI = price index for sales of whiskey in shops in Northern Ireland.
- PCB = price index for domestic consumption of beer.
- PCO = price index for the rest of personal consumption.
(When using quarterly data this is the overall consumer price index.)
- C = total personal consumption at constant 1980 prices, £ million.
- D1, D2, D3 = seasonal dummies used when using quarterly data.
- A1..A6 and S1..S3 = coefficients to be estimated.

4.4 RESULTS

Using the log linear specification an equation for domestic demand for spirits was estimated using quarterly data. The time period chosen was the first quarter of 1978 to the fourth quarter of 1986, omitting the first and second quarters of 1980. (These two quarters were omitted due to the effects on them of anticipatory purchases of spirits prior to the 1980 budget.) This time period still includes some quarters when domestic consumption was significantly affected by changing administrative regulations. (To avoid these problems the equation was tested using a truncated sample beginning in the first quarter of 1982. This did not significantly alter the results.)

Data sample: 1978 1 to 1979 4 and 1980 2 to 1986 4.

$$\begin{aligned} \text{LOG(CS)} = & -3.63 - & 1.28 \text{ LOG(PCSP/PCB)} + & 0.98 \text{ LOG(PCSPNI/PCB)} + \\ & (0.7) & (4.4) & (3.4) \\ & 1.20 \text{ LOG(C)} - & 0.64 \text{ D1} - & 0.57 \text{ D2} - & 0.39 \text{ D3} \\ & (1.5) & (9.5) & (8.0) & (6.1) \end{aligned}$$

$$\bar{R}^2 = 0.882 \quad \text{S.E.} = .117 \quad \text{DW} = 2.42 \quad \text{DFFITS} = 1.41$$

The overall fit of this equation is very satisfactory. As indicated by the DFFITS statistic¹⁸ no one observation was especially influential and testing with different subsamples of the data did not significantly alter the coefficients. The Durbin Watson statistic is in the inconclusive region and one would have preferred a dynamic specification. However, experimentation with different lag structures proved unsatisfactory. Attempts to model the demand for spirits using different models of expected prices were also less satisfactory than the model using actual prices.

¹⁶ Keegan, Owen P., 1984, "Description, Simulation, and Analysis of an Excise Tax Forecasting Model for Ireland", The Economic and Social Research Institute Seminar Paper.

Thom, R., 1985, "The Demand for Alcohol in Ireland" University College Dublin, Working Paper no. 24.

¹⁷ Deaton, A., and J. Muellbauer, 1980, "An Almost Ideal Demand System", *American Economic Review*, Vol. 70, No.3, June.

¹⁸ Krasker, W.S., E. Kuh and R.E. Welsch, 1983, "Estimation for Dirty Data and Flawed Models", in Z. Grilliches and M.D. Intriligator (eds.), *Handbook of Econometrics*, Vol. 1, Amsterdam: North-Holland.

The estimate of the own elasticity of demand and the cross elasticity are significantly different from zero. The income elasticity (the elasticity with respect to the consumer's budget or total consumption) is not significant. The cross - elasticity with respect to beer is 0.30 indicating that beer and spirits are substitutes. The cross-elasticity with respect to the Northern Ireland Price is not significantly different from 1.0 indicating that spirits bought in the North are a close substitute for spirits bought in the Republic.

When the consumer price index was included in the equation as a proxy for the price of all other goods, all the coefficients, barring the seasonal dummies, were insignificant. As a result, it was omitted in the chosen specification discussed here. The seasonal dummies, which are highly significant, indicate that, as might be expected, sales of spirits peak in the last quarter of the year.

This equation was used to estimate the volume of cross - border trade in spirits. This was done by substituting the price of spirits in the Republic for the Northern price in the equation (setting the 2 prices equal) and estimating the resulting change in the domestic consumption of spirits. This change is an estimate of the volume of cross-border trade in spirits. The results are shown in Table 5, with all the data expressed at constant 1980 prices. This shows that in 1983 and again in 1986 approximately a quarter, by volume, of spirits drunk in the Republic are likely to have originated in Northern Ireland.

Table 6 gives the estimated actual expenditure on spirits in Northern Ireland by residents of the Republic. In this case the volume of trade, derived from the equation, has been converted to current prices and valued at the price of a bottle of spirits in Northern Ireland (i.e. the price paid by the shopper from the Republic.) To the extent that the cross-border trade is accounted for by smuggling in large quantities bought at wholesale prices, this would overestimate the value of the trade. As can be seen from the table, for the period covered, the value of cross-border trade in spirits peaked in 1983 at £56 million. In October 1984 the tax on spirits was reduced to counter this trade and the effects, on a full year basis, can be seen in the decline in the estimated value of the trade to £33 million in 1985. However, chiefly because of changes in the Sterling Irish Pound exchange rate, the price differential opened up again in 1985. On the basis of the equation, the value of cross-border trade climbed again in 1986 to nearly £55 million, almost equal to it's peak 1983 value. This total would represent approximately 20 per cent of the total expenditure on spirits by residents of the Republic.

TABLE 5
*Purchases of Spirits in Northern Ireland as % of Volume of Total Purchases,
(constant 1980 prices, IR£ Million).*

	PURCHASES IN			NORTH AS % OF TOTAL
	REPUBLIC	NORTH. IRL.	TOTAL	
1978.....	254.5	13.1	267.7	4.9
1979.....	268.4	11.4	279.9	4.1
1980.....	239.2	27.6	266.8	10.3
1981.....	221.4	40.6	262.1	15.5
1982.....	191.5	59.3	250.8	23.6
1983.....	180.4	64.7	245.1	26.4
1984.....	189.5	56.9	246.4	23.1
1985.....	225.8	35.3	261.0	13.5
1986.....	192.5	64.3	256.9	25.0

TABLE 6
*Purchases Of Spirits In Northern Ireland
As Per Centage Of Total Purchases, By Value*

	PURCHASES IN NORTHERN IRELAND	
	£ MILLION	AS % OF TOTAL
1978.....	5.9	3.5
1979.....	5.8	3.1
1980.....	17.6	7.8
1981.....	31.4	12.3
1982.....	48.1	19.5
1983.....	55.6	24.6
1984.....	50.8	19.6
1985.....	32.5	11.2
1986.....	54.7	20.2

4.5 CONCLUSIONS

When the time series approach was applied to trade in TV sets and petrol it suggested that the cross-border trade in TV sets amounted to at least £5 million in 1986. In the case of petrol the evidence from the limited time series data available tends to confirm the survey based estimate of cross-border trade amounting to £22 Million.

For spirits the time series evidence is quite strong and suggests that there is a very large illegal cross-border trade. This conflicts with the survey results. However, this result may be explained partly by the fact that the illegal trade is carried on on a commercial rather than a household basis and partly by the unwillingness of respondents in surveys to admit to illegal activity. Given the magnitude of the estimates based on the time series data, it is clear that the bulk of the trade would have to be on such a commercial basis with professional smugglers selling to trade outlets. On this basis we would estimate that the value of the cross-border trade in spirits in 1986 amounted to around £55 Million Irish.

Because of the limited nature of the time series data available it was not possible to estimate the sensitivity of cross-border trade to price differentials of varying sizes. In each case the models used would suggest that the trade would decline in line with the price differential. However, one may surmise that as the domestic price approaches the Northern price the trade may fall off more than proportionately and that a long term price difference of a few per centage points might not result in substantial cross-border trade.

These results would indicate that the substantial cut in the rate of tax on TV sets and spirits in the Republic in late 1984 / early 1985 resulted in a net increase in revenue to the exchequer. They would also suggest that a further substantial cut in 1986 in the tax on spirits would have been self-financing. The situation is less clear for TV sets though it is probable from the 1984 experience that a cut in tax here would also be close to self financing. The volume of cross-border trade in petrol is small compared to total sales in the Republic. As a result, the loss of revenue from a reduction in the rate of tax would receive little offset through a fall in such cross-border trade.

5 IMPLICATIONS FOR COMPLETING THE INTERNAL MARKET

Taking the two sets of data together, and making allowances for underestimation by households, the overall magnitude of cross-border trade in consumer goods was between £150 Million and £250 Million in 1986 (between 1.5 and 2.5 per cent of personal consumers' expenditure). This volume of trade took place in spite of extensive customs restrictions affecting individual consumers.

The fact that the total estimated expenditure by households in the Republic is slightly lower than might have been expected on the basis of media comment should not detract from the serious implications of this trade for border areas. The bulk of the trade by households is concentrated among those living in border counties of the Republic. While, due to convenience factors, one would expect quite significant cross-border shopping by such households even without price differentials, the magnitudes reported in the study go far beyond this. Two thirds of all petrol consumed by households living in border counties who shopped in the North (46% of the total) was bought North of the border. For these households almost all alcohol bought for consumption at home was bought in the North. Approximately two thirds of certain consumer durable items and toys were bought there. In total, the cross-border shopping of households in border areas in 1986 accounted for nearly 10 per cent of their total expenditure. Clearly, the effects of such a pattern of shopping on the retail sector in these counties is very severe in terms of profits, wages, and employment. It must also have had some effect on certain other sectors of the local economy such as restaurants and hotels.

It is not possible to work out the effect of this cross-border trade on tax revenue in the Republic without a much more complex model of how consumers allocate their budgets. If they were not able to shop in the North they would face much higher prices for some of those goods which they currently buy in the North. As a result, they would alter their spending patterns. In addition, their disposable income would be reduced because of the increase in the effective level of prices which they would face. If one ignores these effects and assumes that the goods purchased in the North in 1986 had been purchased in the Republic, Government revenue would have been higher in the Republic by around IR£100 Million. However, the actual amount received by the Government from such a change in trade patterns would have been much lower for the reasons stated above.

The survey data do not allow a direct estimate of the sensitivity of the cross-border trade to changes in price differentials. However, the pattern of decay of this trade with distance and households' own estimate of savings required to justify travelling, does give some indication of the sensitivity of household behaviour to this factor. The fact that approximately half of the petrol purchases of households (who shopped in Northern Ireland) who lived between 15 and 30 miles from the border was made in the North is striking. Given the households' estimate of the savings required to justify travelling North (£0.42 per mile) this trade could be expected largely to disappear if the price differential were halved. (It would not be profitable to travel North merely to buy petrol.) The purchases of petrol by households living between 6 and 15 miles from the border would also be significantly affected by such a cut. A similar argument applies in the case of purchases of food and groceries. However, for alcohol and consumer

durables, such as television sets, the potential savings per unit are large. As can be seen from the data, this justifies consumers travelling much longer distances. For these items the required reduction in price differential to stem such trade may be quite substantial.

The evidence from the analysis of the time-series data shows that at a national level the sales of alcohol and TV sets are quite sensitive to changes in the price differential between the North and the Republic. The estimated elasticity of substitution of spirits with respect to the Northern Ireland price is high and very close to the elasticity with respect to the (own) price in the Republic. This indicates that there is a very high degree of substitutability between purchases in the Republic and in the North.

The analysis carried out in this study suggests that even without the requirements of the completion of the internal Community Market there is a need for greater harmonisation of the Republic's indirect tax system with that in Northern Ireland. In the case of spirits and television sets the level of commercial smuggling in 1986 was sufficiently large that a reduction of tax levels in the Republic to those in the North would have been likely at least to leave total domestic tax revenue unchanged, and possibly even increase it. This was unlikely to have been the case for any other commodities. However, the distortions to trade in other commodities in border counties is sufficiently large to give serious cause for concern. This is particularly true in the case of petrol where the distortions arising from the tax system have wiped out many petrol stations operating close to the border.

The completion of the internal market implying, as it does, the ending of all restrictions on cross-border trade clearly has major implications for the Irish tax system. While the evidence presented above suggests that for everyday items and goods which are difficult to transport or store, such as petrol, quite significant cross-border price differentials are possible, though not necessarily desirable, without seriously affecting the shopping patterns outside border counties, this is not true for items such as consumer durables. Those trading in border areas have to bear a disproportionate share of the costs arising from the tax induced price differentials.

Whatever its impact at retail level, the complete freeing of trade is likely to have an even bigger potential impact on the wholesale trade if there is no attempt to harmonise taxes. This study does not examine the sensitivity of this trade to price differences. However, it is clear that for retailers and wholesalers, wherever they are located in the Republic, the existence of even a small price differential will be enough to cause them to shift their source of supplies North of the border. As outlined above, this has already happened to a significant extent on an illegal basis for spirits.

The effect on the distribution trade of a complete elimination of border controls is likely to be particularly important in the case of goods liable to excise taxes where the tax is paid by the producer or wholesaler and the retailer buys the goods inclusive of excise taxes. In this case, by buying North of the border, the retailer could avoid higher taxes in the Republic. In the case of differences in prices due to differences in VAT rates there may be little incentive for the retailer to source products North of the border due to the fact that he can reclaim VAT on inputs. Clearly it is the sensitivity of the distribution trade to differences in tax rates which makes the harmonisation of the indirect tax systems North and South of the border an essential prerequisite for completing the internal market¹⁹.

As the analysis of price differences indicated, factors other than indirect taxes may cause price differentials to arise between the North and the Republic. The importance of exchange rate changes in causing deviations from purchasing power parity highlights the vital role of the EMS in underpinning the Single Market.

Even with exchange rate stability the completion of the internal market may affect prices in two ways. It may result in an approximation of both pre and post tax prices. Domestic retailers will, in theory, have access to wholesalers in the North at current Northern trade prices. To the extent that net of tax prices are higher in the Republic because of higher margins of UK exporters or the margins of Irish importers this should allow for a reduction in prices in the Republic. In 1987, given the price differential for many items, this could have significantly improved the lot of consumers in the Republic.

The alternative is that restrictive agreements, which grant exclusive import licenses and restrict maintenance on durables bought outside the jurisdiction, could cause considerable problems in such a free internal market. This could effectively prevent the convergence of pre-tax prices and could seriously distort trade. It is, therefore, important that the relevant directorate of the European Commission, DG IV, consider this aspect of the completion of the internal market. Certainly, if there is not a rapid approximation of pre-tax wholesale prices on the completion of the internal market this will have very serious implications for the distribution trade in Ireland.

Finally, it should be noted that this problem is not unique to the Republic of Ireland. Purchasing power parity data make it clear that this difference in pre-tax prices between member states of the Community is the rule rather than the exception. As a result, the problems set out here will affect all member states to a greater or lesser degree.

¹⁹ Fitz Gerald J., 1986, "The Economic implications of Tax Harmonisation", in *The Economic Consequences of European Union*, Dublin: The Economic and Social research Institute, Policy Research series, No. 6.