International Access to Irish Non-Geographic Numbers

A Report for ComReg

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EXECUTIVE SUMMARY

Introduction

1 This is the final report for the Commission for Communications Regulation in Ireland (ComReg) of Europe Economics' analysis of the costs and benefits of the options involved in meeting the full requirements that might be implied by the Universal Services Directive Article 28 (1).

2 This study assesses the economic feasibility of a range of possible measures that ComReg could adopt in order to enable international access to Irish non-geographic numbers. Six policy options are assessed, and the three most viable ones investigated in greater depth. The impacts of these options are compared with the possible benefits to Ireland and to the rest of the EU arising from the opening of international access to currently inaccessible Irish non-geographic numbers.

3 We developed a spreadsheet model to help to estimate the costs and benefits of the options.

4 We gathered information needed to make these assessments through desk research, interviews with stakeholders (businesses, telecommunications experts and operators) and two surveys of Irish businesses that would be affected by the policies. Europe Economics wishes to thank all those who contributed to this important work, in particular members of ComReg's Numbering Advisory Panel, for their invaluable assistance.

Background

5 The new version of Article 28 (1) of the Universal Services Directive (USD), Directive 2002/22/EC (the 2002 USD), as amended by the Citizens' Rights Directive 2009/136/EC (the 2009 USD), states that Member States should ensure that end users are able to access and use all services using non-geographic numbers within the Community, and access all numbers provided in the Community, where technically and economically feasible.[1]

6 In Ireland there are some non-geographic numbers that are currently inaccessible when dialled from outside the country. These are the number ranges beginning with lead digit '1', for example Freephone (1800), shared cost (1850 and 1890) and Premium Rate Service (PRS) numbers (e.g. 1520). When dialled from abroad these numbers could be indistinguishable from Dublin numbers (which also have a lead digit of '1' which is the

[1] Almost anything in telecommunications could be considered technically feasible at some level, but that is not the sense of the term that we assume the EU legal draftsmen had in mind. Something that was prohibitively difficult in technical terms would be regarded as technically infeasible.

Dublin area code). Due to this potential clash with Dublin numbers, non-geographic numbers beginning with '1' are currently not accessible when dialled from abroad. [2]

7 Of these non-geographic numbers beginning with '1', a sub-set is not relevant for further analysis in this study. This includes short codes and emergency numbers which are either only relevant in a national scope, or would never clash with Dublin numbers due to a permanent reservation of the corresponding Dublin number range.

8 The non-geographic number ranges that are considered in further detail in the study are:

(a) 1520 – 1590, 1512 – 1519 and 1598-1599 ranges (PRS numbers)

(b) 1850 and 1890 ranges (shared cost)

(c) 1800 (Freephone)

(d) 1891 – 1893 (internet dial-up)[3]

(e) 190X and 191X (operator service codes)

9 These number ranges correspond to approximately 92,000 numbers (with 36 per cent PRS numbers, 32 per cent shared cost and 32 per cent Freephone), assigned to an estimated 28,000 businesses and services across Ireland.[4]

10 In order to enable cross-border access to these number ranges, ComReg could undertake a range of possible measures. However, there are a number of outstanding barriers affecting the whole of the EU that may impede the *de facto* access to such numbers. These barriers are at a far-reaching policy level beyond ComReg's control and would need to be resolved before the full benefits of international access are realised:

(a) The lack of a comprehensive international settlements regime (billing and interconnection arrangements) between EU operators and businesses using some non-geographic numbers (in particular PRS numbers, but also with shared cost numbers) means that cross-border access to non-geographic numbers, especially PRS numbers, is often not granted by operators and content providers.[5,6]

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2 For the remainder of this study the term 'non-geographic numbers' will be used to refer to such numbers commencing with lead digit '1', even though some non-geographic numbers with other lead digits also exist. The latter ranges (Universal access numbers and VoIP numbers) are already internationally accessible.

3 Whilst internet dial-up is unlikely to be accessed from abroad the number range is still considered relevant to international access.

4 Businesses typically use more than one non-geographic number, in particular those providing premium rate services.

5 The Appendix details the Member States (approximately 20) where there are currently no interconnection agreements that include provisions for international PRS calls.

6 See, for example, Cullen International SA and WIK Consult GmbH, Final report - National PRS implementation Study on pan-European market for premium rate services, 24 June 2005

(b) The scope for fraud and abuse related to PRS numbers also results in the restriction within the EU of access to many premium rate services and numbers on the grounds of economic feasibility.

(c) The varying regulatory regimes concerning PRS numbers across Member States, and the absence of a pan-European framework, further impede cross-border accessibility.

11 For these reasons we consider that although PRS numbers would be included in any options available to ComReg to make non-geographic numbers accessible to international callers,[7] there would be no benefits in doing so for in reality such access is unlikely to be implemented in the EU unless these wider policy issues are addressed.

Baseline Scenario of Irish Telephone Market

12 The baseline scenario is a picture of how the Irish telephone market may evolve in the absence of any direct policy of ComReg to open international access to Irish non-geographic numbers.

13 The concept of the baseline scenario is important when assessing the costs and benefits of policy options. As we are only interested in the *additional* impacts of the policies, we need to disentangle these from changes that may have occurred anyway.

14 A key change that may occur in the Irish telephone market and which has bearing on the issue of international access to non-geographic numbers is a possible future Dublin number change. This would take place if the current capacity of Dublin numbers runs out. The nature of this change could enable the opening of international access to non-geographic numbers without any significant additional cost.

15 We consider three possible scenarios of demand for Dublin numbers. Under high demand, a Dublin number change is required in 2021; under medium demand it is required in 2033; and under low demand it is required in 2056.[8]

Benefits of International Access to Irish Non-geographic Numbers

16 In considering the benefits of international access to Irish non-geographic numbers we do not include PRS numbers. Although these would be technically accessible, it is unlikely that international access to any PRS numbers across the EU would be possible without the removal of the extensive commercial and regulatory barriers discussed earlier.

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7 The related adjustment costs would also be incurred.

8 Demand for geographic numbers has exhibited considerable volatility since telecoms liberalisation in 1998, and this is likely to continue into the future, depending on the successes and failures of innovative telecommunications applications and services. The wide ranges in demand scenarios reflects this volatility.

17 The introduction of international access to Irish non-geographic free phone numbers (1800) and shared cost numbers (1850 and 1890) could give rise to a range of benefits:

(a) Irish businesses using these non-geographic numbers may benefit from the ability to access a wider EU market. However, any such benefit to Irish businesses is likely to be offset in part (from a Single Market perspective) by a diversion of trade away from businesses in the rest of the EU. Furthermore, some organisations using non-geographic numbers (in particular help-lines or government bodies) do not receive any revenue (direct or indirect) through their non-geographic numbers and thus an increase in call traffic would bring no benefit to them.

(b) EU consumers from outside Ireland may be able to access services that they are currently unable to (in the cases where Irish businesses do not publish an international geographic number). This benefit is measured as the consumer surplus — the amount consumers are willing to pay for a service over and above what they actually pay.

The additional benefit to consumers of being able to access the non-geographic *number* as opposed to just the geographic number for the same service is likely to be negligible (although it is required by the EU Directive). Given the nature of an international non-geographic call, international consumers are highly likely to be charged more when accessing the non-geographic number as opposed to a geographic number, and may well go to lengths to avoid using the non-geographic number.[9]

(c) Communications providers in Ireland may benefit from increased revenues from increased traffic to Irish non-geographic numbers.

(d) The EU single market would be enhanced through the removal of the barrier to common access (of both numbering resources and underlying services). The European Commission views the harmonisation of numbering resources as a means of enhancing the single market for telecommunications services, as well as the wider European Union single market in terms of consumers' access to services.[10]

18 Research shows that the scale of any of these benefits is likely to be small.

(a) ComReg, eircom and other telecommunications operators interviewed are not aware of any demand for international access to the currently inaccessible non-geographic numbers. International callers seeking access to services provided on non-

[9] This is because when dialling the non-geographic number form abroad the consumer will be charged at least the international rate (as when dialling a geographic number) as well as most likely a premium for the non-geographic number, especially if this is a shared cost number.

[10] European Commission (DG Information, Society and Media) 'Questionnaire for the pubic consultation on the future harmonisation of numbering resources for the provision of businesses services' December 2010

geographic numbers can usually use alternative routeings, such as Irish geographic numbers or international numbers (such as International Freephone).

(b) Feedback from our survey of businesses using non-geographic numbers indicates that they would not expect a significant increase in call traffic or business revenue from callers abroad should their non-geographic numbers become accessible.[11]

(c) Other investigations into the demand for cross-border access to EU numbers also suggest that the level of this demand for consumers, businesses and communications providers is not significant. Examples include the results of the European Commission consultation on the harmonisation of numbering resources which showed a general lack of demand for cross-border access; and the lack of use of the European Telephony Numbering Space (ETNS).

19 The high degree of uncertainty associated with estimating the possible benefits (resulting from a lack of directly relevant data and the limitations of the limited response rate to our survey) means that the benefits presented here should be treated with relative caution. Given the qualitative evidence that there will be little scope for benefits arising from an opening of access to Irish non-geographic numbers, we consider these estimates to be a high upper bound. We therefore consider the benefits to range from negligible to approximately €14 million in the year after access is enabled (2014). We base these estimates on information from our survey of businesses using non-geographic numbers and data reported in a study on number changes by Ofcom.[12,13] Given the substantial evidence that suggests benefits are likely to be small or negligible, we consider that a middle to lower point in this range is a more realistic representation of the likely benefits.

20 The scale of benefits of opening international access to non-geographic numbers in 2014 (i.e. as a result of ComReg policy) will need to be compared with the benefits arising from a natural opening of access under a future Dublin number change in order to distinguish those benefits arising from the policy from those that would have occurred anyway. Thus the timing of an eventual Dublin number change will affect the scale of the benefits of ComReg policies that enable access in 2014. The earlier the future Dublin number change, the less additional value specific polices undertaken today will have.

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11 Fifteen per cent of respondents thought that international access could lead to an increase in call traffic, and four per cent believed that this would lead to an increase in revenue.

12 We use our survey results to estimate the average increase in call traffic resulting from an opening of access, and the results of the Ofcom report on number changes to estimate the revenue associated with incoming call traffic.

13 The Ofcom data is based on a survey of around 400 businesses in the UK on the costs and wider impacts of a number change that took place in 2000. All figures used have been updated to account for inflation and exchange rate differences. The figures quoted in the Ofcom report on lost business revenue resulting from a number change help us to estimate the value of call traffic, but are not directly relevant to the context of an increase in trade to businesses using non-geographic numbers.

Policy Options

21 We assess six possible options available to ComReg to open access to non-geographic numbers:

(a) Option 1: Change Dublin telephone numbers. An additional digit would be inserted before all subscriber numbers in Dublin and thus no clash would arise with non-geographic numbers when dialled from abroad.

(b) Option 2: Change non-geographic numbers. All non-geographic numbers with lead digit '1' would be given a new lead digit that would not clash with any national number when dialled from abroad.

(c) Option 3: Hybrid number change. For each range of non-geographic numbers that clash with Dublin numbers either the non-geographic numbers, or the Dublin numbers, would be changed, depending on the scale of the impact.

(d) Option 4: Require full number analysis by international gateway exchanges. This would not involve a number change, and instead would require Irish international gateway exchanges to analyse incoming calls to a sufficient degree to avoid a dialling clash between geographic and non-geographic calls.

(e) Option 5: 'Close' the Irish dialling plan. The Irish dialling plan would move from an open to a closed plan. This would require a '0' to be inserted after the international dialling code on all geographic numbers in Ireland, thus removing the clash between Dublin and non-geographic numbers when dialled from abroad.

(f) Option 6: Issue additional internationally accessible non-geographic numbers. Non-geographic numbers that were accessible from outside of Ireland would be issued, on a voluntary basis, to businesses that perceived sufficient international demand for their services. The current inaccessible numbers would remain.[14]

22 Our qualitative assessment concludes that Option 3 (Hybrid number change), Option 5 (close the Irish dialling plan) and Option 6 (issue accessible non-geographic numbers) are not viable and do not warrant further investigation. Option 3 would result in a confusing mix of Dublin and non-geographic numbers which would have the same lead digit when dialled from abroad, which could have wider impacts on the way telecommunications providers abroad (over whom ComReg has no control) provide access (or not) to Irish numbers. Option 5 would incur disproportionate costs that are higher than a number change in Option 1 as all numbers in Ireland would be impacted. Option 6 would not meet the legal drafting of Article 28 as existing inaccessible non-

[14] It would not be possible to re-label the remaining inaccessible non-geographic numbers as relevant only in a national scope as this would be seen as an attempt to avoid the full implications of Article 28 (1). The drafting of the article implies that access to these numbers would still be required.

geographic numbers would remain in use, even though accessible alternatives were provided.

23 We analyse the remaining three in more detail including through stakeholder consultation.

Option 4: Require full number analysis by international gateway exchanges

24 This option has been investigated in more detail and on further analysis is not considered to be a viable option.

25 This option would not involve a number change, and instead would require telecommunications providers operating international gateway exchanges in Ireland or abroad to undertake sufficient number analysis to ensure that non-geographic numbers do not clash with Dublin numbers when dialled from abroad.

26 Dialplans can allow for a detailed set of rules for transferring international calls to be defined, such that from a purely technical perspective it could be feasible for both the originating operator and the international gateway(s) to differentiate between a Dublin number and a non-geographic number. This would avoid the potential clash with Dublin numbers and resolve the billing difficulties for operators associated with having to assume whether numbers are geographic or non-geographic. This could be performed either by looking at the complete number or by analysing specified digits at the start of the number and then considering the number length.[15]

27 Taking account of a complete called number would be completely impractical for all but the final terminating exchange as it would, by definition, require that the exchange gateway had access to an up to date list of all possible numbers that could be called.[16] Thus the only viable alternative would be the second one of analysing a few digits at the start of the number and then forming a decision based on the overall length of the number. This would be the responsibility of the foreign operator, who is responsible for informing the international gateway in Ireland of the type of number being sent across.

28 However, there exist a number of significant issues that could make this option administratively impossible to implement. Foreign operators would need to be responsible for analysing the dialled number to distinguish the number length, which could result in a time delay while the operator waited to see whether the dialled number was the length of a Dublin or non-geographic number. If the timeout is kept short by the operator then the likelihood of a call meant for a non-geographic number being connected to a Dublin number might become significant.

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15 As number length differs between Dublin and non-geographic numbers, the latter being longer.

16 Whereas currently only the first few digits are ever analysed. Conducting further analysis would not be possible due to significant logistical and technological constraints.

29 Furthermore, requirements to analyse number length and change dialplans would need to be undertaken by every operator in every country; they would need to consider the impact of the requirement, form a decision on the necessary changes that have to be made, plan for those changes and finally implement them. ComReg would have no control over the actions of foreign operators throughout the world, and where operators form the opinion that the changes are too complicated or irrelevant, then they might well put in place call barring of all numbers beginning +353.1 to avoid confusion between geographic numbers and non-geographic numbers (the latter potentially associated with high charges). This would affect both the non-geographic and, more importantly, the Dublin numbers.

Option 1: Dublin number change

30 Changing Dublin numbers might in theory be a viable option as the scope of unintended impacts, over which ComReg would have no control, is minimal, and it would fully comply with the implementation of Article 28 USD.

31 In this option existing Dublin numbers would be changed by inserting a '3' after the area code '01', making the number after the area code eight digits long. This change would avoid a clash with non-geographic numbers when dialled from abroad as no non-geographic number begins with the lead digits '13'. This change would also provide additional Dublin numbers such that a future Dublin number change would not be necessary. Given the number of Dublin numbers allocated to operators, this option would affect approximately 5.3 million numbers.[17]

32 The stakeholders affected by this option include:

(a) Telecommunications providers.[18] Operators hosting Dublin numbers would incur costs of changing the numbers, such as IT, project management, marketing and changes to billing and databases. Costs to operators hosting numbers over VoIP platforms would be less as the changes would be limited to database and IT platform changes. Operators not hosting any Dublin numbers (e.g. mobile-only operators) could incur costs of updating billing systems to adjust to new number length.

Operators would also suffer a decline in revenues should the number change result in a fall in call volumes to Dublin numbers.

The total cost to operators of the change, if undertaken in 2011, would be approximately €112 million.

[17] Not all numbers allocated to operators are in use (i.e. allocated to subscribers). However, the total number of Dublin numbers allocated to operators has bearing on the costs to operators of a number change.

[18] Cost to telecommunications providers have been gathered through interviews with eircom and other operators

(b) Dublin businesses.[19] Businesses in Dublin would incur costs of changing their numbers, including advertising costs and marketing costs, reprinting and changes to stationery, informing customers and business contacts. The direct adjustment cost to businesses is estimated at just under €149 million. Businesses may also suffer from lost revenue resulting from a decline in call traffic. This is estimated at approximately €40 million.[20,21]

(c) Residential subscribers in Dublin. The cost and inconvenience to Dublin subscribers is non-trivial. Using a conservative estimate of this cost, the burden on Dublin subscribers is estimated at approximately €13 million.

(d) Callers to Dublin. All callers to Dublin would experience a small adjustment cost of updating their telephone records and misdialling the numbers. Estimating this cost at €5 per caller, the total cost across all callers to Dublin numbers (including the relevant number of EU callers) is €22 million.

33 The table below presents an illustration of the total one-off costs of a Dublin number change if undertaken in 2011.[22]

Table 1: Summary of Option 1 costs, if undertaken in 2011

Stakeholder	Cost (€000s)
Operators	112,385
Dublin businesses, of which	
Adjustment costs	*148,939*
Costs of lost business	*40,506*
Dublin residential subscribers	13,132
Callers to Dublin numbers	22,079
Total excluding lost business costs	**296,535**
Total including lost business costs	**337,041**

Note: figures in all tables are rounded to the nearest whole number

34 The above table represents the total one-off costs of a Dublin number change if this were undertaken in 2011. However, as a future Dublin number change is possible, the

[19] Costs to businesses have been gathered from our survey and an Ofcom survey of 400 businesses on the costs of a 2000 number change.

[20] Although it is clear that some loss to businesses will occur, there is a degree of uncertainty surrounding the estimate of lost revenue. Figures have been taken from the Ofcom study based on a number change in 2000; it is possible that since then the relevance of the Internet in providing access to updated contact details would reduce the decline in call traffic resulting from consumers adjusting to the changed numbers. We present final costs both including and excluding lost business revenue, although consider the inclusion of lost revenue as a more realistic representation of the costs.

[21] This figure is calculated using data from the Ofcom study on the lost business revenue incurred by businesses resulting from a number change. Using only the results from our survey, this figure would be much larger, approximately €1.4 billion.

[22] We note that if a number change is undertaken to enable international access to non-geographic numbers, this would occur in 2014 rather than 2011 given a three year lead time required by ComReg. For simplicity we present the costs as undertaken in 2011 here, and take account of the growth in the telephony market between now and 2014 in our model.

additional cost of Option 1 (i.e. those resulting from ComReg action in relation to enabling international access of non-geographic numbers) is the cost of undergoing this change now rather than later, as a later table will show.

Option 2: Non-geographic number change

35 This option would entail changing all relevant non-geographic numbers with lead digit '1' so that they would be made internationally accessible. A change to these non-geographic numbers might entail the use of the '7' lead digit number range, so that the non-geographic numbers would begin with '7' instead of '1'. An example would be the number **1890 123 123** which could change to **7890 123 123**. Given the current number of non-geographic numbers allocated to communication providers, this option would affect approximately 2.5 million numbers[23].

36 Some of the stakeholders affected in this option are similar to those affected by a Dublin number change.

(a) Telecommunications providers would incur costs relating to IT, project management, marketing and changes to billing and databases. The scale of these costs would be lower on a per-number basis compared with a Dublin number change as the nature of the change would not require as significant an overhaul of existing infrastructure. Providers would also experience a loss in revenue resulting from decreased call volumes to non-geographic numbers. The total cost to telecommunications providers of the change, if undertaken in 2011, would be approximately €30 million.

(b) Businesses using non-geographic numbers would incur adjustment costs of changing their number similar to those of Dublin businesses. However, a higher proportion of businesses using non-geographic numbers are likely to be large (e.g. banks, insurance companies, cinemas), and the adjustment costs per business affected are therefore likely to be higher. In addition, businesses using non-geographic numbers are more likely to incur costs associated with rebuilding the brand around the number. Total adjustment costs are estimated at around €317 million if the change were to occur in 2011. Businesses would also suffer from lost revenue resulting from a decline in call traffic. This is estimated at a little over €170 million. Again, this lost revenue figure should be treated with caution given the uncertainties inherent in its estimation.

(c) Callers to non-geographic numbers would incur adjustment costs estimated at just over €20 million if the change were to occur in 2011.

[23] Please note that the costs of a number change for telecoms operators are related to all numbers allocated to operatorsby ComReg, regardless of whether they are used by subscribers. Although only approximately 92,000 non-geographic numbers beginning with 1 are in use by subscribers, the total number of these numbers allocated to operators is approximately 2.5 million.

37 The table below summarises the one-off costs of Option 2if undertaken in 2011.[24]. Given the degree of uncertainty surrounding the value of lost business revenue arising from a number change, total costs are shown both inclusive and exclusive of lost revenue. The present value of total adjustment costs, including lost revenue, is approximately €500 million. We note that the cost of changing non-geographic numbers is higher than that of changing Dublin numbers. This is driven by the adjustment costs to businesses. A similar number of businesses would be affected in both cases, but the larger average size of businesses using non-geographic numbers (with costs increasing with size) and additional costs for brand rebuilding result in higher average costs.[25]

Table 2: Summary of Option 2 costs, if undertaken in 2011

Stakeholder	Cost (€000s)
Operators	30,659
Businesses using non-geographic numbers , of which	
Adjustment costs	317,220
Costs of lost business	169,703
Callers to non-geographic numbers	20,105
Total excluding costs of lost business	367,984
Total including costs of lost business	537,687

Note: Estimates of lost business revenue are estimated using Ofcom results rather than relying solely on our survey results.

Summary of Costs and Benefits

38 The benefits of enabling international access to Irish non-geographic numbers are compared with the costs of the two number change options. As the benefits will vary according to when an eventual Dublin number change takes place (as the *additional* benefits of measures adopted by ComReg to open access will only last until such time as access is opened naturally), we present these under three scenarios — an eventual number change in 2021, 2033 and 2056.[26] Benefits could range from approximately zero, and the maximums presented in our table represent a high upper bound of possible benefits. Given the uncertainty of the estimates and other evidence that suggests benefits are likely to be small, we consider a mid-point of this range to be a more realistic representation of the likely benefits.

[24] We note that if a number change is undertaken to enable international access to non-geographic numbers, this would occur in 2014 rather than 2011 given a three year lead time required by ComReg.

[25] Details can be found in our model inputs table in the Appendix

[26] The additional benefits are smaller the sooner the natural change in Dublin numbers takes place as there is less time for the benefits resulting from ComReg's specific policies to accrue.

Table 3: Benefits associated with opening international access to Irish non-geographic numbers, Present Value

Counterfactual Dublin number change	Benefits (€000s) (PV)
High demand for numbers (change in 2021)	0 – 77,718
Medium demand for numbers (change in 2033)	0 – 148,820
Low demand (change in 2056)	0 – 193,379

Note: we assume medium growth of the Irish telephone market
Estimates incorporate Ofcom results and are not based solely on our survey

39 In comparison to the benefits, the costs of Option 1 — a change in Dublin numbers, are higher under each scenario. The additional costs of a Dublin number change undertaken to enable access to non-geographic numbers (which would occur in 2014, given the three year lead time required if instigated in 2011), compared with waiting for a natural number change, will vary according to when the natural number change would have taken place. We present the costs compared with three possible dates of a future Dublin number change, both including and excluding estimates for lost revenue.

Table 4: Additional costs of Dublin number change in 2014 to enable international access to Irish non-geographic numbers, Present Value [27]

Counterfactual Dublin number change	Additional costs of Option 1 (€000s) (PV) including lost business revenue	Additional costs of Option 1 (€000s) (PV) excluding lost business revenue
High demand for numbers (change in 2021)	99,183	84,844
Medium demand for numbers (change in 2033)	158,376	134,578
Low demand (change in 2056)	224,987	197,781

Note: we assume medium growth of the Irish telephone market
Estimates incorporate Ofcom results and are not based solely on our survey

40 The costs of Option 2 — change to non-geographic numbers, are presented in the table below, again both including and excluding lost business revenues arising from the number change. As the costs of Option 2 are not affected by a natural change in Dublin numbers, these will be the same regardless of the demand scenarios. The costs reflect a number change in 2014, which would be the actual date of the change if the decision to undertake this option was made in 2011.

[27] These are the additional costs compared with waiting until a capacity-driven number change is needed in any case in either 2021, 2033 or 2056.

Table 5: Costs of a non-geographic number change in 2014 to enable international access to Irish non-geographic numbers, Present Value

Cost of Option 2 (€000s) (PV) including lost business revenues	Cost of Option 2 (€000s) (PV) excluding lost business revenues
499,144	358,709

Note: we assume medium growth of the Irish telephone market

41 Again, the costs of a non-geographic number change are significantly higher than the benefits, regardless of when a natural change in Dublin numbers takes place.

42 A final comparison of the costs and benefits of enabling international access to Irish non-geographic numbers is presented in Table 6 below. Given the uncertainty in estimating the benefits and the likelihood that these figures are very much an upper bound,[28] we consider a lower end of benefits to be more realistic, shown below as the mid-point in the range presented in Table 3. Although we consider lost business revenue an important element of costs, there is also some uncertainty involved in estimating the value of this loss. We therefore include the low end of costs in the table below. It is clear that even the lowest estimates of costs outweigh the likely benefits.

Table 6: Comparison of costs and benefits, Present Value, under each Dublin demand scenario

Date of Dublin number change	Likely benefits (€millions) PV	Likely costs – Dublin number change (€millions) PV	Likely costs – non-geographic number change (€millions) PV
2021	39	85	359
2033	75	135	359
2056	97	198	359

Note: Costs of both options exclude lost business revenue

43 A final consideration is the use of social discounting in the current economic climate. Our model uses the conventional discount rate of 3.5 per cent which represents the extent to which society values money spent or gained today over and above that spent or gained in the future. However, as a result of the current economic climate in the EU Eurozone and in Ireland, in particular public policy regarding future spending cuts, it is likely that society may place a greater value on the current value of money. Taking this into account and using a higher discount rate of say five per cent makes the difference between the costs and benefits of enabling international access to Irish non-geographic numbers even greater. This is shown for illustrative purposes in the table below, and

[28] Including likelihood that businesses that were motivated to complete the survey are more likely to gain from an opening of international access to non-geographic numbers than the average business.

further enforces the conclusion that it would not be economically feasible for ComReg to undertake action to enable international access to non-geographic numbers.

Table 7: Comparison of costs and benefits of both options, excluding and including lost business revenue, 5 per cent discount rate

Date of natural Dublin number change	Range of possible benefits (€millions) PV	Range of likely costs – Option 1 (€millions) PV	Range of likely costs – Option 2(€millions) PV
2021	0 – 72	101 – 116	344 – 478
2033	0 – 129	167 – 191	344 – 478
2056	0 – 158	234 – 260	344 – 478

Conclusions

44 Our results show that the costs of enabling international access to Irish non-geographic numbers far outweigh the possible benefits of doing so, and that it would not be economically feasible for ComReg to adopt any specific measures to enable international access to the currently inaccessible non-geographic numbers. This result holds for a range of scenarios for a possible future Dublin number change. Furthermore, these costs are based on established research into the burden of number changes, whereas the benefits are highly speculative.

45 The drafting of Article 28 USD specifies that Community-wide access to all numbering resources should be provided where it is technically and economically feasible. Notwithstanding the technical constraints that Ireland faces in achieving this, that this would not be economically feasible leads us to conclude that no action would be required by Article 28, and we recommend that no such action should be taken.

46 A further recommendation is that ComReg ensures that users of Irish non-geographic numbers not currently accessible to international callers are aware of the availability of other, accessible non-geographic numbers that can be used should sufficient demand for services be perceived. This would ensure that the spirit of Article 28 is upheld by enabling consumers within the EU to access all services across Member States.

1 INTRODUCTION

1.1 This is the final report for the Commission for Communications Regulation (ComReg) of Europe Economics' analysis of the costs and benefits of the options involved in meeting the full requirements that might be implied by the Universal Services Directive Article 28 (1).

Scope and remit

1.2 The aim of this study is to assess the impact of a range of measures that ComReg could adopt in order to enable international access to Irish non-geographic numbers. This access may be required under the full implementation of Article 28 USD.

1.3 We assess the possible benefit to Irish businesses, communications providers and EU consumers of opening international access to Irish non-geographic numbers. We investigate a total of six options of ways in which such open access could be provided, and assess the costs of the three most viable options in detail.

1.4 The overall objective is to compare the costs of the various options with the benefits to reach a conclusion as to whether or not fully implementing Article 28 USD would be economically feasible.

Structure of report

1.5 The report is structured as follows:

(a) Section 2 presents the methodology used in the analysis.

(b) Section 3 presents the background to Article 28 USD and the implications this has for Ireland. It also presents information on non-geographic numbers in Ireland and the rest of the EU.

(c) Section 4 describes the Irish telephone market and assesses how this is likely to evolve in the future in the absence of new policy measures. It explains the impact this evolution might have on the costs and benefits of the options to open international access to non-geographic numbers.

(d) Section 5 discusses the potential benefits of opening international access to Irish non-geographic numbers, and estimates the possible scale of these benefits.

(e) Section 6 describes a range of policy options that ComReg might use to enable access to Irish non-geographic numbers.

(f) Section 7 analyses three potentially viable options in more detail and estimates the costs and impacts of these options.

(g) Section 8 summarises the results of the analysis, and gives our conclusions.

1.6 The Appendix contains relevant additional information, including the detailed results of the surveys, a description of the inputs to our model, and further context to the study.

2 METHODOLOGY

2.1 The research undertaken for this study comprised desk research, interviews with stakeholders, and questionnaire surveys of businesses. The results of this research were used in the development of a spread-sheet model to estimate the overall costs and benefits of the policy measures available to ComReg to open international access to Irish non-geographic numbers.

Desk research

2.2 Desk research was undertaken to inform the context of the work and to gather information on the costs of number changes. Sources include:

(a) Reports and consultations from international bodies such as BEREC, ITU, CEPT and the European Commission (EC)

(b) Information from telecommunications regulators and trade bodies across the EU

(c) Consultancy reports and market analyses

(d) Reports from ComReg's Numbering Advisory Panel

(e) Data published in ComReg's Key Quarterly Data reports

(f) Unpublished ComReg data on numbering resources

(g) Data from Eurostat and the census section of the Irish Central Statistical Office (CSO)

Interviews

2.3 Telephone interviews were conducted with telecommunications providers in Ireland and the UK in order to gather information on the costs and wider impacts of the various options available to enable international access to Irish non-geographic numbers. The interviews were also used to further our understanding of the options and associated issues and to test our assumptions used in our model.

2.4 Operators interviewed included the incumbent telecommunications provider in Ireland eircom, as well as mobile phone and IP-based telecommunication providers.

2.5 In addition, informal telephone interviews and email exchanges were also held with four businesses and business representatives likely to be affected by a possible Dublin or non-geographic number change. Information gathered here helped with the questionnaire design and was used qualitatively in our analysis. The contact details for Dublin businesses were obtained through the Bill Moss database and the Dublin Chamber of Commerce.

Surveys

2.6 We distributed two surveys to businesses likely to be affected by the policy options.

Businesses using Dublin geographic numbers

2.7 An online questionnaire was distributed to businesses in Dublin to gather information on the possible costs and wider impacts of a change to Dublin numbers. The purpose of the survey was to provide additional information on the costs of a number change compared to that obtained through the desk research.

2.8 The survey was designed in-house by Europe Economics and reviewed by ComReg, and included questions about company sector and turnover; the nature and scale of costs associated with a number change; and any wider impacts (e.g. lost business revenue) likely to arise from a number change.

2.9 The Dublin Chamber of Commerce distributed the questionnaire on our behalf in the middle of July to all its members. Respondents were given until 19 August to complete the questionnaire. Two reminder emails were sent by the Dublin Chamber during this period. Europe Economics also contacted a range of businesses using the Bill Moss marketing database to flag the existence of the survey and encourage responses.

2.10 A total of 18 responses were received, of which 14 were usable (four not provide any information other than some company details). Despite the limitations of this sample size (i.e. the survey cannot be considered to be fully representative of Dublin businesses), the survey replies do provide a useful understanding of the potential impact of a number change in Dublin. We use these results qualitatively alongside data from published sources on the costs of other number changes, as described in subsequent sections of the report. The results of the survey are also presented in the Appendix.

Businesses using non-geographic numbers

2.11 An online questionnaire was distributed to businesses that use non-geographic numbers. The purpose of this survey was twofold: to provide context to the costs of a number change to businesses; and to gather information on the possible benefit of enabling international access to Irish non-geographic numbers that are currently inaccessible.

2.12 The Dublin, Cork and Galway Chambers of Commerce distributed the questionnaire to their members on our behalf, and eircom distributed it to their subscribers of non-geographic numbers. The questionnaire was distributed between the middle of July and the beginning of August, and businesses all had at least a week to complete the survey.

2.13 A total of 47 responses were received, with 26 usable results. Given the limited response rate we have, where possible, relied on published figures for the costs of a number change and used the survey results to provide additional context in the Irish situation, rather than relying solely on them for our estimates.

2.14 However, in estimating the possible benefits of international access to non-geographic numbers, the lack of information has obliged us to base our estimates mainly on the survey results. We therefore emphasise that these results should be treated with caution given the limitations of the response rate.

Spreadsheet model

2.15 We developed an excel model to calculate the costs and benefits associated with two options for enabling international access to Irish non-geographic numbers — a Dublin number change and an Irish non-geographic number change.

2.16 The model uses inputs derived from published data, interviews and surveys, and several assumptions.

2.17 The model estimates the costs and benefits to each actor (operators, businesses, residential fixed line owners and callers) of the two options. A full description of the model, including the inputs used, is presented in the Appendix.

3 BACKGROUND

Ireland and the Universal Services Directive

3.1 The new version of Article 28 (1) of the Universal Services Directive (USD), Directive 2002/22/EC (the 2002 USD), as amended by the Citizens' Rights Directive 2009/136/EC (the 2009 USD), states that:

> Member States shall ensure that, where technically and economically feasible, and except where a called subscriber has chosen for commercial reasons to limit access by calling parties located in specific geographical areas, relevant national authorities take all necessary steps to ensure that end-users are able to:
>
> (a) Access and use services using non-geographic numbers within the Community; and
>
> (b) Access all numbers provided in the Community, regardless of the technology and devices used by the operator, including those in the national numbering plans of Member States, those from ETNS and Universal International Freephone Numbers (UIFN).

3.2 Recital 46 of 2009/136/EC further states that:

> Cross border access to numbering resources and associated services should not be prevented except in objectively justified cases, for example to combat fraud or abuse (e.g. in connection with certain premium rate services), when the number is defined as having a national scope only (e.g. a national short code) or when it is technically or economically unfeasible.

3.3 The Citizens' Rights Directive also introduced paragraph 2 to Article 28, which established enforcement powers in relation to access to numbers or services where this justified by fraud or misuse, including on a cross-border basis:

> Member States shall ensure that the relevant authorities are able to require undertakings providing public communications networks and/or publicly available electronic communications services to block, on a case-by-case basis, access to numbers or services where this is justified by reasons of fraud or misuse and to require that in such cases providers of electronic communications services withhold relevant interconnection or other service revenues.[29]

3.4 Cross–border issues under Article 28 (2) USD relating to fraud and abuse are currently being discussed at the EU level, notably through a consultation exercise by the Body of European Regulators for Electronic Communications (BEREC).[30]

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[29] See the Appendix for the transposition of Article 28 in Ireland.

[30] BEREC report on cross-border issues under Article 28(2) USD, February 2011; BoR (10) Rev1

3.5 In Ireland there are non-geographic numbers that are inaccessible when dialled from outside the country. These numbers commence with digit '1', which is also the area code for Dublin. When dialled from abroad, these non-geographic numbers could be indistinguishable from a Dublin number until the last two digits, resulting in a number clash. The table below illustrates how this could occur:

Table 3.1: Illustration of dialling clash

Dublin geographic number when dialled within Ireland	01.890.1231
Non-geographic number when dialled within Ireland	1890.123123
Dublin number when dialled from abroad	**+353.1.890.1231**
Non-geographic number when dialled from abroad	**+353.1890.1231**23

3.6 Non-geographic ranges commencing with digit '1' therefore have not been opened by international gateways.[31] When these numbers are dialled from abroad, they are treated as Dublin numbers by the exchange and either terminated at the Dublin number that corresponds with the first eight digits after the country code, or left to hang if no corresponding Dublin number exists.[32,33] Non-geographic numbers beginning with '1' make up the majority of Irish non-geographic numbers and include primarily Freephone numbers (1800), shared cost numbers (1850 and 1890) and PRS numbers (e.g. 1520).

3.7 For the remainder of this study the term 'non-geographic numbers' will be used to refer to such numbers commencing with lead digit '1', even though some non-geographic numbers with other lead digits also exist.[34]

3.8 For the majority of other Member States cross-border access to their non-geographic numbers is not problematic given historical arrangements of their dialling plans. However, international access to Irish non-geographic numbers would require significant changes to be undertaken, and could be considered technically infeasible in Ireland.[35] Even if providing such access was believed to be technically feasible, ComReg considers that it is important to investigate whether it would be economically feasible, given the technical constraints. This is the purpose of this report.

3.9 The term "economically feasible" is not defined in the Directive. We take it to mean that either a private sector investor would be likely to be willing to invest in the project in

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31 An international gateway is an exchange owned by an operator (e.g. eircom) that connects international calls to and from Ireland.

32 For international gateway exchanges to screen incoming calls to a sufficient depth to determine whether the numbers are Dublin or non-geographic would be beyond the capability of existing infrastructure, given the vast volumes of calls passing through the exchanges. This is discussed in more detail in Section 7, under Option 4.

33 Given the insignificant number of call attempts on these numbers from international callers, this has never caused a problem with Dublin residents to the knowledge of ComReg or *ericom* (the telecommunications provider hosting the majority of Dublin numbers).

34 These numbers (e.g., Universal Access Numbers and IP-based numbers) are already internationally accessible, and so are not relevant here.

35 At some level *anything* could be considered technically feasible, without being at all practical. In Ireland's situation, opening access to non-geographic numbers to international callers is so impractical that it could be considered technically unfeasible.

question, or that a public sector investor could justify doing so from a realistic assessment of the benefits in relation to costs.

3.10 It is important to note that the drafting of Article 28(1) makes it clear that the access to numbering resources refers to both (a) the services using the non-geographic numbers and (b) the numbers themselves. It is therefore not sufficient that a service makes available an alternative number that is internationally accessible (i.e. a geographic number), whilst the inaccessible non-geographic number still remains.

Non-Geographic Numbers in Ireland

3.11 The non-geographic numbers ranges of relevance to this study are those beginning with lead digit '1', as these clash with Dublin numbers when dialled from abroad. Ireland is unique in this respect: in other EU Member States non-geographic numbers are assigned lead digits (usually '0') that do not clash with any local numbers when dialled from abroad. The use of lead digit '1' is the result of the historical development of the dialling plan in Ireland.

The dialling plan in Ireland

3.12 Ireland has an 'open' dialling plan that supports local dialling for geographic numbers.

3.13 Thus geographic telephone numbers in Ireland consist of two segments:

(a) The subscriber Trunk Dialling (STD) code: this comprises the trunk prefix "0" and the National Destination Code (NDC) e.g. Dublin 01; Cork 021.

(b) The subscriber number, which is the five, six or seven digit number unique to each subscriber.

3.14 For calls terminating in the same local area, callers need only to dial the subscriber number, not the STD code. The original dialling was simple to understand and offered a number of benefits (e.g. the number of digits required to be dialled for local calls was minimised; and callers were reassured when a local call was dialled that the call charge would be local).

3.15 When the original dialling plan was put in place, international calls were in general operator-assisted. The current dialling plan facilitated the creation of a national numbering sub-space for non-geographic numbers using the lead digit '1'. At the time this was an attractive numbering solution. Non-geographic numbers were considered to be relevant only in a national context and thus access from abroad was not considered.

3.16 Evolving telephony services have resulted in international access issues. In particular the introduction of inward international subscriber dialling to Ireland required an additional dialling procedure — for incoming international calls to Ireland callers dial 00 + 353 + the STD Code (without the zero) + the subscriber number.[36]

3.17 Dropping the trunk prefix '0' introduces the problem of a potential dialling clash between non-geographic and Dublin numbers when dialled from abroad, as both now begin with digit '1' after the Ireland dialling code. In Ireland potential clashing is prevented by the gateway operators blocking incoming international calls to non-geographical numbers beginning with '1'.[37]

Non-geographic numbers of relevance

3.18 Currently, all non-geographic numbers in Ireland with lead digit '1' are inaccessible when dialled from abroad. These are presented for completeness in Table 3.2, although only a sub-set is relevant to this study:

(a) Some non-geographic numbers beginning with '1' are not relevant to international access.[38] For example, some short codes (171,172, and 1740-1749) are relevant only to individual mobile network functions and access is not relevant to other Irish callers, let alone international callers.[39] We therefore do not consider these numbers in the remainder of our analysis.

(b) Some non-geographic numbers beginning with '1' do not, and never will, pose a problem in terms of a clash with Dublin numbers. These are the short codes beginning with '11' (112 for emergency services, 116 for services of social value and 118 for directory enquiries) whose ranges have been held back for harmonised use throughout the EU. Dublin numbers have not been and will never be assigned to this range and no costs will be associated in making these internationally accessible. It is also highly unlikely that these will be relevant to international access.[40] We therefore do not consider these codes in any more detail in the remainder of our analysis.

3.19 Table 3.2 below presents the non-geographic numbers in Ireland beginning with '1'. Those number ranges relevant to this study are shaded in the table. It must be noted that while some shaded ranges (e.g. the first row) do not *currently* result in a clash with Dublin

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36 353 is the Country Code for Ireland

37 We note that international calls to the underlying *geographic* number (if known to the caller abroad) are accessible from abroad as these would have their own unique Irish STD codes. However, an issue with Article 28 USD is the cross-border access of *all* numbering resources, and thus the blocking of the non-geographic numbers poses a problem.

38 Recital 46 of 2009/136/EC to the USD states that a number that is defined as having a national scope only (e.g. a national short code) does not need to be made internationally accessible.

39 Where these codes need to be accessed outside of Ireland (e.g. a mobile network customer wanting to access his voicemail when abroad), individual mobile operators already have in place platforms that enable international access without resulting in a Dublin clash. The exception here is the operator service codes beginning 19XX (reference number 13 in the table) that include the fixed-line incumbent eircom, for whom international access would pose a problem.

40 For example, whilst it could be possible that a caller from abroad would wish to access an Irish emergency service, this is very unlikely.

numbers, the possibility for a clash still exists in the future should these ranges be used for Dublin numbers, and therefore these ranges are still relevant to our study.

Table 3.2: Non-geographic numbers in Ireland beginning with lead digit '1'

Ref.	Specific non-geographic range		Relevant to international access	Clash with Dublin sub-range
1	1520, 1530, 1540, 1550, 1560, 1570, 1580, 1590	Premium Rate Services (PRS): Per-minute charge	Yes	No current clash as corresponding Dublin ranges reserved
2	1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519	PRS: Per-call charge	Yes	Clash
3	1598, 1599	PRS: Adult services	Yes	Clash
4	1800	Freephone	Yes	No current clash as corresponding Dublin ranges reserved
5	1850, 1890	Shared cost	Yes	Clash
6	1891, 1892, 1893	Internet dial-up	Yes	Clash
7*	112	Emergency Access Number	Unlikely	No clash
8*	116XXX [116000; 116006; 116111; 116117; 116123]	Harmonised codes of social value[41]	Unlikely	No clash
9*	118XX	Harmonised Directory Inquiry numbers	Unlikely	No clash
10*	13XXX	Carrier routing codes (incl CPS)	No – carrier codes are purely network functions and no reason to make internationally accessible.	N/A
11*	141, 142, 1471	CLI (CLIP/CLIR)[42] and Call return	No – CLI & call return services local to each network or each caller and no reason to make internationally accessible.	N/A
12*	171, 172-1749, 1753-176XX	Voicemail, NUSCs, Number Porting network routeing codes	No – 171 voicemail, NUSCs & NP routeing local to each network or each caller and no reason to make internationally accessible.	N/A
13*	190X, 191X,	Operator service codes	Yes – 1901X and 191X are network-related functions (e.g.	Clash

[41] For example, hotlines for missing children or victims of crime.
[42] Calling Line Identification Present and Calling Line Identification Restrict

	199	Network engineering tests	customer support) that could require international access. 199 is network internal.	

** These non-geographic numbers are short codes*

3.20 Table 3.3 presents the final ranges of non-geographic numbers that will be the subject of all further analysis in this report

Table 3.3: Final sub-set of non-geographic numbers in Ireland relevant to analysis

Ref.	Specific non-geographic range		Relevant to international access	Clash with Dublin sub-range
1	1520, 1530, 1540, 1550, 1560, 1570, 1580, 1590	Premium Rate Services (PRS): Per-minute charge	Yes	No current clash as corresponding Dublin ranges reserved
2	1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519	PRS: Per-call charge	Yes	Clash
3	1598, 1599	PRS: Adult services	Yes	Clash
4	1800	Freephone	Yes	No current clash as corresponding Dublin ranges reserved
5	1850, 1890	Shared cost	Yes	Clash
6	1891, 1892, 1893	Internet dial-up	Yes	Clash
13*	190X, 191X	Operator service codes	Yes – network-related functions (e.g. customer support) that could require international access.	Clash

Businesses associated with non-geographic numbers

3.21 Businesses using non-geographic numbers that might be relevant for international callers include:

(a) Premium Rate Service numbers (1520 – 1590, 1512 – 1519 and 1598,1599)

- competitions and voting;
- information services like news, weather, financial information, astrology
- adult services.

(b) Free phone numbers (1800)

- Government services help and advice
- Commercial businesses help and advice

(c) Shared cost numbers (1850 and 1890)

- Customer support, advice and sales for small businesses (including sole proprietors) and large businesses (banks; insurance companies; cinemas; NGOs)

3.22 As of 2008 there were 92,453 non-geographic numbers of relevance to this study allocated to subscribers by telecommunications providers.[43,44] Of this, 32 per cent were Freephone numbers, 32 per cent shared cost and 36 per cent premium rate. The number of services using PRS numbers is estimated by ComReg at 4,462, and we estimate the number of businesses using non-PRS numbers at 23,682[45], bringing the total to around 28,000.

3.23 The call traffic to non-geographic numbers in Ireland was approximately 440 million minutes in 2010. This represents 2.42 per cent of the total originating traffic in Ireland.[46]

International Non-Geographic Calls

3.24 The process through which a non-geographic call is made and delivered has bearing on the possible impact of enabling international access to non-geographic numbers. The process and associated flow of funds between callers, operating networks and the businesses using the non-geographic numbers is complex, and will depend on the type of non-geographic number called, the types of operating networks involved (e.g. mobile, fixed) and the contracts that the operating networks have with their customers (both the callers and the businesses using the non-geographic numbers) and between themselves.[47]

3.25 This flow of funds is even more complex when international callers are involved. In many cases, revenue and billing agreements are not in place between Originating Communications Providers (CPs) in the originating country who transfer the call to the Terminating CP in the destination country. This is a particular issue with PRS numbers which are associated with high charges. Hence many operators in EU Member States do

[43] ComReg 2008 audit of non-geographic numbers

[44] The total number of non-geographic numbers allocated to operators by ComReg exceeds this amount (approximately 2.5 million) as operators to not use all the numbers they are allocated. The total number of non-geographic numbers allocated is relevant when calculating the costs to operators of a number change.

[45] Assuming an average of 2.5 numbers per business, confirmed by eircom

[46] ComReg Quarterly data reports 2010

[47] A further (still simplified) description of this process, including calls originating from international callers, is included in the Appendix. We refer to only the main points here.

not originate or terminate international calls to non-geographic, in particular PRS, numbers.[48]

3.26 Where calls to non-geographic numbers in foreign countries are terminated (including Freephone numbers), charges to the callers would include the international call cost plus any premium the Originating CP may charge (either in relation to the higher cost to the Originating CP of transferring the calls, or purely as a commercial exercise).

Barriers to International Access to Non-Geographic Numbers

The complexity of billing arrangements

3.27 The existing billing arrangements for international non-geographic calls, in particular involving PRS numbers, present a significant barrier to effective cross-border access to certain non-geographic numbers.

3.28 Pricing principles for PRS numbers vary considerably across EU Member States and in many instances international charging arrangements for these numbers between operating networks in different countries do not exist. The use of standard global interconnection agreements to transfer international PRS calls would in many cases result in either the Terminating CP or the Originating CP losing out financially, as these standard contracts do not take into account the higher charges associated with the PRS numbers.[49]

3.29 For this reason, current cross-border access to PRS and other revenue share numbers is uneven across the EU. There are few interconnection agreements that include provisions for international PRS calls. Table A1 in the Appendix shows that national interconnection services for originating PRS calls to abroad or for terminating PRS calls from abroad are missing for most Member States.[50]

3.30 Therefore, even if PRS numbers were made technically accessible to callers abroad, the absence of a comprehensive international settlement regime makes it impossible to know on an EU-wide basis whether or not the calls would in fact be transferred. This issue will remain a barrier to international access of all non-geographic numbers, regardless of the technical steps undertaken. Indeed, the conclusions of the Cullen report on an international market for PRS were that PRS numbers based on existing national numbering plans were not well suited for cross-border access, and that in order to achieve a pan-European PRS market, a pan-European numbering space should be created.

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[48] The Appendix details the Member States (approximately 20) where there are currently no interconnection agreements that include provisions for international PRS calls.

[49] BEREC report on cross-border issues under Article 28(2) USD, February 2011

[50] Cullen International SA and WIK Consult GmbH, Final report - National PRS implementation Study on pan-European market for premium rate services, 24 June 2005.

Scope for fraud and abuse

3.31 In addition to the absence of an international settlements agreement for PRS numbers, access to these numbers may also be restricted on the grounds of fraud and abuse, as is provided for in Article 28(2) USD. This leads to justifiable commercial actions undertaken by operators to protect themselves against fraud and abuse associated with some PRS numbers. BEREC has highlighted that many operators take action to block access to international PRS numbers where they consider there is a risk of fraud, as in such cases providing cross-border access is not "economically feasible" (part of the caveat to providing international access included in Article 28 USD).[51]

3.32 The regulatory authorities from Germany and Belgium responding to the consultation expected that any increase in cross-border access would lead to an increase in the prevalence of cross-border fraud or misuse of premium rate numbers and services.

Fragmented regulatory frameworks

3.33 This is compounded by the wide range in regulatory practices concerning PRS across Member States including different levels of maximum allowed tariffs applicable for each specific range of non-geographic services, different requirements to provide options for call barring to increase customer protection, and different legal and contractual responsibility of stakeholders in the implementation of non-geographic services.[52] The lack of a pan-EU regulatory framework to PRS further inhibits the international access of PRS numbers.

Implications for this study

3.34 These unresolved issues suggest that even if all non-geographic numbers in Ireland were made technically accessible to callers from abroad, the actual level of access for PRS numbers would be most unlikely to increase. This will have implications for the level of benefits likely to arise from introducing international access to Irish non-geographic numbers. Although the possibility of effective international access to some other non-geographic numbers (e.g. shared cost) is uncertain, we assume that such access will be possible.[53]

3.35 Thus the Irish non-geographic numbers to which international access could in principle be of value if it is economically feasible are:[54]

(a) Free phone numbers (1800)

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[51] BEREC report on cross-border issues under Article 28(2) USD, February 2011, p12

[52] Cullen International SA and WIK Consult GmbH, Final report - National PRS implementation Study on pan-European market for premium rate services, 24 June 2005.

[53] Feedback from industry suggests that as there are not the same issues relating to fraud or excessive billing with shared cost numbers, operators are likely to transfer these and absorb any billing discrepancies where these occur.

[54] As noted earlier, certain short codes may be relevant to international access, but due to the extremely small number of people affected, the benefits associated are likely to be negligible. We therefore do not consider these in our analysis.

(b) Shared cost numbers (1850 and 1890)

3.36 These are likely to relate to customer support, advice and sales for small businesses (including sole proprietors) and larger organisations (banks; insurance companies; cinemas; NGOs).

4 BASELINE SCENARIO

Introduction

4.1 In this section we describe the baseline scenario in the Irish telephone market. This baseline scenario is not just a continuation of the current status quo; it is rather a picture of how the market may evolve in the absence of any direct policy of ComReg to open international access to Irish non-geographic numbers.

4.2 The concept of the baseline scenario is important when assessing the costs and benefits of policy options. As we are only in interested in the *additional* impacts of the policies, we need to disentangle these from changes that may have occurred anyway. By comparing the situation under the policies with the baseline situation (also known as the counterfactual) we are able to estimate the additional impact that the policies may have.

4.3 Here we present an overview of the Irish telephone market (those aspects relevant to our study) and our assumptions of how this may evolve over time in the absence of any policy change. Part of this evolution includes a potential future Dublin number change arising from an expiry in the capacity of Dublin numbers. We discuss this potential number change first, and then present our overview of the market.

Future Change in Dublin Telephone Numbers

4.4 Without specific measures adopted by ComReg to enable access to currently inaccessible non-geographic numbers, this situation is likely to continue until such time as Dublin telephone numbers change for other reasons (capacity having been exhausted), or possibly technological developments mean that a dialling clash can easily be resolved by operators.

4.5 It would not be reasonable to make projections about the likelihood of the latter scenario at this stage, and we restrict our discussion to the possibility of a future Dublin number change in order to provide increased capacity. Should such a change occur, the dialling clash with non-geographic numbers when dialled from abroad could be removed, and international access would become possible. The timing of such a change (indeed, whether one would be needed at all) is, however, uncertain.

4.6 We consider three scenarios for a natural Dublin number change. Our estimates are based on existing demand for Dublin numbers and excess number capacity, and considerations of the range of factors that may influence demand in the future.

Existing number capacity and demand

4.7 Analysis of existing Dublin number allocations was undertaken by ComReg using information from their numbering database in 2010. Number blocks are measured in sizes of 1,000 numbers (1K) and therefore the total capacity of Dublin numbers is approximately 8 million numbers, before any allocations or reservations. The following allocation profile is presented in Table 4.1 below.

Table 4.1: Allocation profile of number blocks as at December 2010

	Number of allocated blocks (000s)	Percentage of total
Allocated 1K blocks	5,377	67%
Free 1K blocks	1,433	18%
Reserved 1K blocks (expansion)	1,000	13%
Reserved 1K blocks ("5" ranges)	80	1%
Reserved 1K blocks ("8" ranges)	10	0%
Reserved 99XX blocks	100	1%
Total 1K number blocks	**8,000**	100%

Source: NAP Information Paper 'Survey of Dublin 01 area number block allocation, December 2010. NAP 175

4.8 The table implies that 18 per cent of the available number blocks in Dublin are free to be allocated over the coming years.

4.9 These data refer to the number of blocks allocated to operators, as opposed to the actual numbers assigned to subscribers. A 2007 ComReg audit of operator utilisation rates for Dublin numbers shows that of the number blocks allocated to the operators, significant proportions remain either unutilised (i.e. not given to subscribers), or reserved or quarantined. The results of this survey suggest that utilisation rates at that time were approximately 47 per cent.[55]

4.10 However, despite the fact that not all the allocated numbers are assigned to subscribers, the total number of free 1K blocks (1,433) remains unchanged. Once a number block has been used even in part it is not practical to allocate any of the remaining numbers to other operators, and the block is no longer considered free.[56] If operators are able to increase their utilisation rates (i.e. assign more numbers within each block to subscribers, or make use of quarantined numbers in the future) then this may reduce the need for new number blocks by operators.

Levels of demand for number blocks over time

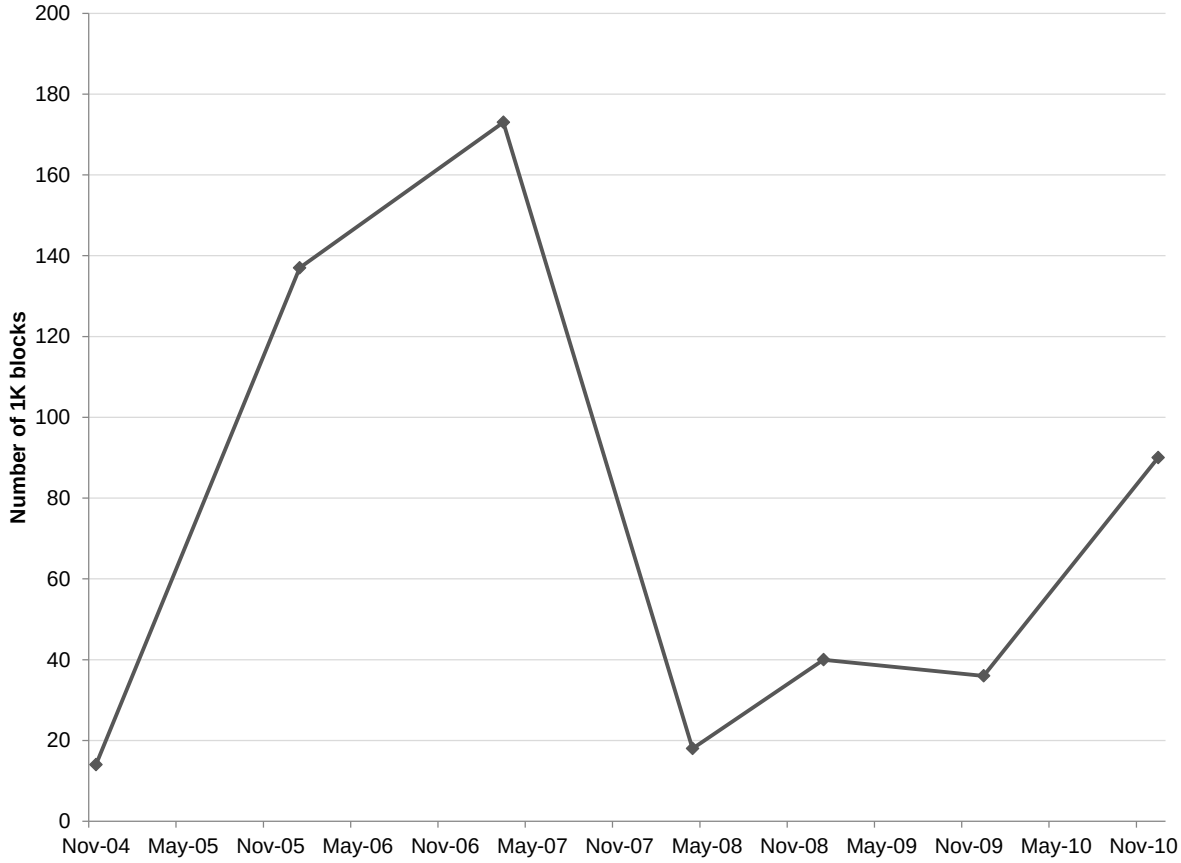
4.11 Demand for Dublin numbers has varied over the last few years, and increased in 2010 by 90 blocks (each block containing 1,000 numbers). This is despite a general decline in the proportion of households with fixed lines.[57] Figure 4.1 below shows the additional number of 1K blocks demanded each year by all operators. Demand peaked between 2006 and 2007, where 173 additional 1K blocks were requested.

[55] This utilisation rate considers only those numbers assigned to subscribers, and does not include numbers quarantined or reserved. If quarantined and reserved numbers are assigned to subscribers at later stages then the utilisation rate would increase.

[56] The practical difficulty is primarily due to the fact that the first four digits of a number are used to determine the identity of the operator that owns the number. Unused numbers from a block can therefore not be recalled and grouped together to form new blocks to reallocate. Moreover, for competition reasons, clean (i.e. contiguous) blocks are allocated to new entrants.

[57] ComReg Quarterly Key Data report 2011

Figure 4.1: Annual growth in demand for number blocks, 2004 – 2010



Source: NAP Information Paper 'Survey of Dublin 01 area number block allocation, December 2010. NAP 175

4.12 There are a number of possible reasons for this increase in demand, and for possible future increases:

(a) New operators — VoIP. Whilst not using fixed lines, VoIP operators can provide a service using geographic numbers. This has increased the demand (and may continue to do so) for Dublin telephone numbers even in the absence of a corresponding increase in fixed lines.

In addition, VoIP providers such as Skype can provide multiple Dublin numbers per household as there is no line rental associated with alternative services, and the traditional norm of one number per household no longer applies. Anecdotal information from ComReg suggests that the majority of new requests for numbers comes from VoIP operators, and that future demand for numbers is likely to be driven by this segment of the market.

(b) Existing operators — new services. Alternate operators have recently begun to win fixed-line market share, and require new geographic numbers. The population of Dublin was 1.27 million at the beginning of 2011, over a quarter of the total population in Ireland, thus forming a large market for providers. Even if switching customers

choose to retain their existing number, operators can offer a service first on a new number, with the option to port over time to the original number. These transitional numbers, when ceased, must be put into quarantine for a period of 13 months before they can be re-used.

(c) Fixed / Mobile Substitution. In some countries, such as Denmark, it is permissible to have a landline number on a mobile device. Whilst there is no such product offering in the Irish market at the moment, this could be offered in the future in the context of home-zone type services[58]. Such a development could place significant pressure on available Dublin numbers.

4.13 On the other hand, there are a number of steps that ComReg can take or implement more aggressively to conserve the demand for and use of Dublin numbers. These include:

(a) Undertake number recovery campaigns. These can free blocks of unutilised numbers held by operators an enable them to be allocated to new subscribers.

(b) Provide smaller number ranges (e.g. 100 numbers rather than 1000) to operators to reduce 'waste' associated with large number blocks.[59]

(c) Implement address validation. This would ensure that numbers are allocated only to customers who live in the area where they are seeking a number, and could help stem the demand arising from new VoIP offerings.

(d) Charge operators for number ranges in areas of short supply. Ofcom recently adopted such an approach which places a financial incentive on operators to ensure that they efficiently utilise the number ranges they have. Such a move could entail procedural complexities, however, and considerations about the passing of costs into consumers would have to be made.

4.14 ComReg estimates that through the above steps it could be possible to aim for a utilisation rate of allocated number blocks of 55 per cent compared with the current 47 per cent, which would result in the remaining free blocks being used up less quickly. Achieving utilisation rates higher than this would be unlikely given the proportion of numbers allocated to each operator that are reserved, in quarantine or ported out to other operators and therefore unavailable to be assigned to subscribers.[60]

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[58] Please refer to ComReg document 07/15 "Addressing Geographic Number allocations for hybrid fixed-mobile services"

[59] If such an approach was adopted for Dublin, ComReg would need to discuss the impact with industry of digit analysis to the fifth digit of the subscriber number which has a bigger impact in a 7-digit area than in a 5-digit area.

[60] ComReg received responses from 19 CEPT countries (Austria, Czech Republic, Denmark, Finland ,France, Germany, Latvia, Lithuania, Macedonia, Malta, Netherlands, Norway, Portugal, Romania, Slovak Republic, Spain, Sweden, Switzerland, and Turkey) to an informal survey requesting opinion on the highest possible attainable utilisation rates. Views on highest attainable rates were typically between 60 and 75 per cent, although reported actual utilisation rates were lower, ranging from around nine per cent to 53 per cent across the countries.

4.15 In addition to these steps, the rapid innovation and change within the telecommunications industry means that new alternatives to fixed line numbers are likely to continue to develop. In a number of years the value of having a Dublin fixed line number may have reduced to such an extent that the growth in demand slows or even reverses.

Estimating the timing of an eventual number change

4.16 Given the range of possible factors contributing to both the increase in demand for Dublin numbers and the containment of this demand, estimating the possibility of the need for a future Dublin number change is not straightforward. Our analysis is therefore based on three possible scenarios.

4.17 We assume that the average annual demand for number blocks by operators in the future will be 62 1K blocks per year, equal to the average annual demand for 2003 adjusted for a utilisation rate of 55 per cent. We then create three scenarios:

(a) High demand — an annual demand of 123 number blocks; double the average demand since 2003 (adjusted for an increase in utilisation rate). This would represent a situation where VoIP numbering and number porting becomes more popular and more Dublin numbers are required.

(b) Medium demand — an annual demand of 62 number blocks.

(c) Low demand — an annual demand of 31 number blocks per year; half the current average demand since 2003 (adjusted for an increase in utilisation rate). This would be a situation where the value of Dublin geographic numbers declines due to technological advances

4.18 For each scenario, we calculate the number of years it would take to exhaust the existing number of free blocks (1,433). Here, we implicitly assume that all the blocks that have already been allocated are at least partly in use, i.e. there are no unused blocks that may be recalled and re-allocated.

4.19 The table below illustrates the current free capacity (using our assumed realistic utilisation rates) and the years before a necessary number change under high, medium and low demand scenarios.

Table 4.2: Estimated years until a natural Dublin number change

	Free blocks at December 2010	Average annual future demand (1K blocks)	Years until a natural number change
High	1,433	123.34	11
Medium	1,433	61.67	23
Low	1,433	30.83	46

4.20 It is therefore possible that the need for a Dublin number change will arise under a high demand scenario in 11 years (end of 2021); in a medium demand scenario in 23 years (2033), and under low demand in 46 years (2056).

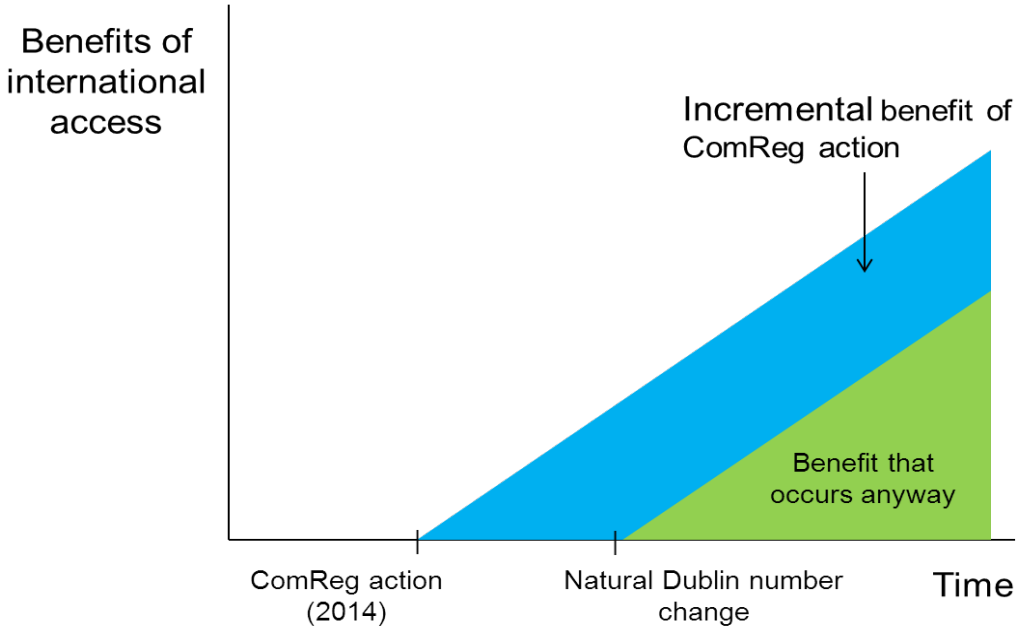
4.21 A description of the change in Dublin telephone numbers is included in the detailed analysis of the options in Section 7.

Implication for the costs and benefits of the policy options

4.22 A future change in Dublin numbers could enable international access to Irish non-geographic numbers and result in corresponding benefits. As this change is part of the baseline (i.e. would happen anyway, in the absence of any policy), the *additional* benefits accruing to any specific policy undertaken by ComReg to enable international access to non-geographic numbers should only be considered insofar as this policy enables *earlier* access compared with what would happen anyway. Therefore, the timing of a future Dublin number change is important.

4.23 The Figure below illustrates this. The area shaded blue represents the benefit that we would assign to ComReg action. The area shaded green represents benefit that would have occurred anyway. The earlier ComReg enables access compared with an eventual number change (i.e. the further away the eventual change), the greater the benefits that are attributable to ComReg action.

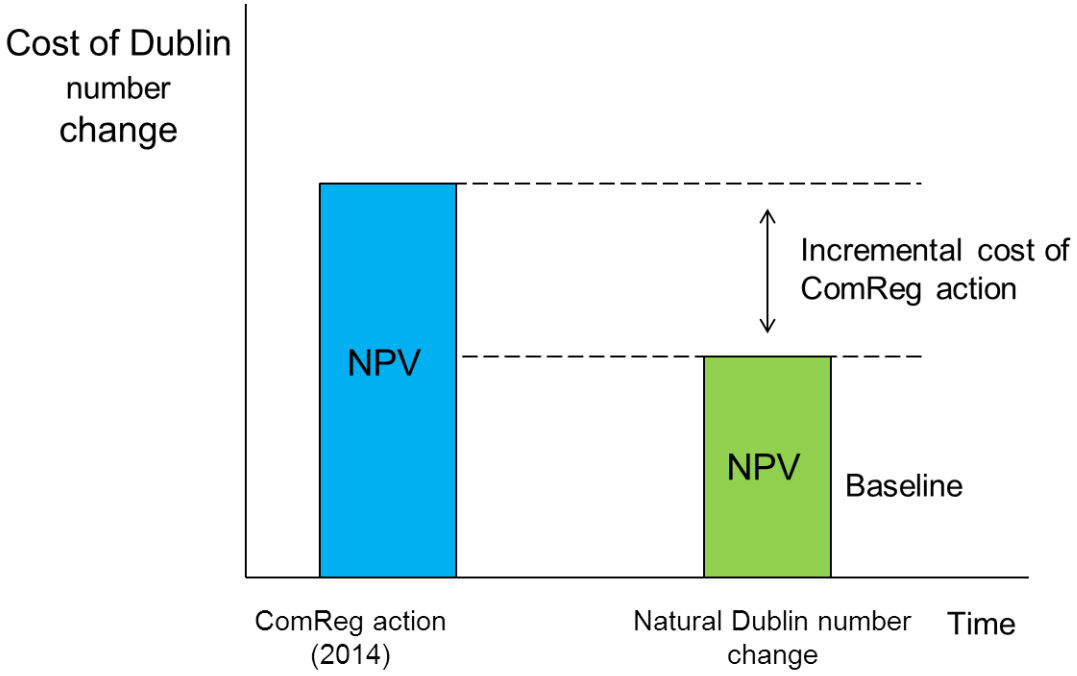
Figure 4.2: Illustration of additional benefits of ComReg action



4.24 Similarly, if one of the policy options entails changing all the Dublin numbers now, then this would mean the numbers would not need to be changed in the future. The costs of a future change would thus be saved, and this saving would offset the costs of a specific policy requiring a number change.

4.25 The Figure below illustrates the costs of undertaking a Dublin number change to enable international access (2014) compared with the costs of undertaking a Dublin number change in the future.

Figure 4.3: Illustration of additional costs of ComReg action



Summary of Current Scenario

4.26 Table 4.3 below presents the current Irish telephone market and our assumptions of its likely evolution in the absence of any policy changes in relation to the international access of Irish non-geographic numbers. Included in the table are the three possible dates of a future Dublin number change, providing the baseline scenarios against which the policy options will be assessed.

Table 4.3: Current scenario of the Irish telephone market

Variable	Value	Year	Expected annual growth rate[61]	Source
Dublin fixed line (residential) incoming minutes	904,399,607	2010	-6.82%	Calculations on ComReg quarterly data
Dublin fixed line (commercial) incoming minutes	2,110,265,749	2010	-6.82%	Calculations on ComReg quarterly data
Irish Non-Geographic incoming minutes (non-PRS) (advanced) (domestic)	345,916,488	2010	-3.31%	Calculations on ComReg quarterly data
Irish Non-Geographic incoming minutes (PRS) (advanced)	94,742,247	2010	-3.31%	Calculations on ComReg quarterly data
Dublin population	1,270,603	2011	1.61%	Calculations on Eurostat and Irish census data
Non-Dublin Irish population	3,310,666	2011	1.26%	Calculations on Eurostat and Irish census data
Non-Irish EU population	496,637,807	2010	0.34%	Calculations on Eurostat data
Number of non-Irish callers to non-geographic numbers	0		0.00% (until opening of international access)	These numbers not accessible to callers from abroad until a Dublin number change
VOIP operators	12[62]	2011	7.18%	ComReg
Mobile operators	8	2011	0.00%	ComReg. Assume the number of operators will remain static
Irish NG# owners	28,000	2008	1.61%	Information from ComReg and calculations on ComReg audit data
Dublin fixed line owners (domestic)	1,010,129	2011	1.61%	Calculations on ComReg data
Dublin fixed line owners (business)	36,726	2011	1.61%	Calculations on ComReg data

[61] Unless otherwise stated, we assume the expected annual growth rate is an extrapolation of the past compound annual growth rate over the past five quarters.

[62] Please note that while there are over 70 authorised VoIP providers, the vast majority of these may not be currently providing VoIP services. Of these 12, approximately four would incur costs of a number change as described in Section 7.

Number of Dublin numbers allocated	5,273,300	2007	2.25%	Assumed equal to growth rate of number of blocks allocated
Number of Irish non-geographic numbers allocated	2,521,083	2008	0.00%	Value based on ComReg audit data, with an assumption of growth rate
Year of Dublin number change	*High demand - 2021* *Medium demand - 2033* *Low demand - 2056*			NAP data and Europe Economics estimates

5 BENEFITS OF INTERNATIONAL ACCESS TO NON-GEOGRAPHIC NUMBERS

Description of Benefits

5.1 As the potential benefits of providing access to Irish non-geographical numbers do not depend on how this is achieved, we first discuss how large these benefits could be. The next section will provide estimates of the costs, which would depend on how the change was made.

5.2 The introduction of international access to Irish non-geographic free phone numbers (1800) and shared cost numbers (1850 and 1890) could give rise to the following benefits:[63]

(a) **Irish businesses** using these non-geographic numbers may benefit from the ability to access a wider EU market. The benefit may arise from increased revenue associated directly with increased call traffic (for example, the sale of products or digital content); or indirectly through the provision of customer support, advice or information. We measure this benefit as the average revenue (both direct and indirect) generated for businesses through their non-geographic number multiplied by the potential increase in call traffic from international callers.

(Businesses that currently publish two numbers (a non-geographic number for local access and a geographic number for international access) may also save in publishing costs if they only need to publish one number. However, we assume this is negligible.)[64]

(b) **Consumers** based in other parts of the EU may be able to access services that they are currently unable to (in the cases where Irish businesses do not publish an international geographic number). The amount that the consumers pay for the new services would only partly reflect the value of the service to them — this would be captured by the increased revenue accruing to the businesses.[65] However, often the consumer values the service at a level greater than the price paid. The difference between what the consumer is willing to pay and what he actually pays is defined as 'consumer surplus' and represents a net benefit to the consumer.

Assigning a value of consumer surplus associated with access to new services is not straightforward given the wide range of products and services that could be available to international callers, and the complexity of measuring consumer surplus in

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63 Given the likelihood that cross-border calls to PRS numbers would not be terminated, we do not include these numbers in our assessment of benefits

64 Based on the results of our survey and on discussions. .

65 To avoid double counting we would therefore not count this benefit again in relation to consumers.

practice.[66] We assume a value of 30 per cent as an illustrative measure of consumer surplus (i.e. consumers value the goods and services they can purchase as a result or international access at 30 per cent higher than what they pay). This is a conservative figure based on existing empirical estimates of consumer surplus in the digital content sector.[67]

Article 28 of the USD refers both to access to services using non-geographic numbers, and the numbering resources themselves. It is unclear what the additional benefit to consumers of being able to access the non-geographic number for the same underlying service as opposed to just the geographic number is likely to be negligible.

(c) **Communications providers** in Ireland (and possibly from other countries) may benefit from increased revenues from terminating calls to Irish non-geographic numbers. Estimating the benefit generated from this is not straightforward given the complexity of international billing arrangements. We assume that Irish communications providers will receive revenue similar to that of terminating an internal non-geographic call. We do not attempt to estimate the revenue generated by foreign communications providers.[68]

(d) The **EU single market** would be enhanced through the removal of the barrier to common access (of both numbering resources and underlying services). The value of this is not quantifiable but remains an important aim of the European Union. The EC views the harmonisation of numbering resources as a means of enhancing the single market for telecommunications services, as well as the wider European Union single market in terms of consumers' access to services.[69] However, this general goal may not be technically or economically feasible in all circumstances.

Scale of Benefits: A Qualitative Discussion

5.3 The possible scale of such benefits is informed by feedback from stakeholders, both from our survey of businesses using non-geographic numbers and telecommunications providers, and existing literature. The results from our survey are summarised in the Appendix. As highlighted in Section 2, due to the limited response rate the estimates of benefits must be treated with caution.

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66 As this relies on unobserved consumer valuation in addition to the prices of goods and quantities purchased.

67 In order to provide a baseline for a consumer surplus figure we focus on the digital content sector. Crandall, Jackson and Singer (2003) estimated consumer surplus in the US broadband market at between 58.3 and 88 per cent of revenues; and Green, Stein and McDevitt (2009) estimated a lower bound of consumer surplus in the US broadband market of between 57.8 and 63.3 per cent. These figures are likely to be a high estimate of consumer surplus given the relatively low costs that consumers pay for broadband compared with the range of activities that broadband access makes possible.

68 Feedback from engagement with operators suggests that margins on originating non-geographic Freephone and shared cost calls abroad are very low.

69 European Commission (DG Information, Society and Media) 'Questionnaire for the pubic consultation on the future harmonisation of numbering resources for the provision of businesses services' December 2010

5.4 In ComReg's experience there has been no demand from businesses or operators for international access to the currently restricted non-geographic numbers.[70] This is partly because of the nature of some of the services, and partly because callers seeking access to services provided internally on non-geographic number can usually use alternative routeings, such as Irish geographic numbers or international numbers (such as Universal International Freephone numbers).

Irish businesses using non-geographic numbers

5.5 Based on the number of non-geographic numbers allocated by communications providers to subscribers, we estimate the number of businesses across Ireland that might benefit from international access to non-geographic at approximately 23,600.[71] This excludes services using PRS numbers.[72]

5.6 Feedback from our field research[73] suggests that many businesses in Ireland use non-geographic numbers in a purely national context, and thus would not expect any increase in call traffic from callers abroad if such access were possible. Where businesses currently perceive a demand for their services from abroad they generally publish a geographic number, or use an alternative non-geographic number that is internationally accessible (for example in the 0818 range).[74]

5.7 In addition, some organisations using non-geographic numbers (in particular help-lines or government bodies) do not receive any revenue (direct or indirect) through their non-geographic numbers and thus an increase in call traffic would have no benefit to them.

5.8 Respondents to our survey do not perceive much international demand for access to their non-geographic numbers or services. Only two respondents believe there is international demand for their services; one of these already publishes an internationally accessible number and the other is considering doing so.

5.9 Similarly, survey results suggest that there would be a very limited increase in incoming call traffic following the opening of international access to non-geographic numbers. Fifteen per cent of respondents believe that if their number was accessible from abroad then incoming call traffic would increase, and of these only eight per cent anticipate an increase in turnover. The average perceived increased in incoming call traffic is 0.55 per cent across respondents, and the average increase in turnover is just over one per cent.[75] Of the two respondents indicating an increase in turnover, one (who anticipated the

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70 Similar feedback was also given by operators

71 Feedback from eircom indicates that an average of 2.5 non-geographic numbers are assigned to each business.

72 Estimated at just over 4,400 by ComReg's PRS department. We assume PRS numbers will not be accessible due to commercial restrictions on the part of operators.

73 Both our survey and discussions with operators and business trade associations.

74 A respondent to our survey explicitly mentioned that it was the existence of cross-border demand that had prompted his firm to use an 0818 non-geographic number as it was accessible from abroad.

75 Average increases in call traffic and turnover is calculated across the 20 respondents who answered that question of whether cross-border access would increase call traffic (either yes or no), and excludes the respondents who did not answer.

highest increase of 33 per cent) is already considering publishing an internationally accessible number. Excluding this respondent, the benefits expected would be negligible.

5.10 An argument presented by some respondents to the EC consultation[76] for the harmonisation of non-geographical numbers was that there would be a reduced cost in advertising, whereby a business can list one instead of two contact numbers in advertising campaigns. However, it was felt by many of the respondents that migrating existing numbers to a single one, producing new advertising material and arranging a transitional period could take years and outweigh this minimal gain.[77] Results from our survey also suggest that such savings would be unlikely to occur and if relevant, would be very small.[78]

International consumer demand for access to Irish non-geographic numbers

5.11 Insight into the existing demand for non-geographic numbers from international callers can be gained from assessing the frequency with which such numbers are dialled from abroad. Feedback from eircom indicates that this is negligible, which suggests that, even if these calls were able to be terminated at the Irish businesses using the non-geographic numbers, there would be little additional benefit.[79]

5.12 Some respondents to the 2010 EC consultation on the future harmonisation of numbering resources for the provision of business services across the European Union noted that there may be demand amongst consumers, who could benefit from greater international competition and a more developed internal market. However, it was noted that tariff barriers would first need to be removed, and that the price of calling any such non-geographic number from abroad would have to be no greater than the price of calling a local number of similar function, which is currently not the case for non-geographic numbers dialled from abroad.[80]

5.13 International consumers may also be wary of dialling unfamiliar non-geographic numbers. Non-geographic numbers in Ireland will still need to be dialled with the Irish international dialling code, and international callers may be unaware that the number they are dialling is non-geographic, and subject to higher call charges than the usual international geographic rate. Ofcom's recent work on non-geographic numbers in the UK shows that

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76 European Commission DG Information Society and Media, Questionnaire for the Public Consultation on the Future of Harmonisation of Numbering Resources for the Provision of Business Services, December 2010

77 ETNO and Moira Hutchings' response to European Commission DG Information Society and Media, Questionnaire for the Public Consultation on the Future of Harmonisation of Numbering Resources for the Provision of Business Services, December 2010. Hutchings is an independent telecom consultant and former member of ETNS Steering Group and Chair of ETNS Commercial Group.

78 Only two respondents said that they might save on advertising costs, and both said the savings would be negligible.

79 As explained in Section 3, calls to non-geographic numbers from abroad are treated as Dublin numbers by gateways, and are terminated at the corresponding Dublin number. Eircom's responsibilities as the host to the majority of Dublin numbers means that it is aware of any problems across the numbers and would detect whether numbers were being incorrectly terminated or forced to hang.

80 Anacom, BTG, ECC, AJ Solokov, INTUG, Dr. Jens Roder, MCA, ONI Communications responses to European Commission DG Information Society and Media, Questionnaire for the Public Consultation on the Future of Harmonisation of Numbering Resources for the Provision of Business Services, December 2010.

consumers are cautious about using unfamiliar numbers, particular if the geographic location is unknown, due to confusion regarding what the different numbers mean and how much calls cost.[81] Consequently, consumers often "go to great lengths to contact organisations in other ways, possibly at higher costs/inconvenience".[82]

5.14 This further implies that the increase in call traffic to Irish non-geographic numbers if access is enabled is unlikely to be significant and indeed it might be offset by a reduction in overall call traffic, due to increased uncertainty about the call charges that might be applied.[83]

5.15 In some cases, the subset of callers abroad that would be likely to access such numbers would be Irish citizens travelling abroad (for example, bank or insurance customers). These consumers already have access to the service through an international geographic number, and any benefit to them of only having to remember one number will not translate into benefits for the wider EU community.

EU demand for access to non-geographic numbers

5.16 Furthermore, on a wider scale, a number of analogous investigations suggest that there is not a large unmet demand for international access to non-geographic numbers across the EU on the part of consumers, content providers (businesses) or telecommunications operators.

5.17 For example, the EC launched a public consultation in December 2010 on the future harmonisation of numbering resources for the provision of business services across the EU. This arose from the view that many international businesses have non-geographic numbers to facilitate access in the Member State in which they are active, but that these non-geographic numbers are sometimes blocked to foreign consumers for economic reasons.

5.18 The EC consultation proposed two ways to enhance harmonised numbering in the EU: a new European telephony numbering space (ETNS) and a new EU-wide short numbering range (e.g. 115 xxx).

5.19 An ETNS, coded +3883 by the International Telecommunications Union (ITU), was introduced in 2000 to 24 European countries to "promote pan-European services by making numbers available in circumstances where neither national nor global numbers

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81 Ofcom response to European Commission DG Information Society and Media, Questionnaire for the Public Consultation on the Future of Harmonisation of Numbering Resources for the Provision of Business Services, December 2010. Own questionnaire available at http://stakeholders.ofcom.org.uk/consultations/simplifying-non-geo-numbers/

82 Ofcom response to European Commission DG Information Society and Media, Questionnaire for the Public Consultation on the Future of Harmonisation of Numbering Resources for the Provision of Business Services, December 2010. Own questionnaire available at http://stakeholders.ofcom.org.uk/consultations/simplifying-non-geo-numbers/

83 To the extent that non-geographic numbers are indistinguishable in the minds of many foreign customers from geographic numbers, introducing access to non-geographic numbers might increase consumer reluctance in making *any* cross-border calls.

were suitable or available".[84] The concept proved unsuccessful amongst businesses and was consequently reclaimed by the ITU on 31 December 2010. Respondents to the consultation indicated reasons for its failure was the lack of demand from businesses and the large number of entities and necessary interconnection agreements in the value chain,[85] which drive up transaction costs.[86]

5.20 Respondents also emphasised that, where demand exists for international services (generally by large multinationals), it is already being met by the ITU's Telecommunication Standardization Sector (ITU-T) (e.g. International Freephone Numbers, International Shared Cost Numbers, International Premium Rate Numbers and International Personal Numbers for Universal Personal Telecommunications).[87]

5.21 The results of the EC consultation suggest that there is little if any demand for the harmonisation of numbering resources for the provision of business services in the EU.[88]

Consumer access to numbering resources

5.22 The legal text of Article 28 USD refers to international access of not only services using non-geographic numbers, but to the numbers themselves. If Irish businesses using non-geographic numbers already provide a means of international access (such as an international geographic number) then there appears to be little benefit to the international consumer of being able to dial the same non-geographic numbers as those callers within Ireland. Indeed, the charges to the caller of dialling a non-geographic number from abroad are likely to be significantly higher than the charges of a standard international geographic call.[89] It is likely that international consumers will continue to use the old number wherever possible.

5.23 Further, if the introduction of a new, non-geographic number results in the removal of the old number to which international consumers may be accustomed, these callers will incur an adjustment cost in addition to higher call charges.

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84 European Commission DG Information Society and Media, Questionnaire for the Public Consultation on the Future of Harmonisation of Numbering Resources for the Provision of Business Services, 6 December 2010.

85 This would be a similar implication of cross-border access to non-geographic numbers, particularly PRS numbers, as discussed in Section 2.

86 AJ Sokolov, ETNO, Hutchings, INTUG, MCA, Von Europe responses to European Commission DG Information Society and Media, Questionnaire for the Public Consultation on the Future of Harmonisation of Numbering Resources for the Provision of Business Services, December 2010.

87 ETNO (European Telecommunications Network Operators Association) response to European Commission DG Information Society and Media, Questionnaire for the Public Consultation on the Future of Harmonisation of Numbering Resources for the Provision of Business Services, December 2010.

88 A total of 31 entities responded to the EC questionnaire. They include citizens and telecom consultants, national regulators and ministries and operator and regulatory associations.

89 They are likely to be charged the international call charge plus a premium associated with the non-geographic number

Quantitative Estimation of Benefits

Benefits to businesses

5.24 From our survey of businesses using non-geographic numbers, we estimate the average increase in call traffic arising from international access to be 0.55 per cent of current incoming call traffic per annum. This represents an upper bound of the possible increase in traffic given the substantial amount of other evidence that suggests little change.[90]

5.25 Given the limitations of the low response rate to our survey, we use figures based on the Ofcom study as a more robust estimate of the revenue associated with call traffic in order to value the possible increase arising from international access. [91] The study gathered information from approximately 400 businesses on the impacts associated with a number change in 2000, including an estimate of the lost revenue to businesses resulting from the loss of their number. Relating these estimates to the number of non-geographic businesses in Ireland and total incoming call traffic to these businesses, we estimate an average revenue per call minute of €13[92,93]

5.26 However, as there is still uncertainty attached to this figure, and the anticipated increase in call traffic used in calculating the benefits is obtained from our survey, the results should still be treated with caution.

5.27 Given the inherent uncertainties involved in estimation, and the qualitative evidence pointing to a very small scope for benefits, we estimate that benefits of opening access to non-geographic numbers could range from negligible to approximately €11 million in the year after the change (2014). The benefits accruing over time (the following 30 years) would be worth €140 million[94,95]

5.28 These figures take into account the fact that it is likely that the increased trade for Irish businesses arising from international consumer activity would result in a degree of diversion from businesses in the rest of the EU as international consumers access Irish businesses instead of businesses in other countries. Whilst we do not know the extent to which this would happen, it could be relatively high given the absence of evidence of current demand for Irish businesses.[96] We assume arbitrarily that this diversion factor to

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90 This figure is based on input from two respondents, one of whom is currently considering using an internationally accessible number. Therefore the scale of *new* call traffic generated from measures to enable cross-border access to currently inaccessible numbers is likely to be smaller if we assume that where demand exists businesses always publish an accessible number.

91 Ofcom Numbering Review, February 2006

92 This assumes that the revenue generated per minute of call traffic to a business using a non-geographic number compared with a geographic number is the same.

93 Relying solely on the results from our survey, this estimate of revenue associated with call traffic is implausibly high, with overall benefit of approximately of €63 million in 2014.

94 All future earnings and costs are discounted to arrive at a present value, as society places a greater value on money today than in the future. We use a social discount rate of 3.5 per cent as advised by the European Commission.

95 Please note that these figures assume a medium growth rate in the Irish telephone market.

96 In other words, it is unlikely that many cross-border consumers would consider that Irish businesses offer completely new services, and if they did access the service it may well be at the expense of another business elsewhere.

be around 50 per cent. Thus, any benefits to Irish businesses come at a corresponding cost to non-Irish businesses, which would reduce the net benefits of opening access to Irish non-geographic numbers.

Benefits to operators

5.29 Operators in Ireland would also stand to benefit from the increased traffic to Freephone and shared cost non-geographic numbers. Using estimates of per-minute revenue to operators of a non-PRS non-geographic call (based on a weighted average of published tariffs) [97] and the results of our survey concerning the anticipated increase in call traffic, we estimate the benefit to operators would be approximately €146,000 in the year of the change (2014), and a discounted net present value over the next 30 years of approximately €2 million.

Benefits to callers

5.30 The benefits to international consumers of being able to access the Irish businesses using the non-geographic numbers is captured by the increase in revenue that the Irish businesses would receive, provided these consumers would otherwise not have accessed similar services from a supplier in another country. However, to account for consumer benefit arising from consumers valuing a service than they have to pay for it, we make an assumption that the level of consumer surplus will be 30 per cent of the value added generated by the businesses. If access is opened in 2014 under the high growth scenario for call volumes, this comes to a figure of €3.4 million in the year of the change and a discounted present value of approximately €45 million over the next 30 years.

Benefits summary

5.31 Table 5.1 below summarises the benefit accruing to businesses, operators and consumers for the year after international access is enabled. Results are presented using inputs from our survey and the Ofcom study. The total benefits are estimated at approximately €15 million in the year after the change.

5.32 Given the low response rate to our survey, the uncertainty surrounding the estimation of revenue generated from incoming call traffic, and the qualitative evidence indicating little scope for benefits arising from international access of non-geographic numbers, we consider that the lower bound of benefits could be negligible, with the figures presented in the table representing an upper bound.

[97] This figure is estimates at €0.18 per minute. We assume that the charges levied by operators to callers represent the total revenue earned by all operators in the call chain of a non-geographic call, regardless of how these charges are distributed across operators. Fees accruing to operators from both callers and businesses using the non-geographic numbers are considered.

Table 5.1: Benefits associated with opening international access to Irish non-geographic numbers (2014)

Stakeholder	Benefit (€000s)
International consumers	3,418
Irish businesses (non-PRS numbers)	11,393
Irish telecommunication providers	146
Total	**14,957**

Note: these figures are based on estimates of revenue per incoming minute from the Ofcom study

Comparison to the baseline scenario

5.33 An important element of cost benefit analysis is to estimate the additional impact a policy may bring relative to what would have happened anyway in the Irish telephone market. The opening of international access to non-geographic numbers would occur anyway with a change in Dublin numbers in the future arising from expired capacity.

5.34 Therefore, the additional benefits of any policy of ComReg's to open international access to non-geographic numbers would only be the increase in benefit of opening access earlier than would otherwise have happened anyway.

5.35 The additional benefit of ComReg opening cross border access to non-geographic numbers will depend on the date of the future Dublin number change, as well as the evolution of the Irish telephone market. We present the discounted benefits under the three different dates for an eventual Dublin number change in the table below. The range includes the possibility that benefits could be as low as zero.

Table 5.2: Benefits associated with opening international access to Irish non-geographic numbers, Present Value.

Counterfactual Dublin number change	Benefits (€000s) (PV)
High demand for numbers (change in 2021)	0 – 77,718
Medium demand for numbers (change in 2033)	0 – 148,820
Low demand (change in 2056)	0 – 193,379

Note: we assume medium growth of the Irish telephone market
Estimates incorporate Ofcom results and are not based solely on our survey

6 POLICY OPTIONS

6.1 In the current situation in Ireland, as we have explained, fully implementing Article 28 USD by making non-geographic numbers in Ireland accessible to callers throughout the EU is not possible due to the technical constraint of a numbering clash between Irish non-geographic numbers and Dublin geographic numbers when dialled from abroad.

6.2 There are a number of policy options available to ComReg for making non-geographic numbers internationally accessible that overcome this technical constraint. These are:

(a) Option 1: Change Dublin telephone numbers. An additional digit would be inserted before all subscriber numbers in Dublin.

(b) Option 2: Change non-geographic numbers. All non-geographic numbers with lead digit '1' would be given a new lead digit that would not clash with any national number when dialled from abroad.

(c) Option 3: Hybrid number change. For each range of non-geographic numbers that clash with Dublin numbers either the non-geographic numbers, or the Dublin numbers, would be changed, depending on the scale of the impact.

(d) Option 4: Require full number analysis by international gateway exchanges. This would not involve a number change, and instead would require Irish international gateway exchanges to analyse incoming calls to a sufficient degree to avoid a dialling clash between geographic and non-geographic calls.

(e) Option 5: Close the Irish dialling plan. The Irish dialling plan would move from an open to a closed plan. This would require a '0' to be inserted after the international dialling code on all geographic numbers in Ireland.

(f) Option 6: Issue additional internationally accessible non-geographic numbers. Non-geographic numbers that were accessible from cross borders would be issued on a voluntary basis to businesses that perceived sufficient international demand for their services. The current inaccessible numbers would remain.

Initial Analysis of Options

6.3 We describe these options in detail here. After further consideration, some options were deemed unviable and are not analysed in the subsequent section. We present these options first.

Option 3: Hybrid number change

6.4 This option would entail changing both the Dublin and non-geographic numbers, but only where an existing clash occurs. The number ranges affected are those identified as having a current clash with Dublin numbers in Table 3.3. Table 6.1 below replicates Table 3.3 and presents an illustration of how the number ranges might be changed under this

option. Changes to either Dublin numbers or non-geographic numbers would take the same form as described later in Options 1 and 2.

6.5 In this option, ComReg would undertake detailed analysis of each non-geographic number range to determine the extent of the possible numbering clash with Dublin numbers. Either the non-geographic number range or the corresponding Dublin number range would be changed, depending on which would result in the least disruption. Ranges where there is currently no clash would not be changed.

6.6 Based on Table 3.3, the ranges corresponding to reference numbers 1 and 4 would not be changed as there is no existing clash. For the other ranges, it may be that in some ranges there are a significant amount of non-geographic numbers allocated, but relatively fewer Dublin numbers. In this case the Dublin numbers would be required to change. Similarly, in some ranges there might be significantly fewer non-geographic numbers allocated compared with Dublin numbers, and thus — having first allowed for the likely greater economic value[98] of non-geographic numbers — the non-geographic numbers would most likely be changed to minimise the disruption.

6.7 The result would be a mix of Dublin and non-geographic numbers within the existing '1' range, and some Dublin numbers in the new '01 3' range.[99] The table below illustrates the possible combinations that may arise.

6.8 As can be seen, there would be both non-geographic numbers and Dublin numbers still commencing with the lead digit '1', although the possibility for a clash when dialled from abroad would have been removed.

[98] Non-geographic numbers, which have higher running costs for the number holder, are generally used for business purposes, whereas the vast majority of geographic numbers are held by ordinary consumers.

[99] The change to Dublin numbers would entail inserting a '3' after the '01' Dublin area code. See the description of Option 1 for more details.

Table 6.1: Hypothetical results of hybrid number change

Ref	Non-geo number range	Clash with Dublin sub-range	New numbering	
			Non-geographic	*Dublin*
1	1520, 1530, 1540, 1550, 1560, 1570, 1580, 1590	No clash	No change	No change
2	1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519	Clash. Non-geographic numbers to change	7512, 7513, 7514, 7515, 7516, 7517, 7518, 7519	01.512 XXXX, 01.513 XXXX etc
3	1598, 1599	Clash. Dublin numbers to change	1598, 1599	01.3598 XXXX; etc
4	1800	No clash	No change	No change
5	1850, 1890	Clash. Dublin numbers to change	1850, 1890	01.3850 XXXX; 01.3890 XXXX etc
6	1891, 1892, 1893	Clash. Non-geographic numbers to change	7891, 7892, 7893	01.891 XXXX; 01.892 XXXX etc
13*	190X, 191X,	Clash. Non-geographic numbers to change	790X, 791X,	01.90X XXXX; 01.91X XXXX etc

Note: these changes are purely hypothetical and serve to illustrate the possible numbering combinations that may arise under this option.

6.9 This option would result in fewer numbers being changed compared with either a Dublin number change or a full non-geographic number change. The same stakeholders would be affected as in Option 1 and Option 2, although the scale of the impacts would be less. However, the option would give rise to a range of additional impacts:

(a) As not all Dublin numbers would be changed, far more effort would be required to inform the affected subscribers of the change. This would need to be done on the individual subscriber level as opposed to a city-wide campaign, and would likely be more logistically complex and resource intensive. The scope for confusion could be significant, both among subscribers affected by the change and among other callers in Dublin and Ireland, while a potential for resentment could also arise among the 'unlucky' subscribers.

(b) Having non-geographic numbers in different ranges (e.g. some beginning with '1' and some with '7') would be sure to cause disruption and confusion to callers. A potentially significant impact would be confusion over billing arrangements, whereby callers would no longer be familiar with the charges associated with the non-geographic codes and could suffer unexpected charges.

(c) The regulatory burden on ComReg in undertaking an impact assessment for each number range (down to the individual subscriber level) to determine which would be

the least disruptive to change could be significant; the costs of such analysis would need to be recouped through levies to operators. ComReg might require additional resources to handle the resulting increase in confusion and consumer complaints.

(d) ComReg would also be required to inform operators world-wide of the change and which specific number blocks fall into each category of Dublin geographic; PRS; Freephone, Shared cost, or internet dial-up. International operators would be required to be familiar with which +353.1 numbers represented non-geographic numbers and which represented Dublin geographic numbers, and would be required to analyse all calls to +353.1 numbers to a depth of four national digits. ComReg would have no control over the extent to which this occurred, particularly with smaller operators. Failure by operators to fully familiarise themselves with the changes could have further consequences:

- Strategic Blocking of Access by Operators. There would be a serious risk of unannounced blocking of access by some foreign operators to all Irish "+353.1" numbers (i.e. some or all of Dublin subscribers), regardless of their ITU or EU obligations. This would protect them from scams and from billing complexities associated with premium rate and other non-geographic numbers, and/or from having to introduce undesirable deep-digit analysis with attendant costs and dialling delays. This could affect all Irish subscribers and Irish competitiveness.

- Scam cost. International scams are hard to protect against and consequently are very attractive to hit-and-run scammers. If Irish Premium Rate Numbers appear indistinguishable from Dublin numbers to ordinary subscribers abroad then the opportunities for scamming become obvious (e.g. invite calls to a PR number masquerading as an ordinary Dublin number). International operators could charge at the highest premium rates for all calls to "+353.1" numbers to guard against this, resulting in serious damage to Ireland's reputation due to excessive call bills for callers to Dublin numbers.

- Vulnerability cost. Conversely, some international operators might simply treat all Irish "+353.1" numbers as Dublin numbers, rather than undertake deep digit analysis. That would result in significant undercharging for many calls and leaving the operators vulnerable to abusers who deliberately run up high bills on Irish premium rate numbers, thus again damaging Ireland's reputation.

6.10 The high complexity of this option and the range of wider impacts (in particular those arising from the actions of foreign operators over whom ComReg has no control) leads us to conclude that this option is not viable on a technical and logistical basis, regardless of the associated technical costs.

Option 5: Close the Irish dialling plan

6.11 This option entails moving away from an open dialling plan in Ireland (with local dialling) to a closed dialling plan. This would do away with local dialling (i.e. all numbers would need

to be dialled with the STD code, and callers could no longer just dial the local subscriber number when calling within the local area).

6.12 Changes to closed dialling systems have taken place in a number of EU Member States. These have been undertaken either as a stand-alone event or as part of a major national number change. However, in these cases the change to closed dialling has been prompted by a capacity shortage of telephone numbers resulting from population growth and increased telephone line density.

6.13 All geographic numbers in Ireland would thus include the STD code and all would begin with '0', regardless of the location of the caller. For example, residents of Cork would need to dial **021 765 4321** when calling each other instead of just 765 4321 as is currently the case. Similarly, residents in Dublin would need to dial **01 289 4266** when calling each other instead of just 289 4266.

6.14 This lead digit '0' would need to be kept when dialling the number from abroad and not dropped as is currently the case. For example, a Dublin number when dialled from abroad would be **+353 01 289 4266** instead of **+353 1 289 4266.**

6.15 Closing the dialling plan would increase numbering capacity in Dublin, as the currently reserved ranges 01 0XXXXXX and 01 1XXXXXX would be free for use.[100]

6.16 As all geographic numbers would begin with '0', mobile numbers (which currently commence with 08X) would also require a lead digit change. This would entail dropping the '0' and having all mobile numbers begin with '8'. Whilst this would not be absolutely necessary it would highlight the distinction between geographic and mobile numbers in the minds of consumers.

6.17 Non-geographic numbers would continue to begin with '1' and no change would be required.[101] With the change to the Dublin numbers, non-geographic access could be opened internationally without a clash.

6.18 In addition, a very large amount of free number blocks would be released (blocks commencing with digits 2, 3, 4, 6, 7 and 9) and would be available for new services such as mobile machine to machine services (these would not be used for telephone numbers as these would all begin with either '0', '1' or '8').

6.19 Table 6.2 below illustrates the possible changes under a closed dialling plan.

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[100] Lead digit number ranges in '0' and '1' are currently reserved. 01 0XX XXX due to local dialling, and 01 1XX XXX reserved for non-geographic numbers.

[101] Two anomalies here would be 0818 and 076 which are both non geographic.

Table 6.2: Possible closed dialling plan approach to Ireland

Calling from	Calling to	Dialling plan		
		Existing plan	*Closed plan*	
outside Ireland	Geographic numbers, e.g. Dublin	00 353 1 XXX XXXX	00 353 **0**1 XXX XXXX	Insert digit zero after the country code
	Mobile numbers	00 353 8X XXX XXXX	00 353 8X XXX XXXX	No change
	Non-geographic numbers	inaccessible	00 353 1XXX XXXXXX	Access opened
within Ireland	Geographic numbers, e.g. Dublin	01 XXX XXXX	01 XXX XXXX	No change
	Mobile numbers	08X XXX XXXX	**8**X XXX XXXX or	No prefix with zero
	Non-geographic numbers	1XXX XXX XXX	No change	No change
within the local area	Geographic numbers, e.g. Dublin	XXX XXXX and 01 XXX XXXX	01 XXX XXXX	Local dialling discontinued
	Mobile numbers	08X XXX XXXX	**8**X XXX XXXX	No prefix with zero
	Non-geographic numbers	1XXX XXX XXX	No change	No change

6.20 Closing the dialling plan in Ireland would be a significant change and would impact all telephony areas of Ireland.

6.21 All callers in Ireland would be affected by the loss of local dialling. Callers would need to remember to include area codes when dialling all numbers. International callers would need to remember to include the '0' in the Irish number when dialling from abroad and a proportion of lost calls could be expected. Any associated adjustment costs would therefore apply to the whole of Ireland rather than a subset affected, for example, by a Dublin number change.

6.22 All businesses with international reach would need to update their number to the new format that includes the '0' in the subscriber number. They would incur similar adjustment costs to other number changes described in Options 1 and 2, such as changes to stationery and advertising material, as well as the possibility of lost revenue resulting from confusion and reduction in call traffic from overseas customers. Local businesses across the whole of Ireland that currently only publish their local number would incur similar adjustment costs of a number change to update to the new number that includes the STD code.

6.23 Changing the dialling plan would require ComReg and communications providers to undertake nation-wide marketing and advertising campaigns to inform the country of the move away from local dialling. These costs would be similar to those incurred under number changes in options 1 and 2, but would affect the whole of Ireland.

6.24 Given these wide ranging impacts we conclude that this would not be a viable option. Where other countries have closed their dialling plans this has been in response to genuine need arising from nation-wide numbering shortages.

Option 6: Issue additional internationally accessible non-geographic numbers

6.25 This option would entail ComReg issuing new ranges of non-geographic numbers that can be accessed from outside Ireland (for example, using the '7' range as suggested in the non-geographic number change option). Given that non-geographic numbers already have to pass through number translation facilities, allowing companies access to a (second) internationally compliant number would be possible. It should be noted that this option would come at an additional cost to numbering resources, as it would completely or virtually completely consume a major number range (probably 07), thus significantly reducing future numbering options available to address unforeseen innovations or numbering contingencies.

6.26 These numbers would be made available to businesses and content providers who felt that international consumer demand for their services would be sufficient to warrant adopting a new number. The businesses could either completely replace their existing non-geographic number with the new, internationally accessible one, or use the two in parallel.

6.27 For example, we note that the 0818 non-geographic range (which is internationally accessible) is charged by eircom as a "local" rate number.[102] This suggests that from the perspective of the customer dialling that number, there is no difference between the cost (from an eircom phone) of 1890 and 0818. Thus to the business being called, there will be no advantage of them adopting a 1890 number over an 0818 number. Indeed there will be two major disadvantages: (1) the business will incur a charge for every 1890 call it receives, whereas it will not for an 0818 call, and (2) the 1890 number is not accessible from other countries, whereas the 0818 number is. Businesses could thus be encouraged to move over to an 0818 number then "retire" the 1890 number. Whilst this example only solves the problem for 1890 non-geographic numbers, a similar process, with new non-geographic number ranges, could take place. There would thus be no commercial reason for making the 1890 and other non-geographic numbers accessible from abroad as the underlying service would be accessible through the new number.

6.28 Businesses choosing to adopt a new, internationally accessible non-geographic number might incur some costs of a number change. However, the costs incurred by them would be considered as business costs and not costs of complying with external regulation (as they would only choose the additional number if they felt this made commercial sense with regard to an international demand for their products or services).

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[102] It was originally intended to be a "national" rate non-geographic number, but eircom has now altered its charging such that it is now only a "local" rate number.

6.29 Similarly, any disruption to Irish callers getting used to the new non-geographic numbers would be considered a result of the businesses' actions, and not a cost of complying with regulation.

6.30 Most of the benefits of making all existing non-geographic numbers available to callers from abroad would stem from those businesses for whose services there exists an international demand. It is reasonable to expect that these would be the businesses that would choose the new non-geographic number under this option. Therefore the total benefits of this option are likely to be similar to the benefits of making all non-geographic numbers accessible to callers from abroad, as described Section 5 above. Indeed, information from our survey suggests that where businesses do perceive international demand for their services they already use an internationally accessible non-geographic number.

6.31 This option would solve part of the initial problem defined by the EC in terms of enabling consumers across the EU to access services associated with non-geographic numbers in all Member States. Normal market forces would be in place here, with Irish businesses undertaking the additional expense of publishing a second, internationally accessible number in response to sufficient demand for their services.

6.32 However, the drafting of Article 28(1) does refer to access to both the services using the non-geographic numbers and the numbers themselves. In terms of complying with the full legal text of the USD, this option would not be sufficient as there would remain a range of inaccessible non-geographic numbers (even though the additional benefit of making these internationally accessible to consumers would be likely to be small).

6.33 We therefore do not consider this option sufficient for fully implementing Article 28 USD as drafted, but are of the opinion that it best serves the underlying commercial and consumer-focused aim of the Article. However, as noted, it would draw down the reserve of un-issued numbers quite significantly. Individual businesses wishing to have a non-geographic number that can be called from outside Ireland are already able to arrange this at little cost.

7 DETAILED ANALYSIS OF OPTIONS

7.1 The three preceding options are not considered viable for fully addressing the implementation of Article 28 USD. We now turn in more detail to the remaining three options, to describe what they entail, present the range of possible impacts, and assess the associated costs.

Option 1: Change Dublin telephone numbers

Description of option

7.2 This option entails changing all Dublin numbers so that they would not clash with non-geographic numbers when the two number types are dialled from abroad.

7.3 The change would consist of making Dublin numbers eight digits long. In the current dialling plan in Ireland, the '3' lead number range is reserved for expansion.[103] Existing Dublin numbers would be changed by inserting a '3' after the area code '01', making the number after the area code eight digits long. For example **01 872 8981** would become **01 3872 8981.** This change would avoid a clash with non-geographic numbers when dialled from abroad as no non-geographic number begins with the lead digits '13'.

7.4 The Dublin number change from seven to eight digits would also create sufficient extra capacity in available numbers to cover any future expansion in demand for Dublin numbers. Placing all the existing Dublin numbers under the lead digit '3'[104] would free up many of the currently allocated lead digits ('2' through to '9').[105] The estimated new volume of Dublin numbers is approximately 80 million.

7.5 This additional capacity would, among other benefits, enable ComReg to reserve the entire '018' and '015' ranges for non-geographic number use, so that a possible clash with Dublin numbers in the future would not arise.

7.6 The implementation of the number change would span approximately three years to enable ComReg and all other affected parties to undertake the work required.

7.7 Given the number of Dublin numbers allocated to operators, this option would affect approximately 5.3 million numbers.[106] It should be noted that this figure refers to all numbers allocated by ComReg to operators. As discussed in Section 4, not all numbers allocated to operators are in use. However, the total number of Dublin numbers allocated has bearing on the costs to operators of a number change.[107]

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[103] In other words, after the area code no number begins with '3'.
[104] All Dublin numbers would be changed from 01 XXXXXXX to 01 3XXXXXXX.
[105] The ranges beginning with '1' and '9' would still be reserved for local dialling and emergency services respectively.
[106] NAP Information Paper 175 'Survey of Dublin 01 area number block allocation, December 2010. Estimate confirmed with eircom.
[107] Separate figures for the number of Dublin businesses and residents are developed from other sources.

Impacts and costs

7.8 There are a number of stakeholders that would be affected by a Dublin number change.

Telecommunications providers

7.9 The telecommunications providers that would be most affected by a change to Dublin numbers would be those operators hosting geographic Dublin numbers. The types of costs involved would include:

(a) Capital and operational expenditure costs on IT resources to prepare for the change.

(b) Capital expenditure on infrastructure, such as the physical work required to update the exchanges.

(c) Project management costs. Given the scale of the changeover and the need to coordinate all relevant parties these would be significant.

(d) Marketing costs. Each operator would be responsible for advertising the change to its customers. This would include distributing letters and flyers, placing advertisements in newspapers, radio and television campaigns.

7.10 Costs can be represented on a per number basis, as all numbers allocated to operators would need to be changed (even those quarantined or reserved). For a Dublin number change, 5.3 million numbers would be affected.[108]

7.11 As the largest host of geographic numbers in Dublin, eircom would bear the bulk of the costs of a change over, and would also be responsible for the costs of the change concerning other operators renting line and number capacity from them. Other operators also hosting geographic numbers would also incur similar costs, but on a smaller scale. Whilst they may not have as great a proportion of, for example, project management costs, they would also not benefit from the economies of scale that eircom would. We thus assume that the average cost per number would be the same across operators.[109]

7.12 Cost information from eircom relating to a previous number change is presented in the Appendix. These figures related to an STD[110] code change in four rural areas in 2009. Feedback from eircom indicates that these per-number cost figures would need to be uplifted for a Dublin change to account for:

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[108] We note that the costs of a numb change for operators is influenced by the number of geographic numbers allocated to them by ComReg, regardless of whether these are allocated to subscribers.

[109] This is an assumption confirmed through industry interviews. An exception would be VoIP operators who may host geographic numbers but would not incur per-number costs of a change. These costs are discussed separately.

[110] E.g. the area code.

(a) Proportionately more resources required for the physical changeover. In smaller, more rural areas, it is possible to extend a changeover over a number of weekends. Fewer teams are needed and the same few can update each of the exchanges consecutively. However, in such as large city as Dublin, the changeover would need to be done as quickly and smoothly as possible, requiring more teams to be positioned at exchanges and working simultaneously. More resources would need to be employed and trained.

(b) Proportionately more effort required to manage the change for large customers (e.g. office blocks, hospitals and government departments). Potential disruptions for large organisations arising from a number change are far more serious than for individual subscribers, and thus the number of such organisations involved in a change incurs costs independently of the amount of numbers that need to be changed.

(c) Proportionately more project management costs, relating to the increased number of operators involved in a Dublin number change and the complexity of the programme schedule. Additional resources and training would be required by eircom which could significantly increase the costs.

7.13 However, there would also be economies of scale associated with a Dublin number change as, for example, IT costs would not increase proportionally with the number of numbers that needed to be changed. Information from eircom suggests that these economies of scale would only just outweigh the additional costs incurred.

7.14 However, a significant factor influencing these costs is the nature of the number change. These costs refer to a change in number length from five to seven digits, arising from a change in STD code. A change in the Dublin subscriber number length to eight digits would represent an enormous change as the majority of exchanges and systems for all operators are currently only able to handle a maximum of seven subscriber digit numbers. To enable this change would require entire infrastructures to be replaced which would at least double the costs. As Option 1 involves a change to number length, we therefore estimate the cost per number to be just under €20.[111]

7.15 It should be noted that a future change in Dublin telephone number length (for example, as a result of increased demand) would not have such significant costs. At that time (anything from 10 years in the future) the current infrastructures would have expired and been replaced with new systems with capacity for longer numbers. The costs of a future change in our baseline scenario (i.e. a natural Dublin number change) would be estimated at €10 per number.

[111] It should be noted that changing the STD code from '01' to '013' would have the same effect in terms of avoiding the dialling clash with non-geographic numbers, but would mean that Dublin number remained seven digits long. This process would be much simpler and the cost incurred would be similar to those incurred in the previous number changes (e.g.€10 per number). However, changing the STD code is not considered as an option here as it would not increase capacity of the Dublin number resource, and the possibility of the need for another, future Dublin number change to accommodate increased demand for Dublin numbers would remain.

7.16 An exception to these costs for operators hosting geographic numbers would be VoIP providers. These use IT platforms to transfer calls over the internet and thus do not have infrastructure directly related to the numbers they host. Their costs would be restricted to updating their IT platforms and databases, estimated at approximately €5,000.[112]

7.17 Other telecommunications providers in Ireland who do not host geographic numbers would also incur costs of change to Dublin number length. These would include:

(a) Changes in billing systems to deal with new number length

(b) Reprogramming exchanges to route calls to the new numbers

7.18 Feedback from industry suggests these costs would not be significant, estimated at €10,000 per operator.

7.19 As an illustrative calculation, if a change took place in 2011, the total cost to telecommunications providers of a change to Dublin telephone numbers would be estimated at €105 million. (Given the lead time required for a number change, the actual date of a change would be 2014 if instigated in 2011. The costs of a change in 2014, accounting for growth in the Irish telephony market since 2011, are included in our model and shown in later tables). The breakdown is presented in the table below. For illustrative purposes, the costs of a change to the Dublin STD code (not an option here as explained above) is estimated at approximately €53 million due to significantly lower infrastructure costs on the part of eircom.

Table 7.1: Costs to operators of a Dublin number change undertaken in 2011

Operators	Average cost	Scale	Total (€000s)
Hosting geographic numbers (excl. VoIP)	€20 per number	5,273,300 numbers	105,234
VoIP	€5,000 per operator	4 operators	20
Others (non-hosts)	€10,000 per operator	8 operators	80
Total			**105,334**

Source: Industry feedback and Europe Economics analysis

Notes:1. Figures in all tables are rounded to the nearest whole number. 2. The number of VoIP operators likely to incur costs of a change is smaller than the number of active operators (12).

7.20 These costs would vary according to the date the change occurred. This is due to three factors — a change in the number of operators, a reduction in per-number costs if the change is after 2020, and higher discounting the further into the future the change is. If the change occurred in 2014, the present discounted value of the total costs would be approximately €95 million.

[112] Estimate from VoIP operator. It is estimated that approximately four VoIP operators would be the most affected by a number change.

7.21 In addition to incurring costs of a number change, operators would also suffer from any decline in call traffic to Dublin numbers arising from a change in numbers. We base our estimates of the fall in traffic to businesses on the results of our survey of Dublin businesses (an average of 5.1 per cent in the three months following the change), and assume a decline of one per cent for residential call traffic. Given the uncertainty of the decline in call volumes based on the limitations of the low response rate this lost revenue is represented as indicative.

7.22 Using these figures and the estimated revenue generated by operators from calls to Dublin numbers (€0.10 per minute), we estimate the indicative lost revenue to operators at approximately €7 million in the year following the change if the change occurred in 2011.

Table 7.2: Decline in operator revenues following a change in Dublin numbers undertaken in 2011

Volume of traffic	Decline in traffic in year after change (million minutes)	Associated revenue for operators (€/min)	Total lost revenue (€000s)
Businesses	60	0.10	6,127
Residential subscribers	9	0.10	924
Total	**69**		**7,051**

Note: the figures in this table assume a medium growth in the Irish telephone market

7.23 These costs would vary according to the date the change occurred. This is due to a change in the number of operators or numbers allocated and higher discounting the further into the future the change is. If the change occurred in 2014 (i.e. the likely date of a change if instigated in 2011), the present discounted value of the total costs to operators, including lost revenue, would be €99 million.

7.24 A final area of impact to communications providers (which we do not quantify) could result from the opening of international access to non-geographic numbers, which would be incurred regardless of the way in which this access is brought about. Feedback from industry indicated that there would be costs involved in opening up international access to currently restricted non-geographic numbers, in particular those related to inter-company revenue transfers and high risks of fraud and arbitrage. In many cases communications providers thought that for some number ranges in particular (PRS and even some shared cost) it would not be economically feasible for them to open access.

Businesses in Dublin

7.25 Businesses in Dublin using geographic numbers would be required to change their numbers. Feedback from businesses in Dublin from our survey and evidence from number changes in other jurisdictions indicates that the associated costs and inconvenience could be significant. These would include:

(a) Changes to advertising (e.g. signage, media advertising and vehicles).

(b) Marketing materials (e.g. leaflets and brochures).

(c) Other stationery.

(d) Informing business contacts of the change.

(e) Additional advertising or expenditure on specific promotional efforts to rebuild a brand associated with the number.

(f) Lost business resulting from reduced call traffic.

7.26 We examine first the first five points taken together as these relate to direct adjustment costs. We consider the potential for lost business revenue separately.

7.27 The cost estimates to businesses of adjusting to a number change are drawn primarily from data published from an Ofcom survey undertaken in 2006 of over 400 businesses.[113] Cost estimates were generated for the aspects of a number change listed in 7.25 above and broken down according to firm size. On average, small firms (1-9 employees) reported a cost of £1,467 of adjusting to a number change; medium sized businesses (10-249 employees) reported a cost of £4,926, and large firms (250+ employees) reported a cost of £20,143.[114] We updated these costs to take account of inflation[115] and exchange rate differences[116] to arrive at an average cost per firm size to use in our analysis.

7.28 Information on the costs of a number change was also gathered through our survey of Dublin businesses.[117] However, given the low response rate rely primarily on the Ofcom figures and use our survey results to provide background information to the likely scale of costs in the Dublin context. The results from our survey were largely in line with those from the Ofcom study, if somewhat higher, with the exception that firms from our survey with 10-249 employees reported a significantly higher level of costs compared to similar firms in the Ofcom study; the figures used in our estimates may thus represent an underestimate of costs incurred by this firm size, although this is difficult to verify given the low representativeness of our results.

7.29 Our survey results and interviews provided some interesting qualitative information. Feedback from a marketing company indicated that that the branding associated with telephone numbers would be less relevant today than in the past given the increasing importance of the internet. Companies nowadays tend to use their website as their main point of contact as this can be directly related to their business name and far easier to remember than a number. This was confirmed through the survey results, where the

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113 Ofcom Numbering Review, February 2006. The figures relate to a number change undertaken in 2000.
114 A table of the results of the Ofcom study adjusted for inflation and exchange rates is included in the Appendix.
115 Average of 2.7 per cent over the period 2000 to 2011
116 Average of 1.167 over the period 2000 to 2011
117 Please see the Appendix for the survey results

smallest range of costs identified related to the expenditure necessary to rebuild a brand associated with the number.

7.30 Another issue highlighted was the fact that in the event of a number change all past marketing material that had been distributed over time to a wide range of potential customers (e.g. promotional stationery) would be out of date. As it would not be possible to redistribute such material to all past contacts this would represent a more intangible cost of lost advertising. The impact would be compounded in relation to international customers and business contacts who may not be aware of the number change in Dublin. Informing such customers may not be possible,[118] and the result could be a decline in trade as the customers might assume the business had closed. This was highlighted as a particular problem by a charity responding to our survey, for which income from overseas donors was important.

7.31 It was noted in our survey feedback that the additional printing costs of a number change could decline depending on the amount of time the business has to adjust to the change. If the change coincided with the general printing cycle of the business (for example, a year) then the new number could be incorporated in the existing publishing and printing costs.

7.32 However, the respondent did note that this could take anywhere from one to five years, which may not be a realistic overlap period. Furthermore, in order to slowly phase in the new number both the new and old numbers would need to be accessible for the duration of this process,[119] so that the new number was not published before it had come into operation. It has also been noted by ComReg that in other number changes businesses often do not begin adjusting to the number change until relatively late in the day, typically when such a parallel period of running old and new numbers is about to end.

7.33 Using estimates from the Ofcom study and an approximate breakdown of business size in Dublin[120] we estimate the total cost to Dublin businesses of adjusting to a number change to be €149 million if undertaken in 2011.

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[118] Recorded announcements would redirect those who understand English to the new number but only for a limited period and even some of those would not proceed to ring a second number.

[119] ComReg generally works on the basis of a 6 months to 1-year parallel running period, followed by a period (3-12 months typically) of recorded announcements, which will ensure most calls can be completed during that period.

[120] Information on the number and size of Dublin businesses is taken from the records of Bill Moss marketing group.

Table 7.3: Direct costs to Dublin businesses of a number change undertaken in 2011

Business size	Average cost per business	Number of businesses	Cost of change (€000s)
1-9	€2,293	27,177	€62,317
10-249	€7,699	8,998	€69,276
250+	€31,482	551	€17,347
Total		*36,726*	
Total			**€148,939**

Lost revenue

7.34 In addition to the direct costs arising from a number change, it is possible that businesses would also suffer a fall in call traffic which could have a corresponding impact on their turnover. Both the Ofcom study and our survey results highlighted a decline in revenue associated with a number change. Of respondents to our survey, 50 per cent expected a reduction in call volumes, with an average of around five per cent fall in the three months following the change. Loss of revenue estimates ranged from less than one per cent, to more than 10 per cent of annual turnover.

7.35 Given the limitations of our low response rate, we base our estimates of lost business on the Ofcom results. Using these estimates of lost revenue per business, and the anticipated reduction in call traffic from our survey, we estimate per-minute value of call traffic of €0.68, which equates to a decline in revenue following the number change of approximately €40 million using 2011 prices.[121]

7.36 Although it is clear that some loss to businesses would arise from a number change, the value of this lost revenue is treated separately to direct adjustment costs given some uncertainty involved in the estimation. The very wide variation between the results of the Ofcom and our surveys suggests that the value of business lost could be higher in the case of a Dublin number change. On the other hand, the Ofcom figures may be an overestimate as they were taken from a time when the Internet was of arguably less importance. Nowadays, the Internet (e.g. email, search engines and websites) can provide instant availability of up to date contact information for the majority of businesses and the damaging effects of a number change may not be as significant as in the past.

[121] Using the results of our survey to estimate the lost revenue related to a number change we obtain a far higher figure. The per minute revenue associated with fixed Dublin incoming traffic was €24.02, which corresponds to a total lost revenue of around €1.4 billion using 2011 prices.

Residential subscribers in Dublin

7.37 Residential subscribers in Dublin would also incur costs of a number change, although these would be less than those incurred by businesses. Whilst we did not include residents within our primary data gathering, results from other studies on number changes provide useful information on the impacts on residential subscribers.

7.38 Impacts of a number change include the time required to notify all contacts of the change, as well as more intangible impacts such as annoyance and stress. A study conducted by NERA on number changes in Hong Kong included a survey of residential subscribers.[122] The average cost quoted by respondents (updated for inflation and exchange rate) was approximately €13. Other studies have also attempted to estimate costs to residential subscribers: consumers surveyed for the Ofcom report were asked both the amount they would be willing to pay to avoid a number change, and the amount they would accept from their telephone provider as a one-off payment in return for having to change their number. Given the wide range in these figures (£6 and £600 respectively) and the indirect nature of the questions, we use the figure from the NERA report in our model, which gives a cost to residential subscribers of approximately €13 million if the change were undertaken in 2011.[123]

Table 7.4: Cost to Dublin residential subscribers of a Dublin number change undertaken in 2011

Number of residents with fixed lines	1,010,129
Cost per resident	€13
Total (€000s)	**13,132**

Callers to Dublin numbers

7.39 Callers within Dublin, Ireland and the rest of the world would incur a small adjustment cost arising from the change in numbers. This would include updating telephone records and the occasions of misdialling the number. We assume that each caller will experience a small adjustment cost of €5 for the duration of the adjustment period.

7.40 The table below shows the current number of callers and the adjustment cost these would incur. Note that these costs will change depending on the growth rates assumed in our final model. Using 2011 figures, the adjustment cost to callers is just over €22 million.

[122] NERA/Smith (1998) 'Feasibility study & cost benefit analysis of number portability for mobile services in Hong Kong' http://www.ofta.gov.hk/en/report/mnp-fin.pdf

[123] We note that if we use the figures from the Ofcom report, these costs range from €6 million to €770 million.

Table 7.5: Adjustment costs to callers of Dublin numbers of a change undertaken in 2011

Caller type	Number of callers	Adjustment cost	Total costs (€000s)
Dublin callers	1,270,603	€5	6,353
Irish callers	2,648,533	€5	13,243
International callers	496,638	€5	2,483
Total	**4,415,744**		**22,079**

Note: We assume that 80% of the Irish population will call a Dublin number, and that 0.01% of the EU population will call a Dublin number

Burden on ComReg

7.41 The final area of impact of a Dublin number change would be on ComReg. This would entail the management and publicising of the number change, fielding consumer enquiries and complaints and liaising with other regulatory functions such as updating telephone directories. However, feedback from ComReg indicates that a number change is part of its regulatory remit, and all efforts would be absorbed into the day to day operation of the regulator. No additional resources would be employed.

Summary of costs

7.42 The table below presents a summary of the costs of a Dublin number change to various stakeholders if the change were undertaken in 2011. We illustrate the range in costs depending in the inclusion of estimates of lost business revenue arising from a number change. The costs without considering lost business are still substantial, at approximately €300 million.

Table 7.6: Summary of costs of a Dublin number change if undertaken in 2011

Stakeholder	Cost (€000s)
Operators	112,385
Dublin businesses, of which	
Adjustment costs	*148,939*
Costs of lost business	*40,506*
Dublin residential subscribers	13,132
Callers to Dublin numbers	22,079
Total excluding lost business costs	**296,535**
Total including lost business costs	**337,041**

Note: figures in all tables are rounded to the nearest whole number

Comparison to baseline costs

7.43 The evolution of demand for numbers in Dublin may require a Dublin number change in the future. This number change would entail the same process described above — the move to eight digit numbers would create the excess capacity needed to meet all future demand.

7.44 The timing of a possible natural Dublin number change is unknown, given uncertainties in the evolution of demand for Dublin numbers and the ability of ComReg to manage this demand. We estimate that such a change may be required in 2021 with 'high demand for numbers'; 2033 with 'medium demand for numbers' or 2056 with 'low demand for numbers'.

7.45 The costs of a future change would be similar, although would be adjusted for growth rates in the telephone market (e.g. number of callers; number of operators; number of businesses etc). These costs would all be attributed to the need for more Dublin numbers and would not be associated with the issue of access to non-geographic numbers. A key difference would be the costs to operators of changing numbers. Given the ability of newer infrastructure to handle the increase in number length to eight digits, such costs would be approximately half of what they would be should the change occur in the next few years.

7.46 Costs in the future are discounted to take into account that fact that society places greater value on money spent or earned today than the future. This discounted figure is the net present value.

7.47 The tables below shows the total costs of changing Dublin numbers in four different years, the first table excluding the lost revenue incurred by Dublin businesses and the second table including this. The first row (2014) represents the year the change would take place if proceedings were instigated immediately.[124] The next three rows correspond to a number change at varying dates in the future. All scenarios assume a medium level of growth in the Irish telephone market (i.e. based on past trends).[125]

Table 7.7: Costs of a Dublin number changes at varying points in time, PV, excluding costs of lost business

Year of number change	Total cost to operators (€000s)	Total cost to businesses (€000s)	Total cost to residential subscribers (€000s)	Total cost to callers (€000s)	Total (€000s)
2014	99,803	167,126	12,731	20,681	300,341
2021	39,684	146,878	11,188	17,747	215,497
2033	25,417	117,709	8,966	13,670	165,762
2056	11,361	77,006	5,866	8,327	102,560

Note: the figures in this table assume a medium growth in the Irish telephone market

[124] This assumes a lead time of three years to complete a number change process, as recommended by ComReg

[125] These costs also represent the use of the midpoint figure for the cost to Dublin residential subscribers

Table 7.8: Costs of a Dublin number changes at varying points in time, PV, including costs of lost business

Year of number change	Total cost to operators (€000s)	Total cost to businesses (€000s)	Total cost to residential subscribers (€000s)	Total cost to callers (€000s)	Total (€000s)
2014	99,803	194,665	12,731	20,681	327,880
2021	39,684	160,078	11,188	17,747	228,697
2033	25,417	121,451	8,966	13,670	169,504
2056	11,361	77,340	5,866	8,327	102,894

Note: the figures in this table assume a medium growth in the Irish telephone market.
Estimates of lost business are those based on the Ofcom study

Option 2: Change Non-geographic Numbers

Description of option

7.48 This option would entail changing all translated non-geographic numbers with lead digit '1' so that they would be made internationally accessible. These ranges are those presented in Table 3.3 and repeated in here for convenience.

7.49 Some non-geographic numbers within these ranges are unlikely to be dialled from abroad, such as internet dial-up. Others will not currently result in a clash with Dublin numbers if dialled from abroad due to historical reservation of the number ranges.[126] Furthermore, in reality access to some numbers is likely to remain restricted by communications providers (such as PRS numbers, as discussed earlier). However, all non-geographic numbers in this table would be changed to avoid the confusion that may arise from having some non-geographic numbers still in the form +353.1 when dialled from abroad.[127]

[126] I.e. no Dublin numbers have to date been allocated to these ranges.
[127] The option of changing only those non-geographic numbers where a clash with Dublin numbers currently occurs is described earlier under the Hybrid Number Change option.

Table 7.9: Non-geographic numbers that would be made internationally accessible

Ref.	Specific Non-geographic Range		Clash with Dublin sub-range
1	1520, 1530, 1540, 1550, 1560, 1570, 1580, 1590	Premium Rate Services (PRS): Per-minute charge	Corresponding 01-5 numbers reserved: no current clash
2	1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519	PRS: Per-call charge	01-51X XXXX range allocated by nine operators: clash
3	1598, 1599	PRS: Adult Services	Clash
4	1800	Freephone	01-800 range reserved: no current clash
5	1850, 1890	Shared cost	01-850 and 01-890 range allocated by eircom: clash
6	1891, 1892, 1893	Internet dial-up	01-89 range allocated by eircom: clash
13*	190X, 191X	Operator service codes	Range includes eircom-related network functions: clash

Note. Whilst we have assumed that de facto cross border access to Irish PRS numbers would not increase following a technical opening up of access, these PRS numbers would still be included in the non-geographic number change.

7.50 A change to these non-geographic numbers might entail the use of the '7' lead digit number range, so that the non-geographic numbers would begin with '7' instead of '1'. An example would be the number **1890 123 123** which could change to **7890 123 123**.

7.51 The billing arrangements associated with the current prefix codes would be transferred to the new codes (i.e. in this case 7890 would represent the same billing arrangements as 1890).

7.52 The implementation of the number change would span approximately three years to enable ComReg and all other affected parties to undertake the work required.

7.53 Given the current number of non-geographic numbers in these ranges allocated to communication providers, this option would affect 2.5 million allocated numbers.[128] As with geographic numbers, the number of non-geographic numbers actually in use by subscribers is much smaller (92,453). However, operators involved in a number change would be required to change all numbers allocated to them, regardless of whether these are in use.

[128] Based on ComReg 2008 audit of allocated non-geographic numbers. The figure only includes those non-geographic numbers beginning with lead digit '1'.

Impacts and costs

7.54 The range of stakeholders that would be affected by a change to non-geographic numbers would be similar to that affected by a Dublin number change, with a few key differences.

Telecommunications providers

7.55 As with a Dublin number change, the telecommunications providers most affected by a change to non-geographic numbers would be the operators hosting these numbers. Costs incurred would include capital and operational IT expenditure, project management costs, and marketing costs.[129]

7.56 Additional costs highlighted by industry would be changes to billing systems and pricing structures to take account of the new number ranges. This could be relatively involved given the different pricing structures across the non-geographic numbers. However, this would be similar to the usual process of updating pricing (for example with the introduction of a new product, which can occur frequently) and thus should not result in significant incremental costs compared with a change in Dublin numbers.

7.57 An area of increased costs related to a non-geographic number change would be project management costs. With a geographic numbering change, operators have existing project plans that are used each time. However, a change to non-geographic numbers has never taken place in Ireland, and thus the process would need to be developed from scratch. This might be expected to increase project management costs by at least half.[130]

7.58 In addition, the physical process of changing the non-geographic numbers would be more complex than that of a Dublin number change as non-geographic numbers are not set out in contiguous ranges. Thus the economies of scale that might be achieved in a geographic number change would not exist with a non-geographic change, and changes would need to be made to a number of separate number blocks.

7.59 On the other hand, the scale of physical effort required to change the numbers would not be as significant as for a Dublin number change and thus the costs would be proportionately less.

7.60 Feedback from industry suggests that these cost differentials would most likely cancel each other out and that the cost per number of a non-geographic number change would be similar to those of a geographic number change. Because the number length would not be changing, the lower cost would apply here: approximately €10 per number.

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[129] Please note that the costs of a number change for telecoms operators are related to all numbers allocated to operatorsby ComReg, regardless of whether they are used by subscribers. Although only approximately 92,000 non-geographic numbers beginning with 1 are in use by subscribers, the total number of these numbers allocated to operators is approximately 2.5 million, as shown in Table 7.10.

[130] Based on feedback from eircom.

7.61 Feedback from industry suggests that costs to VoIP service providers would be even less than those associated with a Dublin number change, estimated at €3,000 per provider.[131]

7.62 Other telecommunications providers in Ireland who do not host non-geographic numbers would also incur costs of change to these numbers. These would include changes in billing systems to deal with new codes.

7.63 Feedback from industry suggests these costs would not be significant, estimated at €5,000 per operator.[132]

7.64 Table 7.10 presents the costs to operators of a non-geographic number change if this was undertaken in 2011. This is estimated at approximately €25 million.

Table 7.10: Costs to operators of a non-geographic number change undertaken in 2011

Operators	Average cost	Scale	Total (€000s)
Hosting geographic numbers (excl. VoIP)	€10 per number	2,521,083	25,155
VoIP	€3,000 per operator	4	12
Others (non-hosts)	€10,000 per operator	8	80
Total			**€25,247**

Source: Industry feedback and Europe Economics analysis

7.65 In addition to the costs involved in a number change, communications providers would also be affected by any decline in call traffic to Irish non-geographic numbers resulting from the number change. This would be particularly the case with a fall in traffic to PRS numbers, where higher revenues are generated for communications providers than through shared cost or Freephone numbers.

7.66 We base our estimates of the fall in traffic to businesses using non-geographic numbers on the results of our survey (an average of approximately five per cent in the three months following the change).[133]

7.67 Using these figures and the estimated revenue generated by operators from calls to non-geographic numbers (both PRS and non-PRS numbers)[134] we estimate the lost revenue to operators to be approximately €5 million in the year following the change (assuming medium growth in call volumes).

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131 Information from VoIP operator

132 Please note this figure may be an under-estimate as the respondent was not certain if these costs would apply to other operators.

133 We did not receive survey responses from businesses using PRS numbers and so assume that the decline in call traffic accruing to PRS numbers would be the same as that accruing to non-PRS numbers.

134 We estimate this revenue figure using a weighted average of the call charges levied by operators to callers and businesses for PRS and non-PRS numbers.

Table 7.11: Decline in operator revenues following a change in non-geographic numbers undertaken in 2011

Volume of traffic	Decline in traffic in year following change (million minutes)	Associated revenue for operators (€/min)	Total lost revenue (€000s)
Non-PRS	12.39	0.18	2,181
PRS	3.39	0.95	3,231
Total for operators	15.78		**5,412**

7.68 As mentioned in the costs of a Dublin number change, a final area of impact to communications providers could result from the opening of international access to non-geographic numbers, which would be incurred regardless of the way in which this access is brought about. Feedback from industry indicated that there would be costs involved in opening up international access to currently restricted non-geographic numbers, in particular those related to inter-company revenue transfers and high risks of fraud and arbitrage. In many cases communications providers thought that for some number ranges in particular (PRS and even some shared cost) it would not be economically feasible for them to open access.

Businesses using non-geographic numbers

7.69 The impacts on businesses using non-geographic numbers are likely to vary according to the type of non-geographic number that is used. There are three main types of non-geographic numbers used by businesses, that are relevant to the change:

(a) Freephone numbers (1800), such as government and industry help lines.

(b) Shared cost numbers (1850/1890), such as customer services for a range of companies (such as banks, insurance companies, IT firms); sales and information services (e.g. cinema and theatre tickets or car parking); and media and entertainment (e.g. radio stations;).

(c) Premium rate services (1500), for example, the provision of news, weather or financial information; adult content, or gaming and competitions.

7.70 Our survey of businesses using non-geographic numbers provides information on the adjustment costs incurred through a number change. Businesses responding made use of both Freephone and shared cost numbers. No responses were received from businesses using premium rate numbers.

7.71 The direct costs resulting from a number change appear to be broadly similar to those incurred by businesses in Dublin undergoing a geographic number change. Costs areas include:

(a) Changes to advertising (e.g. signage, media advertising and vehicles).

(b) Marketing materials (e.g. leaflets and brochures).

(c) Other stationery.

(d) Informing business contacts of the change.

(e) Additional advertising or expenditure on specific promotional efforts to rebuild a brand associated with the number.

(f) Lost business resulting from reduced call traffic.

7.72 Given the limitations of low response rate (although the response rate for this survey was larger than the survey of Dublin businesses — 26 compared with 14) we again base our adjustment cost estimates on the Ofcom study.

7.73 We do, however, make a consideration for the costs involved in rebuilding a brand associated with a non-geographic number. Nearly all respondents attached value to the particular non-geographic number they used,[135] and the average costs associated with rebuilding the brand were the highest of all the cost categories (an average of €33,000 per firm). Given the fact that the Ofcom results do not consider this effect and are not related to firms using non-geographic numbers, we apply a small uplift to the Ofcom figures. We also make an adjustment for firm size. In our survey sample there are firms with high employee numbers (e.g. in the thousands) which anticipated correspondingly higher adjustment costs. We consider it reasonable to assume that firms using non-geographic numbers, which are very often customer support or sales numbers, are likely to be larger than usual. When estimating the average costs to businesses, we therefore include an additional firm size category (>1,000) to the Ofcom results, and assign an average cost of a change of €300,000 to this.[136]

7.74 Using an approximate breakdown of non-geographic business size[137] we estimate the adjustment cost to businesses using non-geographic numbers to be €300 million if the change occurred in 2011.

[135] 54% said they had built their brand around the number and 65% said their number was particularly easy to remember

[136] The number of firms within this range is estimated at approximately 300, a conservative estimate based on information from the Bill Moss database of businesses.

[137] As suggested by Bill Moss marketing.

Table 7.12: Direct costs to businesses using non-geographic numbers of a number change undertaken in 2011

Business size	Average cost per business	Number of businesses	Cost of change (€000s)
1-9	€2,293	16,886	38,720
10-249	€11,548	7,599	87,751
250-1000	€31,482	3,377	106,319
>1,000	€300,000	281	84,431
Total		**28,144**	**317,220**

Lost revenue

7.75 In addition to direct costs of a number change, it is also possible that businesses would suffer a decline in call traffic if their non-geographic number was changed, which could have a negative impact on their business. In our survey 42 per cent of respondents expected a decline in call traffic following a number change (with an average decline of five per cent across respondents), and 39 per cent anticipated an associated fall in revenue (with an average fall in turnover of approximately four per cent across respondents).

7.76 Again, our survey results on the decline in call traffic and associated revenue cannot be considered representative due to the low response rate. Using figures from the 2006 Ofcom study of lost revenue arising from a number change, in conjunction with our assumptions regarding the distribution of businesses using non-geographic numbers, we estimate a 2011 cost of €170 million in the form of lost revenue.[138]

Callers to non-geographic numbers

7.77 Callers within Dublin and Ireland would incur a small adjustment cost arising from the change in non-geographic numbers. This would include updating their telephone records and the occasions of misdialling the number. We assume that each caller will experience a small adjustment cost of €5 for the duration of the adjustment period.

7.78 The table below shows the current number of callers and the adjustment cost these would incur. Note that these costs will change depending on the growth rates assumed in our final model. Using 2010 figures, the adjustment cost to callers is just over €20 million.

[138] Using the results of our survey on the revenue associated per minute of non-PRS call traffic (average of €75.35)gives a value of lost revenue of approximately €934 million using 2011 prices.

Table 7.13: Adjustment costs to callers of non-geographic numbers of a number change undertaken in 2011

Caller type	Number of callers	Adjustment cost	Total costs (000s)
Dublin callers	1,087,174	€5	€5,436
Irish callers	2,933,895	€5	€14,669
Total			**€20,105**

Note: We assume that 90% of the Irish and Dublin population will call a non-geographic number.

7.79 In addition to the adjustment costs associated with dialling a new number, callers may also suffer more indirect costs related to confusion over billing arrangements with the new non-geographic numbers. This may lead to consumers being overcharged for calls made to the new non-geographic numbers

Burden on ComReg

7.80 The regulatory burden of a non-geographic number change for ComReg is likely to be similar to that of a Dublin number change. The smaller scale of a non-geographic number change would be offset by the fact that such a change has never been undertaken before.

Summary of the costs of a non-geographic number change

7.81 The table below summarises the costs of Option 2 if it were undertaken in 201. Given the degree of uncertainty surrounding the value of lost business revenue arising from a number change, total costs are shown both inclusive and exclusive of lost revenue. The total adjustment cost, including lost revenue, is €538 million.

Table 7.14: Summary of the costs of a non-geographic number change undertaken in 2011

Stakeholder	Cost (€000s)
Operators	30659
Businesses using non-geographic numbers , of which	
Adjustment costs	317,220
Costs of lost business	169,703
Callers to non-geographic numbers	20,105
Total excluding costs of lost business	367,984
Total including costs of lost business	537,687

Note: figures in this table assume a medium growth in the Irish telephone market. Estimates of lost business revenue are estimated using Ofcom results rather than relying solely on our survey results.

7.82 The present value of these costs will decline the further into the future they are incurred. Thus, the costs of a number change undertaken in 2014 (the likely date given the required lead time) will range between €359 million to €499 million depending on the inclusion or not of lost business revenue.

Option 4: Require Full Number Analysis by Irish International Gateways

7.83 This option would not involve a number change. Instead, fundamental changes to routeing analysis in all international gateway switches in Ireland would be required. This would allow the gateways to analyse incoming calls to a sufficient level so as to recognise whether the number was a Dublin number, or a non-geographic number, and transfer it accordingly without resulting in a clash. This option would also be likely to have an impact on foreign operators transferring calls into Ireland.

7.84 We have explored the feasibility of this option through discussions with a number of Irish operators, as well as a UK-based operator for a view on how this option could affect operators abroad.

Transferring international calls

7.85 International gateways are used to interconnect the public switched voice networks in one country with corresponding networks in other countries.

7.86 Every operator handling (sending and/or receiving) international calls will require at least one international gateway, although it is much more likely that they will require at least two for reasons of resilience. Smaller operators, not able to justify their own gateways, might simply direct international traffic to an intermediary operator in the same country for onward transmission to other countries.[139]

7.87 The originating operator will know to route calls to the international gateway within its country when the dialled digits commence with "00", signifying an international call.

7.88 Once identified as an international call, additional dialled digits will be examined to determine how to route the call, and how much to bill for the call. This analysis could be thought of as comparing the dialled digits with a list of routing "rules" (also referred to as the dial plan — see Appendix for a more detailed description), with the intention being to route the call in the most advantageous way for the originating operator, taking account of things such as:

(a) agreements in place with operators in other countries;

(b) time of day and/or day of week;

(c) amount of traffic already being carried on specified routes (to avoid congestion);

(d) cost of each available route.

[139] Feedback from interviews with operators suggests there may be at least 23 international gateway exchanges in Ireland owned by the various operators.

7.89 With regards to billing arrangements, different operators will often take different approaches. Much is likely to depend on the amount of traffic an individual originating operator is sending to a specific country and the general nature of that traffic. Where the amount of traffic being carried is small and/or the differences in terminating charges faced by the originating operator are not that great, an operator might adopt a blended charge rate for all calls to a particular country (or more likely one blended rate for all calls to fixed geographic numbers and another for all calls to mobile numbers). Therefore the same charge would be levied to callers regardless of what the final terminating charge might be.

7.90 However, where the traffic flows to a particular country are significant to the originating operator, or where the terminating charges the operator faces can vary significantly, then the use of a simple blended rate might open the originating operator up to falling foul of arbitrage opportunities (i.e. they might suffer losses from being charged high termination rates on a large volume of calls, for which they are unable to recoup cost from callers). Where this is the case, the originating operator could either de-average the tariffs to make them much more specific to the costs incurred, or they could decide to simply block unfavourable number ranges.

7.91 'De-averaging' the charges would require the originating operator to undertake further analysis of the number to determine the correct billing. This is a more complex procedure. For some number ranges rules for such analysis may already exist (e.g. if the operator knows that *all* numbers beginning with a certain code are premium rate he can assign a certain charge to all these numbers). However, if there is any possible overlap or confusion (for example, if a number beginning 159X could either be a local geographic number or a premium rate number, as is currently the case with some Dublin and non-geographic numbers) then it is unlikely the operators will undertake the more detailed analysis required and/or risk charging the wrong rate to the caller. Such number ranges may therefore be blocked outright.

Distinguishing between Dublin and non-geographic numbers

7.92 Dialplans allow for a sophisticated set of rules to be defined, such that from a purely technical perspective it would be feasible for both the originating operator and the international gateway(s) to differentiate between a Dublin number and a non-geographic number. This would avoid the potential clash with Dublin numbers and resolve the billing difficulties described above. This could be performed either by looking at the complete number or, more realistically, by analysing specified digits at the start of the number and then considering the number length.

7.93 Taking account of a complete called number would be completely impractical for all but the final terminating exchange as it would, by definition, require that the exchange gateway had access to an up to date list of all possible numbers that could be called. Thus the only viable alternative would be the second one of analysing a few digits at the start of the number and then forming a decision based on the overall length of the number.

7.94 For example, a Dublin called number range (after stripping out the country code digits) could be categorised as starting with the digits 1890, and having a length of eight digits (one for the area code plus seven for the number itself), whereas a non-geographic called number range could start with 1890 and have a length of ten digits (four for the non-geographic code plus six for the number itself).

7.95 For the initial switch of the originating operator, the principal challenge associated with the second alternative would be in deciding when the switch had received all of the dialled digits from the caller. This would have to be done on the basis of a timeout — beyond which the switch concludes that no further digits are forthcoming.

7.96 The existence of this timeout would result in a significant delay for affected calls (only calls matching rules in the dialplan that include a timeout would be affected) prior to call completion, as the likely value of the timeout would be a number of seconds. Whether this would result in an acceptable level of user experience is perhaps debateable, although if it is only a few seconds the caller might not mind or indeed notice. However, if there is a perceptible period of silence, then the caller might be liable to think they have misdialled and perhaps hang up and redial.

7.97 We would point out that it is only the initial switch that has to have such a timeout function included in the dialplan. Subsequent switches, including any international gateways, will receive the complete called number as part of the SS7 signalling information.

7.98 If, with the intention of keeping this period of silence as acceptable as possible, the timeout is kept short, then the likelihood of a call meant for a non-geographic number being connected to a Dublin number might become significant, as the Dublin number would be shorter in length than the non-geographic number. Even worse, it would probably result in a sub- set of Dublin numbers receiving most of the incorrect calls — itself likely to result in significant inconvenience to the owners of the Dublin numbers and a considerable number of complaints being raised with ComReg.

Summary of Issues and concluding remarks

7.99 The option of requiring international gateways and foreign operators to undertake detailed analysis of numbers to avoid a clash between Dublin and non-geographic numbers option is feasible, from a technical standpoint.[140] However, there exist a number of significant administrative-based issues. In particular:

(a) Whereas ComReg has a degree of leverage on Irish based operators that could be used to encourage/enforce the adoption of this option, the same cannot be said with regard to operators in other countries who would be responsible for originating the calls and undertaking the initial analysis.

[140] This refers to the use of dialplans to examine the first few digits of the number and then number length. The option for gateways and operators to analyse the entire number is not considered feasible.

(b) Operators are used to making changes to their dialplans on a regular basis, and it is likely that basic/frequent changes are delegated to the relevant technical staff to implement without senior management involvement. However, a request/need to implement a major change — potentially involving an analysis of all "Dublin based" calls to see which ones are actually meant for non-geographic termination — could well be outside the scope of what the technical staff are pre-authorised to do. This could give rise to significant delays in the implementation of the necessary changes and might even result in senior management deciding to effectively bar certain number ranges.

(c) It is not just operators in one foreign country that would need to implement the changes, or even just the incumbent operator in each country. Every operator in every country would need to consider the impact of the requirement, form a decision on the necessary changes that have to be made, plan for those changes and finally implement them. Where operators form the opinion that the changes are somewhat bizarre, then they will probably be in no hurry to implement them and might well put in place call barring in the meantime. This would affect both the non-geographic and, more importantly, the Dublin numbers

7.100 We are of the opinion that, whilst technically possible, this option would prove to be administratively impossible to implement as it would run a significant risk of foreign operators blocking significant portions of the Dublin number range due to the complexity of implementing the option plus the fear of falling foul to arbitrage opportunities if they got it wrong.

8 SUMMARY OF COSTS AND BENEFITS AND CONCLUSIONS

8.1 In this section we draw together the costs and benefits presented above and reach our conclusions of the economic feasibility of enabling international access to Irish non-geographic numbers.

Benefits

8.2 The benefits of enabling international access to non-geographic numbers will arise regardless of the way in which this is done. Benefits could accrue to Irish businesses through increased call traffic and the resulting impact this would have on their revenues; international consumers through the additional benefit they gain from access to the services over and above what they pay for them; and Irish communications providers through revenues from increased call volumes. From a broader EU perspective, there would be some offsetting losses to businesses outside Ireland from which sales were diverted. We believe that foreign operators will not consider it economically feasible to enable access to PRS numbers due to complex billing arrangements and the risk of fraud and abuse, and we see no early prospect of this situation changing. Benefits to Irish businesses will thus only accrue to those using non-PRS numbers.

8.3 We have estimated the benefits both using information from the Ofcom study of businesses undergoing a number change, and using only information from our survey, to arrive at two different estimates. The low response rate of our survey leads us to consider the estimates using Ofcom figures more robust. However, these too should be treated with caution as we are obliged to use part of our survey results for the percentage change in call traffic arising from an opening of access to non-geographic numbers. Only two respondents to our survey suggested that international access to their non-geographic numbers would increase their revenue, and of these one is currently considering moving to an already accessible number.[141] This suggests that the additional benefit of enabling international access to currently inaccessible non-geographic numbers is likely to be negligible

8.4 Furthermore, a substantial amount of other evidence suggests that the demand for non-geographic numbers from international callers is low, and unlikely to grow even if such numbers were accessible. We therefore consider the estimated benefits an upper bound, and believe that a middle to lower point in the range a more realistic representation of the likely benefits.

8.5 An essential aspect of a cost benefit analysis of policy options is the consideration of the counterfactual: in this case the evolution of the Irish telephone market in the absence of any policy to immediately open access to non-geographic numbers. This ensures that only the benefits attributable to the policy are taken into account.

[141] Excluding this respondent's feedback makes the estimated increase in revenue negligible.

8.6 A Dublin number change in the future arising from an expiry of Dublin number capacity would solve the problem of a clash between non-geographic numbers and Dublin numbers when dialled from abroad, and thus international access could be opened. Therefore, the *additional* benefits of opening access now (in 2014) would only last until such time as a future Dublin number change. This will depend most importantly the date of the future change, which depends on the future evolution of demand for Dublin numbers.

8.7 We therefore present the benefits under three scenarios — an eventual Dublin number change in 2021, 2033 and 2056.[142] Given the uncertainty surrounding the estimation of the benefits we consider a wide range, from negligible to approximately €190 million in the highest scenario.[143] The Table below presents the maximum benefits under each scenario.

Table 8.1: Benefits associated with opening international access to Irish non-geographic numbers, Present Value.

Counterfactual Dublin number change	Benefits (€000s) (PV)
High demand for numbers (change in 2021)	0 – 77,718
Medium demand for numbers (change in 2033)	0 – 148,820
Low demand (change in 2056)	0 – 193,379

Note: we assume medium growth of the Irish telephone market

Costs

Option 1 — change in Dublin numbers

8.8 The costs of Option 1 are presented in comparison with the baseline scenario, as a change in Dublin numbers now will result in a cost saving of avoiding a future number change.

8.9 Changing costs to Dublin numbers in order to enable international access to non-geographic numbers will result in costs to communications providers (from making the number change and through declining call traffic following the change); businesses in Dublin (adjusting to the change and through lost revenue resulting from declining call traffic); residential subscribers (costs and inconvenience from the change); and other callers in Dublin, Ireland and the rest of the EU.

8.10 We present these costs both including and excluding estimates for lost revenue. We consider that costs including an estimate of lost business revenue are a fairer

[142] The additional benefits are smaller the sooner the natural change in Dublin numbers takes place as there is less time for the benefits resulting from ComReg's specific policies to accrue.

[143] This takes into account the likely diversion of trade from other EU businesses.

representation of the cost of the Option, despite some level of uncertainty in estimating the value of this lost business.

Table 8.2: Costs of change in Dublin numbers in 2014 to enable international access to Irish non-geographic numbers, Present Value.

Counterfactual Dublin number change	Costs of Option 1 (€000s) (PV) including lost business revenue	Costs of Option 1 (€000s) (PV) excluding lost business revenue
High demand for numbers (change in 2021)	99,183	84,844
Medium demand for numbers (change in 2033)	158,376	134,578
Low demand (change in 2056)	224,987	197,781

Note: we assume medium growth of the Irish telephone market

Estimates incorporate Ofcom results and are not based solely on our survey

Option 2 — change to non-geographic numbers

8.11 In comparison to the benefits, the costs of Option 2 are also significantly higher. Changing non-geographic numbers in order to enable international access to non-geographic numbers will result in costs to communications providers (from making the number change and through declining call traffic following the change); Irish businesses using non-geographic numbers (adjusting to the change, including rebuilding brands associated with the number, and through lost revenue resulting from declining call traffic); and callers of non-geographic numbers.

8.12 Costs are presented in the table below, again both including and excluding lost business revenues arising from the number change. As the costs of Option 2 are not affected by a natural change in Dublin numbers, these will be the same regardless of the demand scenarios.[144]

Table 8.3: Costs of a change in non-geographic numbers in 2014 to enable international access to Irish non-geographic numbers, Present Value.

Cost of Option 2 (€000s) (PV) including lost business revenues	Cost of Option 2 (€000s) (PV) excluding lost business revenues
499,144	358,709

Note: we assume medium growth of the Irish telephone market

Estimates incorporate Ofcom results and are not based solely on our survey

[144] Similarly, as the costs of a non-geographic number change do not include any saving against a future Dublin number change, they are higher than the costs of Option 1 when compared against the baseline.

Other concerns with international access

8.13 Whilst other Member States are unlikely to be similarly affected given the absence of a clash between their non-geographic and local numbers in this instance, similar problems relating to the possible use of other non-geographic numbers were highlighted by a number of the national regulatory authorities in the EC's consultation process on creating an EU-wide short numbering range space (e.g. 115XXX). Respondents referred to "unforeseeable consequences" and "considerable confusion" resulting from a clash in numbering between their local numbers and the proposed EU-wide short numbering space. Respondents asked that any such action on the part of the EU must be carefully considered, lest it leads to complications for national development. These potential clashes with already established national operations are easily comparable to Ireland's, whose entire capital city would be directly affected by the internationalisation of its non-geographic numbers.

Comparison of costs and benefits

8.14 A final comparison of the costs and benefits of enabling international access to Irish non-geographic numbers is presented in Table 8.4 below. Given the uncertainty in estimating the benefits and the likelihood that these figures are very much an upper bound, we consider a lower end of benefits to be more realistic, shown below as the mid-point in the range presented in Table 8.1. Although we consider lost business revenue an important element of costs, there is also some uncertainty involved in estimating the value of this loss. We therefore include the low end of costs in the table below. Even the lowest estimates of costs outweigh the likely benefits by a substantial ratio.

Table 8.4: Comparison of costs and benefits, Present Value, under each Dublin demand scenario

Date of Dublin number change	Likely benefits (€millions) PV	Likely costs – Dublin number change (€millions) PV	Likely costs – non-geographic number change (€millions) PV
2021	39	85	359
2033	75	135	359
2056	97	198	359

Note: Costs of both options exclude lost business revenue

8.15 It is clear from the above figures that the costs of both options far outweigh the likely benefits of enabling international access to non-geographic numbers. Furthermore, these costs are based on clear cost implications of number changes, whereas the benefits are highly speculative. Our findings indicate that it would not be economically feasible for ComReg to adopt any specific measures to enable international access to the currently inaccessible non-geographic numbers.

Accounting for the economic climate

8.16 A final consideration is the use of social discounting in the current economic climate. Our model uses the conventional discount rate of 3.5 per cent which represents the extent to which society values money spent or gained today over and above that spent or gained in the future. However, as a result of the current economic climate in the EU Eurozone and in Ireland, in particular public policy regarding future spending cuts, it is likely that society may place a greater value on the current value of money. Taking this into account and using a higher discount rate of say five per cent makes the difference between the costs and benefits of enabling international access to Irish non-geographic numbers even greater. This is shown for illustrative purposes in the table below, and further enforces the conclusion that it would not be economically feasible for ComReg to undertake action to enable international access to non-geographic numbers.

Table 8.5: Comparison of costs and benefits of both options, excluding and including lost business revenue, 5 per cent discount rate

Date of natural Dublin number change	Range of possible benefits (€millions) PV	Range of likely costs – Option 1 (€millions) PV	Range of likely costs – Option 2(€millions) PV
2021	0 – 72	101 – 116	344 – 478
2033	0 – 129	167 – 191	344 – 478
2056	0 – 158	234 – 260	344 – 478

Conclusions

8.17 The overall aim of this study is to assess the economic feasibility of fully implementing Article 28 USD by enabling international access to the Irish non-geographic numbers that are currently inaccessible due to a clash with Dublin numbers (those beginning with lead digit '1').

8.18 We have restricted our analysis to non-geographic numbers that are likely to have international relevance. Our main focus is therefore on 92,000 shared cost numbers, PRS numbers and Freephone numbers allocated to businesses.[145]

8.19 The benefits of enabling international access to these numbers have been compared with the costs of the measures available to ComReg to bring about such access. In estimating the benefits of international access, we focus only on those number ranges that in reality would become available to international consumers. Given the existing barriers to

[145] This figure considers only those number assigned to subscribers. The total number of relevant non-geographic numbers allocated to operators is much higher, but a large proportion are not in use.

international access of PRS numbers we do not include these number ranges in the estimation of our benefits. In estimating the costs of enabling such access, we focus on two options available to ComReg — a change to Dublin geographic numbers or a change to non-geographic numbers.[146] A wider range of possible measures have been considered but considered not to be viable options for ComReg.

8.20 Our results show that the costs of enabling international access to Irish non-geographic numbers far outweigh the possible benefits of doing so. This result holds for a range of scenarios for a possible future Dublin number change.

8.21 The drafting of Article 28 USD specifies that Community-wide access to all numbering resources should be provided where it is technically and economically feasible. Notwithstanding the technical constraints that Ireland faces in achieving this, our conclusion that this would not be economically feasible leads us to conclude that no action would be required by Article 28.

8.22 A further recommendation is that ComReg ensures that users of Irish non-geographic numbers not currently accessible to international callers are aware of the availability of other, accessible non-geographic numbers that can be used should sufficient demand for services be perceived. This would ensure that the spirit of Article 28 is upheld by enabling consumers within the EU to access all services across Member States.

[146] We note again that a change to non-geographic numbers would affect all non-geographic ranges in our sub-set, including PRS numbers. This is because even though there may not be value in opening PRS numbers up to cross-border access due to current barriers, these ranges would nevertheless need to be changed as part of the option.

APPENDIX 1: DETAILED INFORMATION

Transposition of USD 28 into Irish Law

A1.1 The text below is the current transposition of USD Article 28 into Irish Law (Universal Service Regulation 23).

> 1. The Regulator may, where technically and economically feasible and except where a called subscriber has chosen for commercial reasons to limit access by calling parties located in specific geographical areas, specify requirements for compliance by an undertaking operating a public telephone network or providing publicly available telephone services for the purpose of ensuring that end-users are able to -
>
> (a) access and use services using non-geographic numbers within the European Union, and
>
> (b) access all numbers provided in the European Union, regardless of the technology and devices used by the operator, including those in the national numbering plans of Member States, those from the European Telephony Numbering Space (ETNS) and Universal International Freephone Numbers (UIFN).
>
> (2) The Regulator may require undertakings providing public communications networks or publicly available electronic communications services to block, on a case by case basis, access to numbers or services where this is justified by reason of fraud or misuse and to require undertakings to withhold relevant interconnection or other service revenues.

Delivering a non-geographic call

A1.2 In this section we describe how a non-geographic call is made and the flow of funds this could entail.

A1.3 Figure A1 illustrates the delivery of a non-geographic number. Moving from left to right, the call is made by a caller on a fixed or mobile network with billing determined either by the Originating Communications Provider (CP) or by an independent retail service provider renting capacity on the network. The Originating CP identifies this as a non-geographic call from the code of the dialled number, and conveys the call to a Transit CP able to switch the call to the appropriate terminator (Terminating CP).[147] The Terminating CP then identifies the geographic number mapped to the non-geographic number (this operation is known as Number Translation Service, or NTS) and sends it to that location (the called party i.e. business using the non-geographic number). As mentioned previously, all non-geographic numbers relevant to this study are translated numbers.

[147] Transit operators are not always involved and the call can pass straight from the OCP to the TCP.

A1.4 Other billing/managing agents can include the number resellers that may act as an intermediary for some businesses.[148]

Figure A 1: Parties involved in a non-geographic call

A1.5 The flow of funds will depend on the type of non-geographic number called, the types of operating networks involved (e.g. mobile, fixed etc) and the contracts that the operating networks have with their customers (both the callers and the businesses using the non-geographic numbers) and between themselves. This flow of funds can be very complex, and we only seek to illustrate how this flow may affect consumers.

A1.6 For premium rate services, the caller contracts with the Originating CP to access the premium rate service. The Originating CP bills the caller for access and passes:

(a) an agreed share of the revenue to the business using the non-geographic number (which may be directly allocated in some cases; in others will pass via the Terminating CP); and

(b) a termination charge to the Terminating CP.

A1.7 The business using the non-geographic number will receive a net payment from the Terminating CP. So that this fee charged by the business can be recouped back though the chain, the caller is charged the full cost fee that the business charges, as well as the fees of the various operators. The Originating CP usually charges an origination fee to the Terminating CP, which has a revenue share agreement (in the case of PRS numbers) or other relationship (in the case of non-PRS numbers) in place with the final business using the non-geographic number to determine the share of the total revenue that is retained by the Originating CP.

A1.8 For shared cost numbers (1850 and 1890), a caller places a call to an Originating CP. This call then flows to the Terminating CP, which then passes the call to the business using the non-geographic number, engaging in a revenue share agreement of some form, whereby the business pays the Terminating CP a hosting and number rental fee.[149] These fees may also be used to somewhat offset the charges that the original caller pays,

[148] In this case, the business using the non-geographic number would have their contract with the number reseller rather than with a terminating operator.

[149] ComReg 2011, National Numbering Conventions Update to V.7

depending on the billing arrangement between the business using the non-geographic number, the terminating CP and the Originating CP. [150]

A1.9 The situation is different in Ireland if the 1890 or 1850 call is made from a mobile subscriber. The mobile Originating CP charges both the caller for making the call and the Terminating CP for originating the call. The Terminating CP thus recovers this charge from the business using the non-geographic number in addition to the usual fee the SP pays for the TCP's hosting and number rental services. When called by a mobile subscriber, therefore, the SP will pay more for the call.

A1.10 For Freephone numbers, the business using the non-geographic number will make a payment to the Terminating CP to cover both any hosting/number rental costs and the originating fee charged by the Originating CP. The Terminating CP then passes some revenue back to the Originating CP after retaining a share.

How an international non-geographic call is made

A1.11 If a non-geographic number is dialled from outside the country, the number of communications providers would usually increase due to the need for the call to originate in one country and terminate in Ireland. Calls entering Ireland will pass through an international gateway exchange.

A1.12 The Originating CP in the foreign country, upon analysing the number dialled by the caller, identifies it as an international call from the first two digits ('00') and transfers the call to one of its international gateway exchanges.[151] The Originating CP's international gateway exchange analyses the country code (e.g. 353 for Ireland) and transfers the call to an international gateway exchange in the country for which the call is destined.

A1.13 The next part of the number (after the country code) is then analysed at the international gateway exchange in the destination country; this reveals that the call is non-geographic. The gateway exchange then transfers the call to the Terminating CP (sometimes via a transit network) which then terminates the call at the business using the non-geographic number.

A1.14 The flow of funds for an international non-geographic call could be similar to those described above, but more complex. The Originating CP in the foreign country would need to have an agreement with the gateway operator in the origination country to which it passes the call about the charge levied for passing on the call. As the termination charge for a non-geographic number will differ to that of an ordinary number (in most

[150] In the 1850/1890 fixed-line origination case, the originating CP pays (via transit operator, if relevant) a termination fee to the terminating operator, being part of the caller's payment. In addition, the terminating operator, which has the relationship with the end business, receives a payment from the business to help subsidise the caller's cost (i.e. to reduce the termination fee charged to the originating CP). Thus this situation is different from the mobile case. In both cases, the hosting and number rental fee charged by the terminating CP to the business are additional costs.

[151] Or, for small operators, to the international gateway owned by a larger operator with whom it has an agreement.

cases be higher), the gateway operator in the destination country will either need to adjust the amount it charges the Originating CP (via the originating gateway operator) to recover the extra costs, or bear the additional cost charged by the terminating CP for terminating the call. This would require operators to have charging and revenue share agreements in place with other operators and businesses using non-geographic numbers around the world for all non-geographic numbers that they agree to transfer. Such a detailed billing or settlement regime on an international scale does exist, but operates on a link by link basis and does not fully cater for transferring the full internal sets of charges and fees that operate in the various national markets.. This is a particular issue with PRS numbers which are associated with high charges, but may also arise with other non-geographic numbers. Hence many operators in EU Member States do not originate or terminate calls to foreign non-geographic, in particular PRS, numbers.

A1.15 Where calls to non-geographic numbers in foreign countries *are* originated, charges to the callers would include the international call cost plus any premium the Originating CP chose to charge (either in relation to the higher cost to the Originating CP of transferring the calls, or purely as a commercial exercise). This international call cost (and possibly premium) would also apply to Freephone numbers for other countries.

Use of Dialplans

A1.16 This refers to the discussion of Option 4 in the main body of the text.

A1.17 The originating operator will know to route calls to the international gateway when the dialled digits commence with “00”, signifying an international call. Additional dialled digits will be examined to determine how to route the call, and how much to bill for the call, with the intention being to route the call in the most advantageous way for the originating operator, taking account of things such as:

(c) agreements in place with operators in other countries;

(d) time of day and/or day of week;

(e) amount of traffic already being carried on specified routes (to avoid congestion);

(f) cost of each available route.

A1.18 It is quite possible that different routes/operators will be selected depending on the “area code” within the target country. For example, basic fixed calls might be routed via operator A, whereas mobile calls routed via operator B, and non-geographic calls via operator C. It is also quite possible that premium rate calls might be barred, for reasons described earlier in this report.

A1.19 In theory, the called number analysis, particularly by the originating operator, can be as general or as specific as required. The depth of analysis might also vary from one destination country to another. For example, all calls destined for Greece might be routed through operator X, whereas for calls to the UK, Operator Y might be used for fixed

geographic calls, Operator Z for fixed non-geo calls, and mobile calls routed over a dedicated leased line connection and handed over locally in the UK to the relevant mobile operator.

A1.20 Entries in the dial plan will often include wildcard symbols and/or variables – with the precise meaning of each symbol/variable potentially dependent on the equipment being configured. The purpose of these symbols/variables is to facilitate detailed decision making, for example depending on:

(g) The destination country

(h) The type of number called (fixed, mobile, non-geographic etc)

(i) The time of day and/or day of week

(j) The amount of traffic currently being carried over relevant routes

A1.21 The table below shows a simple example of wildcard symbols that could be used in the dial plan for a Cisco router using Cisco IOS (the Cisco router operating system)

Table A 1: Cisco IOS Wildcard Symbols

Symbol	Description
.	Indicates a single-digit placeholder. For example, 555.... matches any dialled string beginning with 555, plus at least four additional digits.
[ ]	Indicates a range of digits. A consecutive range is indicated with a hyphen (-); for example, [5-7]. A nonconsecutive range is indicated with a comma (,); for example, [5,8]. Hyphens and commas can be used in combination; for example, [5-7,9]. **Note** Only single-digit ranges are supported. For example, [98-102] is invalid.
( )	Indicates a pattern; for example, 408(555). It is used in conjunction with the symbol ?, %, or +.
?	Indicates that the preceding digit occurred zero or one time. Enter ctrl-v before entering ? from your keyboard.
%	Indicates that the preceding digit occurred zero or more times. This functions the same as the "*" used in regular expression.
+	Indicates that the preceding digit occurred one or more times.
T	Indicates the interdigit timeout. The router pauses to collect additional dialled digits.

Note: Cisco softswitches, such as the PGW2200 allow for much more sophisticated analysis.

Existing international access to PRS numbers

A1.22 There are few interconnection agreements that include provisions for international PRS calls. As Table A2 shows, national interconnection services for originating PRS calls to abroad or for terminating PRS calls from abroad are missing for most Member States.[152]

Table A 2: Access to national PRS numbers from international operators in 2005

	Yes/no	Comments
Austria	No	International access is not covered by current interconnection agreements.
Belgium	No	-
Cyprus	Yes	Subject to commercial agreements between national and international operators. Incoming calls from abroad with Cypriot country code and PRS prefixes 90x are cut off (by incumbent).
Czech Republic	No	-
Denmark	No	International access is not covered by current interconnection agreements.
Estonia	No	International access is not covered by current interconnection agreements.
Finland	No	Access to some numbers under special agreement.
France		Art L.44 states that the national numbering plan allows, subject to technical and economic feasibility, to users located in other EU Member States access to non-geographic numbers accessible throughout the national territory. In practice, access operators located in other countries have not taken advantage of this possibility.
Germany	No	International access is not covered by current interconnection agreements.
Greece	No	Not part of regulation.
Hungary	No	-
Ireland	Not yet	In Consultation response document 03/54 of May 27, 2003 ComReg decided to reserve National Destination Code “92” for EU-wide access to PR numbers, subject to the following: An agreed framework for commercial operation of such numbers would have to follow an initial decision to deploy and activate this code. ComReg will postpone taking such a decision until it is satisfied that the commercial and technical basis exists; The EU-wide dialling format would be +353 92YZ XXX XXX, corresponding to the existing National Premium Rate Numbers 15YZ XXX XXX; There will be no change in the national dialling format for Premium Rate Numbers for the time being, but callers from within the Republic of Ireland (as part of the EU) would – as part of a move to implement ‘092’ - have the choice to use either of the two access procedures for Premium Rate

[152] Cullen International SA and WIK Consult GmbH, Final report - National PRS implementation Study on pan-European market for premium rate services, 24 June 2005.

		Numbers i.e. "15YZ XXX XXX" or "0 92YZ XXX XXX".
Italy	Yes	If technically and economically feasible, and unless PRS provider chooses, for commercial reasons, to limit access to callers from certain geographic areas. Electronic Communications Code (article 78).
Latvia	No	International access is not covered by current interconnection agreements.
Lithuania	No	International access is not covered by current interconnection agreements.
Luxembourg	Yes	-
Malta	No	International access is not covered by current interconnection agreements.
Netherlands	No	Not part of regulation. OPTA has not received any complaints.
Norway	No	International access is not covered by current interconnection agreements.
Poland	No	International access is not covered by current interconnection agreements.
Portugal	No	-
Slovakia	No	Not covered by interconnection agreements.
Slovenia	Yes	Operators of public telephone networks or publicly available telephone services are obliged to ensure that users from other EU member states are able to call non-geographic numbers determined in the numbering plan where technically and economically feasible. Operators of public telephone networks or publicly available telephone services are not obliged to comply with the obligation from the previous paragraph where a called subscriber has chosen, for commercial reasons, to limit calls originating from specific areas of the EU.
Spain	No	International access is not covered by current interconnection agreements.
Sweden	No	International access is not covered by current interconnection agreements.
UK	Yes/no	Ofcom is only NRA for the UK. Access to UK PRS numbers outside UK depends on how Article 28 of Universal Service Directive has been implemented in relevant originating country (if appropriate, i.e., if w/i EU) or other relevant national legislation/ regulation. In essence this is a matter of technical & economic feasibility in relevant country of origin, rather than regulatory requirement of Ofcom/ UK.

Source: Cullen International SA and WIK Consult GmbH, Annex I Final report - National PRS implementation Study on pan-European market for premium rate services, 24 June 2005

A1.23 A number of issues could arise were Member States to allow international access to PRS:[153]

(a) Potentially higher interconnection costs for international calls.

(k) Lack of transparency regarding the international character of the call (i.e. language spoken, destination country).

(l) Different national taxes and different interconnection and conveyance charges.

[153] Cullen International SA and WIK Consult GmbH, Final report - National PRS implementation Study on pan-European market for premium rate services, 24 June 2005.

(m) Providers would need to abide by country-specific regulatory requirements regarding consumer protection, fraud prevention, regulation and billing.

(n) Ability of regulators to act against foreign providers would remain limited.

(o) Consequently, harmonisation of international regulatory environment may be necessary (and expensive).

(p) The PRS numbering scheme of the home country may conflict with national regulations in the countries where the PRS call is originated.

Estimates of Adjustment costs

A1.24 The table below presents the estimates from the Ofcom report on the adjustment costs to businesses associated with a change in geographic telephone numbers. The figures relate to a number change that took place in 2000.

A1.25 These have been uplifted for inflation (average of 2.7 per cent per year) and exchange rates (average of 1.67) over the period 2000 to 2011.

Table A 3: Estimates of Adjustment Costs of a number change (2011 prices)

	All businesses	1-9 emps	10-249 emps	250+ emps
Base size:	*n = 406*	*n=190*	*n=183*	*n=33*
Stationery	€2,790	€675	€3,507	€15,349
Signs	€789	€355	€853	€3,367
Marketing materials	€1,313	€281	€1,339	€10,300
Management staff costs	€658	€660	€495	€1,322
Admin staff costs	€274	€175	€258	€1,142
Lost business estimate	€1,890	€388	€3,096	€3,837
Other costs*	€628	€148	€1,244	€3
TOTAL COST excl lost business	€6,452	€2,294	€7,697	€31,483
TOTAL COST incl. lost business	€8,341	€2,682	€10,794	€35,320

** Note: Other costs include yellow pages ad change, website change, inconvenience, etc. We are aware that the figure for large businesses appears very low; there may have been measurement error in the Ofcom report.*

Source: Ofcom Numbering review 2006

Data Gathering

Interviews

A1.26 Telephone interviews were conducted with telecommunications operators in Ireland and the UK in order to gather information on the costs and wider impacts of the various options available to enable international access to Irish non-geographic numbers. The interviews were also used to further our understanding of the options and associated issues and to test our assumptions.

Results of the surveys

A1.27 The results of the surveys to businesses using Dublin numbers and to those using non-geographic numbers are summarised below.

Dublin survey results

A1.28 The total number of individuals responding to the survey was 18. However, four of these were not usable, and so the number of usable responses was 14.

A1.29 Of the 14 usable responses, all respondents were service-based organisations, including marketing and PR consultancies, financial services, retail, security and cleaning. Given the small response rate these results cannot be taken as representative of all businesses in Dublin. Our use of these results in our report is therefore more illustrative. Due to the small response rate we also present the results in absolute figures rather than percentages.

A1.30 The majority of organisations employed fewer than 100 employees with the exception of two which employed 2,500 and 700 respectively. The turnover generated by responding organisations ranged from €90,000 to €100 million: the majority (nine) had a turnover of less than €1 million in 2010; three reported a turnover of between €1 million and €6 million, and one reported turnover of €100 million (one respondent did not answer the question).

A1.31 The results to the questions about the cost of a number change are summarised in the Table below.

Table A 4: Survey results from Dublin businesses

(respondents = 14)

	Averages	**No. of Respondents indicating 'Relevant'**
Expected reduction in incoming call traffic following change		**7**
% change in incoming traffic		
3-5%		*1*
6-10%		*1*
>10%		*5*
Time before traffic levels normalise		
3 months		*2*
6 months		*2*
1 year		*3*
Loss of revenue as % of total turnover		

1-2%		*2*
3-5%		*3*
>10%		*2*
Total cost associated with changing non-geographic number, aside from lost revenue		**14**
Changes to advertising	€5,121	7
Provision of information	€6,257	8
Other stationary	€3,457	9
Informing business contacts	€4,093	10
Additional expenditure associated with rebuilding the brand	€3,182	4

A1.32 The impact on incoming call traffic from a number change is not clear from the results, with equal numbers of respondents either expecting a decline in traffic or not expecting one. Of those that did expect a decline in traffic, this could result in lost revenue, ranging from €28,000 to €4 million.[154] (This latter figure was reported by a financial services firm and was significantly higher than the other responses which were less than €80,000). It would take anywhere between three months and one year for incoming call traffic to return to previous levels following a number change, according to respondents.

A1.33 The average cost of changes to advertising across all 14 respondents is just over €5,000, ranging from €500 to €29,000. An additional €300 to €50,000 (average of around €6,000 across respondents) would need to be spent on provision of information (e.g. on leaflets and brochures) and an average of €3,400 on other stationary (e.g. letterheads and websites). Anywhere between €50 and €34,000 (but with an average of just over €4,000) would need to be spent on informing business contacts of the change (e.g. existing customers and suppliers). In total, costs incurred following a number change would range between €650 and €125,000, representing an average of €25,000 across all respondents.

A1.34 Other costs were identified. For example, one respondent explains that a "dead" line would lead an overseas customer to assume that the business was no longer trading, and it would lose a large number of clients. Informing them of the change would be difficult as these clients' contact details are not held in company records. The same is true for not-for-profit charities, whereby one explains that donors would become very uneasy were they unable to easily contact the head office. One respondent explains that the use of mobile numbers and web based donations means that phone lines are less important than in the past. Another explains that changing numbers in Dublin would be a "serious inconvenience" to clients, staff and suppliers, as the business has been trading under one

[154] Based on the respondents that reported a figure for the percentage decline in turnover and a figure for turnover

general number and direct lines for almost 20 years. On respondent whose business operates over a number of sites across the country highlighted the importance of their number to both staff and customers, and that a change could have far-reaching disruption. Finally, one respondent explains that if sufficient time is provided in which the use of new and old numbers can overlap, so as to allow the necessary changes in marketing material to come about naturally, then much of the costs would be eliminated. However, this would require between 1-5 years.

Non-geographic survey results

A1.35 The total number of individuals responding to the survey of businesses using non-geographic numbers was 47. However, 21 of these are not usable as respondents did not provide any information other than company details. The number of complete responses is therefore 26.

A1.36 Of the 26 usable responses, a wide range of organisations were represented, including government and public bodies, financial services, retail, consultancies, charities, taxi companies and a radio station. Business's employee numbers ranged from two to 15,000; 23 per cent (6 respondents) employ between 1 and 9 employees, 27 per cent employ between 10 and 249, 27 per cent employ between 250 and 1,000, and 23 per cent employ over 1,000.

A1.37 Turnover reported by respondents also varied widely from €154,000 to €50 million, with 12 per cent (three respondents) with less than €1 million, 35 per cent between €1 million and €10 million, and one respondent (4 per cent) over €10 million.[155] Nine respondents (35 per cent) reported receiving revenue indirectly through their non-geographic number (e.g. through the sale of goods and services); only one respondent reported receiving revenue directly from their non-geographic number. The companies that reported turnover associated with their number included insurance and other financial services, healthcare, construction, a taxi company and a charity. Turnover associated with the non-geographic number ranges from €250,000 to €3 million. The latter figure was reported by a taxi company manager who stated that nearly all their turnover comes through their number. The average turnover associated with non-geographic numbers across all respondents is just under €260,000.

A1.38 The form of non-geographic number in use was important to the majority of respondents. Just over 65 per cent said that their number was easy to remember, and 62 per cent claimed to have invested in the number as part of their business' brand.

[155] The rest of respondents did not provide turnover figures

Table A 5: Survey results from businesses using non-geographic numbers

(total respondents = 26)	**Range**	**% of respondents indicating Yes**
Additional value associated with non-geographic number		**92%**
Brand		54%
Easy to remember		65%
Other		12%
Expected reduction in incoming call traffic following change		**42%**
% change in incoming traffic		
3-5%		*4%%*
6-10%		*4%%*
>10%		*31%*
Time before traffic levels normalise		
1 month		*4%*
6 months		*4%*
1 year		*35%*
Loss of revenue as % of total turnover		
<1%		*12%*
1-2%		*4%*
6-10%		*4%*
>10 %		*15%*
Average cost associated with changing non-geographic number, aside from lost revenue	**€189,807**	**50%**
Changes to advertising	€17,981	
Provision of information	€8,769	
Other stationary	€5,577	
Informing business contacts	€12,769	
Additional expenditure associated with rebuilding the brand	€33,269	
International accessibility		
Currently publish geographic numbers		*35%*
No, but considering doing this		*4%*
Perceived demand from abroad		*8%*
Accessibility would result in increased incoming call traffic		**15%**
By <1%		*4%*
By 1-2%		*4%*
By 3-5%		*8%*

(total respondents = 26)	**Range**	**% of respondents indicating Yes**
Accessibility would increase annual turnover	5% - 33%	8%

Notes: Numbers have been rounded to the nearest unit.

1 Includes PRS, Freephone, shared cost, internet dial-up, emergency access number, harmonised codes, harmonised directory inquiry numbers, carrier routing codes, CLI and call return, 17X-17XXX (e.g. voicemail) and/or operator codes and network tests.

A1.39 Feedback suggests there exists the possibility of a reduction in incoming call traffic following a change in non-geographic numbers. Eleven respondents (42 per cent) expected a decline in call traffic following from a number change, and of that eight respondents (31 per cent overall) thought that call traffic would decline by more than ten per cent.

A1.40 This was associated with a fall in turnover. Estimated decline in turnover ranged from €12,500 to €525,000, with an average decline in turnover of €113,000 across respondents who anticipated a decline, and an average of €47,800 across the whole sample.

A1.41 Responses to the survey indicated that costs associated with changing non-geographic numbers could be significant. Similar categories of costs of a number change compared with the change in Dublin numbers were anticipated by 13 (50 per cent) of respondents. Costs of a change ranged from €2,500 to €1.7 million, with an average total cost across all respondents of just under €190,000. The costs of a change in branding associated with the number were the highest on average (€33,000) which corresponds to the value that many respondent place on the form of their non-geographic number.

A1.42 If a firm using both a non-geographic number and an internationally accessible geographic number could now use only the non-geographic number if this was internationally accessible, it might be expected that a reduction in marketing would arise brought about the by need to only publicise one number. However, this was not supported by the survey. Only two respondents indicate a reduction in marketing costs resulting from the change. Both claimed the reduction would be either close to nil or very small, as both geographic and non-geographic numbers would need to be maintained, anyway.

Benefits of international access to non-geographic numbers

A1.43 According to survey results, respondents do not feel there is international demand for access to their non-geographic numbers. Only two respondents (8 per cent) believe there is international demand for their services through their number, and of these one already publishes an internationally accessible number and the other is considering doing so.

A1.44 Four respondents (15 per cent) believe that if their number was accessible from abroad this would result in increased incoming call traffic, and of these only two envisage a

corresponding increase in turnover. The average perceived increase in incoming call traffic is 0.55 per cent across respondents (ranging between 3 and 5 per cent), and the average increase in turnover is 1.02 per cent (ranging between 5 and 33 per cent).[156] The turnover associated with these two figures was €40,000 and €200,000 respectively. It must be noted that of the two firms recording an anticipated increase in turnover, one (who anticipated an increase in turnover of 33 per cent, or €200,000) is already considering publishing an internationally accessible number.

A1.45 In summary, respondents seem to have chosen to invest in non-geographic numbers as part of their brand. Consequently, there is a value attached to the number itself, and changing this could be quite costly. There are also potentially significant costs and inconvenience attached to changing their non-geographic numbers. These could arise in advertising, as well as an initial loss of incoming call traffic. The survey results suggest that respondents on the whole do not feel there is international demand for their products, and consequently access to their non-geographic numbers. A small proportion of the respondents felt that international access to their numbers would bring about an increase in call traffic and revenues.

Description of Model Inputs

A1.46 We have developed an excel model to calculate the various incremental costs and benefits associated with two options – an immediate Dublin number change and an immediate Irish non-geographic number change.

A1.47 The model uses inputs derived from published data on traffic volumes, tariffs, adjustment costs and other variables; information gained from interviews regarding infrastructural change costs and other variables; information gained from surveys of businesses on adjustment costs and the expected effects of number changes on call traffic; and several assumptions.

A1.48 These inputs are then used to calculate various costs and benefits to each actor (operators, businesses, residential fixed line owners and callers) under the various scenarios.

A1.49 We first discuss below the model inputs, giving details of the original source data as well as the steps involved in deriving the inputs. We then go on to a description of the workings of the model, which sets out the calculations involved in deriving the various categories of cost and benefit for the various actors in each scenario from the model inputs.

[156] Average increase in call traffic and turnover is calculated across the number of respondents who answered the question of whether international access would increase (either yes or no), and excludes respondents who did not answer.

A1.50 The table below presents the inputs we have used in our model and describes the sources and relevant calculations used.

Table A 6: Description of model inputs

Input	Value	Calculation / source
Call volumes		
Dublin fixed line (residential) incoming minutes (2010)	904,399,607	We added 'fixed-fixed', 'mobile-fixed' and 'fixed-international' categories in the Quarterly Data Reports to get total fixed incoming minutes. 'Fixed-international' is a proxy for incoming calls to fixed lines from abroad. We then took a fraction of incoming minutes (assumption) to give Irish incoming residential minutes. Then, we totaled over four quarters of 2010 and combined this with an assumption regarding the proportion of Irish incoming minutes that are Dublin incoming minutes.
Dublin fixed line (commercial) incoming minutes (2010)	2,110,265,749	These are the proportion of total Dublin incoming fixed minutes not going to residential line owners.
Irish Non-Geographic incoming minutes (non-PRS) (advanced) (domestic) (2010)	345,916,488	Based on a Q1 2011 breakdown of the 'advanced category', we calculated the proportion of non-PRS minutes in advanced minutes. We applied this proportion to the total of 'fixed-advanced' and 'mobile-advanced' minutes, totaled over the four 2010 quarters.
Irish Non-Geographic incoming minutes (PRS) (advanced) (2010)	94,742,247	Based on a Q1 2011 breakdown of the 'advanced category', we calculated the proportion of PRS minutes in advanced minutes. We applied this proportion to the total of 'fixed-advanced' and 'mobile-advanced' minutes, totaled over the four 2010 quarters.
Compound annual growth rates of call volumes		
Dublin fixed line (residential) incoming minutes medium growth rate	-6.82%	This is the average of year-on-year growth rates for five quarters from Q1 2010 to Q1 2011.
Dublin fixed line (commercial) incoming minutes medium growth rate	-6.82%	This is the average of year-on-year growth rates for five quarters from Q1 2010 to Q1 2011.
Irish Non-Geographic incoming minutes (non-PRS) (advanced) (domestic) medium growth rate	-3.31%	This is the average of year-on-year growth rates for five quarters from Q1 2010 to Q1 2011.
Irish Non-Geographic incoming minutes (PRS) (advanced) medium growth rate	-3.31%	This is the average of year-on-year growth rates for five quarters from Q1 2010 to Q1 2011.
High (low) growth rates in call volumes		2% per annum higher (lower) than medium growth figures. This is an assumption.
Per unit revenue for operators		
Dublin fixed line (residential) incoming minutes	€0.10/min	We first worked out average published per minute tariffs for landline and mobile calls (from various operators) and then computed an average of these weighted by fixed and mobile call volumes (which were based on the Quarterly Data Reports).

Dublin fixed line (commercial) incoming minutes	€0.10/min	We assume that operators charge the same amount regardless of whether the call is made to a residential or commercial fixed line subscriber.
Irish Non-Geographic incoming minutes (non-PRS) (advanced) (domestic)	€0.18/min	We calculated total charges to line owners and callers for freephone and shared cost numbers from tariffs published by non-geographic number sellers. Where the charges were per call, these were converted to per minute using an assumption about the average length of a call. There were separate tariffs for landline and mobile incoming calls, so we first calculated a weighted average for each call category (1800, 1850 and 1890 numbers). These totals were then weighted by call volumes (from ComReg data) to these numbers, and an average was computed.
Irish Non-Geographic incoming minutes (PRS) (advanced)	€0.95/min	We used two methods to first calculate the revenue generated by a PRS call. The first method was using maximum tariffs published in the numbering conventions and call volume breakdowns from ComReg coupled with assumptions on average call lengths and the percentage of the maximum tariff that is charged in practice to compute average per minute charges for all PRS calls. The second method involved using data from the erstwhile Regtel on the number of PRS calls and the revenues from those calls. Both methods gave very similar answers, so a simple average was taken. This total revenue per minute was divided between operators and businesses using proportions from an Ofcom study into UK non-geographic numbers.
Per unit revenue for businesses		
Dublin fixed line (residential) incoming minutes	€0.00/min	By definition, businesses do not receive any income when a residential call is made.
Dublin fixed line (commercial) incoming minutes (using Ofcom (2006) figures)	€0.68/min	Using the results of our survey regarding the expected fall in call volumes and the time it would take to return to normalcy following a Dublin number change, we computed the fall in Dublin fixed line commercial incoming minutes following a Dublin number change. We then calculated the associated fall in revenue for Dublin businesses. To do this, we used Ofcom (2006) per business figures in conjunction with the number and size distribution of businesses (from the Bill Moss database). We then divided this by the fall in minutes to get the per minute revenue associated with incoming call traffic.
Dublin fixed line (commercial) incoming minutes (using survey figures)	€24.02/min	Using the results of our survey regarding the expected fall in call volumes and the time it would take to return to normalcy following a Dublin number change, we computed the fall in Dublin fixed line commercial incoming minutes following a Dublin number change. We then calculated the associated fall in revenue for Dublin businesses. To do this, we used survey results regarding the percentage fall in turnover as a result of falling call volumes, and applied this percentages to the service sector GDP for Dublin. This fall in revenue was divided by the fall in minutes to calculate how much revenue is associated with every minute of incoming calls for Dublin businesses using geographic numbers.

Irish Non-Geographic incoming minutes (non-PRS) (advanced) (domestic) (using Ofcom (2006) figures)	€17.13/min	Using the results of our survey regarding the expected fall in call volumes and the time it would take to return to normalcy following a non-geographic number change, we computed the fall in non-PRS incoming minutes following a non-geographic number change. We then calculated the associated fall in revenue for Irish businesses. To do this, we used Ofcom (2006) per business figures in conjunction with the number and size distribution (an assumption) of businesses. This was divided by the fall in minutes to calculate how much revenue is associated with every minute of incoming calls for Irish businesses using non-geographic numbers.
Irish Non-Geographic incoming minutes (non-PRS) (advanced) (domestic) (using survey figures)	€11.17/min	Using the results of our survey regarding the expected rise in call volumes following a non-geographic number change, we computed the rise in non-PRS incoming minutes following a non-geographic number change. We then calculated the associated increase in revenue for Irish businesses. To do this, we first arrived at an estimate of the proportion of non-PRS businesses that use non-geographic numbers using ComReg survey data and assumptions. We then applied this proportion to Irish services GDP, to get the portion of Irish GDP attributable to businesses using non-PRS non-geographic numbers. Then, we applied survey results regarding the percentage rise in turnover as a result of increasing call volumes to this quantity to get the increase in revenue for all Irish businesses using non-PRS non-geographic numbers. This was divided by the increase in minutes to calculate how much revenue is associated with every minute of incoming calls for Irish businesses using non-PRS non-geographic numbers.
Irish Non-Geographic incoming minutes (PRS) (advanced)	€0.33/min	We used two methods to first calculate the revenue generated by a PRS call. The first method was using maximum tariffs published in the numbering conventions and call volume breakdowns from ComReg coupled with assumptions on average call lengths and the percentage of the maximum tariff that is charged in practice to compute average per minute charges for all PRS calls. The second method involved using data from the erstwhile Regtel on the number of PRS calls and the revenues from those calls. Both methods gave very similar answers, so a simple average was taken. This total revenue per minute was divided between operators and businesses using proportions from an Ofcom study into UK non-geographic numbers.
Numbers of potential callers		
Dublin callers (2010)	1,270,603	This is the 2011 Dublin population, taken from the Irish Census.
Non-Dublin Irish callers (2010)	3,310,666	This is the 2011 Ireland population less the 2011 Dublin population, taken from the Irish Census.
Non-Irish callers (2010)	496,637,807	This is the 2010 EU population less the 2010 Irish population, taken from Eurostat.
Compound annual growth rates of potential callers		

Dublin callers (2010)	1.61%	This is the average of 2009, 2010 and 2011 year on year growth rates of Dublin callers, calculated based on Eurostat and Irish Census data.
Non-Dublin Irish callers (2010)	1.26%	This is the average of 2009 and 2010 year on year growth rates of non-Dublin Irish callers, calculated based on Eurostat data.
Non-Irish callers (2010)	0.34%	This is the average of 2009, 2010 and 2011 year on year growth rates of non-Irish callers, calculated based on Eurostat and Irish Census data.
Proportions of potential callers currently calling Dublin geographic numbers		
Dublin callers (2010)	100%	This is an assumption.
Non-Dublin Irish callers (2010)	80%	This is an assumption.
Non-Irish callers (2010)	0.1%	This is an assumption.
Proportions of potential callers currently calling Irish non-geographic numbers		
Dublin callers (2010)	90%	This is an assumption.
Non-Dublin Irish callers (2010)	90%	This is an assumption.
Non-Irish callers (2010)	0%	This is an assumption.
Numbers of operators		
VOIP	4	This information was gathered from an interview.
Mobile	8	ComReg Quarterly report 2011
Compound annual growth rates of numbers of operators		
VOIP	7.18%	This was calculated based on the assumption that the number of VOIP operators will double in 10 years.
Mobile	0.00%	This is an assumption.
Numbers of line owners		
Irish non-geographic number owners (2008)	28,144	The ComReg PRS department informed us that there were 4,462 PRS businesses in Ireland. To this, we added the number of non-PRS businesses, calculated by dividing the number of non-PRS non-geographic numbers in Ireland (from ComReg) by the average number of non-geographic numbers used by a business (from eircom).
Dublin residential fixed line owners (2011)	1,010,129	In a recent survey by ComReg, 79.5% of residential respondents reported owning a fixed line. We applied this proportion to the 2011 Dublin population.
Dublin commercial fixed line owners (2011)	36,726	This is the number of businesses in Dublin, as contained in the Bill Moss database.
Compound annual growth rates of numbers of line owners		

Irish non-geographic number owners (2008)	1.61%	This is based on the assumption that the growth rate is the same as that of Dublin population.
Dublin residential fixed line owners (2011)	1.61%	This is the growth rate of the Dublin population (and therefore of any proportion of it).
Dublin commercial fixed line owners (2011)	1.61%	This is based on the assumption that the growth rate is the same as that of Dublin population.
Numbers of numbers allocated		
Dublin geographic numbers (2007)	5,273,300	This is from ComReg's 2007 geographic audit.
Irish non-geographic numbers (2008)	2,521,083	This is from ComReg's 2008 non-geographic audit.
Compound annual growth rates of numbers of numbers allocated		
Dublin geographic numbers (2007)	0.00%	This is an assumption.
Irish non-geographic numbers (2008)	0.00%	This is an assumption.
Adjustment costs for callers and number owners		
Callers	€5	This is an assumption.
Dublin residential geographic number owners	€13	Estimate from NERA survey of residential subscribers
Dublin commercial geographic number owners	4,810	We used the average costs of adjustment for various sizes of firms to the 2000 UK 'Big Number Change' as reported in the Ocfom numbering review document. We applied an uplift to the 10-249 employees category based on our survey. We then weighted the costs by the proportion of Dublin firms in each category (from the Bill Moss database) and computed an average. Finally, we adjusted for inflation and converted from £ to €.
Non-geographic number owners	11,272	We used the average costs of adjustment for various sizes of firms to the 2000 UK 'Big Number Change' as reported in the Ocfom numbering review document. We applied an uplift to the 10-249 employees category and added a 1000+ employees category based on our survey. We then weighted the costs by the proportion of firms using non-geographic numbers in each category (assumptions) and computed an average. Finally, we adjusted for inflation and converted from £ to €.
Infrastructure costs for operators following a number change		
Cost of change for standard operators for both geographic and non-geo numbers	€9.98 /number	This information was gathered from interviews.
Cost uplift for geographic change for standard operators if change is before 2020	100%	This information was gathered from interviews.
Costs per VOIP operator for a Dublin number change	€5,000	This information was gathered from interviews.

Costs per VOIP operator for an Irish non-geographic number change	€3,000	This information was gathered from interviews.
Costs per mobile operator for a Dublin number change	€10,000	This information was gathered from interviews.
Costs per mobile operator for an Irish non-geographic number change	€10,000	This information was gathered from interviews.
Changes in call volumes in year following Dublin number change		
Dublin fixed line (residential) incoming minutes	-1.00%	This is an assumption.
Dublin fixed line (commercial) incoming minutes	-2.84%	Our survey results indicated that businesses expected, on average, a reduction in incoming call traffic of 5.10% in the three months following the change, and that it would then take 7.38 months for traffic to return to normal. Using these, we calculated the decline in the year following the change.
Irish Non-Geographic incoming minutes (non-PRS) (advanced) (domestic)	0.00%	Non-geographic call volumes are assumed not to change when geographic numbers are changed.
Irish Non-Geographic incoming minutes (non-PRS) (advanced) (from abroad)	0.55%	This is a direct result of our survey, and would be a permanent increase.
Irish Non-Geographic incoming minutes (PRS) (advanced)	0.00%	Non-geographic call volumes are assumed not to change when geographic numbers are changed.
Changes in call volumes in year following Irish non-geographic number change		
Dublin fixed line (residential) incoming minutes	0.00%	Geographic call volumes are assumed not to change when non-geographic numbers are changed.
Dublin fixed line (commercial) incoming minutes	0.00%	Geographic call volumes are assumed not to change when non-geographic numbers are changed.
Irish Non-Geographic incoming minutes (non-PRS) (advanced) (domestic)	-3.58% in year 1; -0.16% in year 2	Our survey results indicated that businesses expected, on average, a reduction in incoming call traffic of 5.09% in the three months following the change, and that it would then take 11.67 months for traffic to return to normal. Using these, we calculated the decline in the years following the change.
Irish Non-Geographic incoming minutes (non-PRS) (advanced) (from abroad)	0.55%	This is a direct result of our survey, and would be a permanent increase.
Irish Non-Geographic incoming minutes (PRS) (advanced)	-3.58% in year 1; -0.16% in year 2	This is based on the assumption that PRS traffic is affected in the same was as non-PRS traffic.

Other inputs		
Social discount rate	3.5%	This was recommended in the EC's (DG Regional Policy) guide to cost benefit analysis of regional investment projects.
Consumer surplus (as % of extra revenue)	30%	This is an assumption.
Proportion of new international non-geographic traffic to Irish businesses that used to go to foreign businesses	50%	This is an assumption.
Year of immediate Dublin number change (op 1)	2014	This based on ComReg's lead time of 3 years for a number change
Year of non-geographic number change (op 2)	2014	This based on ComReg's lead time of 3 years for a number change

Description of Model

A1.51 The workings of the model are organised across three worksheets, each with the same basic structure. The structure calculates, for each actor, the costs and benefits under the scenario associated with that particular worksheet.

A1.52 The scenarios attached with each worksheet, and their descriptions are given in Table A 7.

Table A 7: Scenarios associated with worksheets

Worksheet name	Scenario description
Baseline scenario	Eventual Dublin number change
Op 1 – Dublin # change	2014 Dublin number change; no eventual change
Op 2 – Irish NG# change	2014 Irish non-geographic number change; eventual Dublin number change

A1.53 The actors considered in the structure are operators, businesses, Dublin residential subscribers and callers. In the worksheets, the sections devoted to each actor are colour coded. The sections of each worksheet devoted to the various actors are shown in Table A 8.

Table A 8: Sections in worksheets allocated to different actors

Actor	Columns	Colour
Operators	B-L	Blue
Businesses	M-AE	Green
Dublin residential subscribers	AF-AJ	Brown
Callers	AK-BE	Purple

A1.54 On each worksheet, there is also a red section, which totals the costs, benefits and net benefits for all actors. In addition, on the Op1 and Op2 worksheets, there is a yellow section, that calculates benefits, costs and net benefits in comparison to the baseline scenario.

A1.55 We now discuss in detail each colour coded section in detail.

Blue – Operators

A1.56 Columns B-H consider costs, I considers benefits and J-L apply discounting to costs and benefits. We consider each of these in turn.

A1.57 Costs to operators originate from two sources: costs of infrastructure upgrade (columns B-D) and lost revenue due to a fall in traffic after a number change (columns E-H).

(a) Column B considers standard operators. The costs of a change to them are the per number cost (which is double if a change occurs before 2020) multiplied by the

number of numbers changed (which is calculated from the current figure and a growth rate). The number of numbers changed differs according to whether there is a Dublin fixed or an Irish non-geographic change.

(b) Columns C and D consider VOIP and mobile operators respectively. The costs to them are the per operator costs multiplied by the number of operators in the year of the change (calculated using current figures and growth rates). The per operator costs differ according to whether there is a Dublin fixed or an Irish non-geographic change.

(c) Columns E-H consider the fall in revenue to operators as a result of fall in Dublin fixed residential (column E), Dublin fixed commercial (column F), Irish non-PRS non-geographic (column G) and Irish PRS non-geographic (column H) traffic following a number change. These are calculated as the per minute revenue to the operator multiplied by the decline in the number of minutes for the relevant category. The fall in the number of minutes is calculated by first arriving at what the number of minutes would have been in the absence of a number change in a particular year (using current figures and growth rates) and multiplying this by the percentage fall for that category following a number change.

A1.58 The benefits to operators are estimated in column I as the increased revenue to operators from the increase in non-PRS non-geographic minutes to Ireland following a number change. This is calculated as the increased number of minutes times the per minute revenue to operators from non-PRS non-geographic traffic. The increased number of minutes are calculated by first considering what the usual level of incoming non-PRS non-geographic would be in the given year in the absence of a number change (using current figures and growth rates), multiplying it by the percentage increase in traffic expected by Irish businesses and finally discounting for the countervailing fall in minutes experienced by foreign businesses who lose call traffic to Ireland. The benefits begin in the year of the earliest number change that makes international access to Irish non-geographic numbers possible.

A1.59 Column J totals all the costs and deflates the total using the social discount rate to convert all costs into present values. Column K applies similar discounting to the benefits, and column L is the difference between the present values of benefits and costs, i.e. it is the present value of net benefits for operators in any given year.

Green – Businesses

A1.60 The analysis is divided into three separate subsections – one dealing with adjustment to the number change (columns M-Q), and two dealing with changes in revenue due to changes in call traffic (columns R-X and Y-AE).

A1.61 Regarding analysis of adjustment of businesses to number changes,

(a) The costs are considered in column M, and are calculated as the per number owner adjustment cost times the number of number owners in that year. The number of

number owners is arrived at using current figures and growth rates. The costs of adjustment differ depending on whether there is a Dublin fixed or an Irish non-geographic change.

(b) Benefits are included in column N, though these are zero, as there is no adjustment benefit to either geographic or non-geographic number owners in the event of any number change.

(c) Column O calculates the present value of costs for each year, while column P does the same for benefits. Column Q calculates the present value of net benefits.

A1.62 Regarding the analysis of changes in revenue due to changes in call traffic, we first discuss columns R-X

(a) R-T consider the fall in revenue for Irish businesses following a number change due to a fall in Dublin fixed commercial (column R), Irish non-PRS non-geographic (column S) and Irish PRS non-geographic (column T) traffic. These are calculated by multiplying per minute Ofcom (2006) based revenue accruing to businesses in the relevant category by the fall in minutes. The fall in minutes is calculated in the same way as for operators as described in A1.57.

(b) Benefits are considered in column U as the increased revenue to Irish businesses arising from increased non-PRS non-geographic traffic (originating abroad). This is calculated by multiplying per minute Ofcom (2006) based revenue accruing to businesses from non-PRS non-geographic traffic by the increase in the number of non-PRS non-geographic incoming minutes to Irish businesses (less the traffic that is siphoned away from foreign businesses). The increase in the number of minutes is calculated in the same way as described earlier in A1.58

(c) Column V calculates the present value of costs for each year, while column W does the same for benefits. Column X calculates the present value of net benefits.

A1.63 Columns Y-AE replicate the same calculations as R-X using survey based rather than Ofcom (2006) based per minute revenue.

Brown – Dublin residential subscribers

A1.64 Costs to Dublin residential fixed line owners are considered in column AF. These are calculated as the number of Dublin fixed line owners in a particular year (calculated using current figures and a growth rate) multiplied by the adjustment cost per line owner in that year. These costs only arise in the case of a Dublin number change, either immediate or eventual.

A1.65 Benefits are considered in column AG, but are zero throughout, as no benefit accrues to Dublin residential fixed line owners of any number change.

A1.66 Column AH calculates the present value of costs for each year, while column AI does the same for benefits. Column AJ calculates the present value of net benefits.

Purple – Callers

A1.67 The analysis is divided into three sections – columns AK-AQ does not consider the additional consumer surplus arising due to the creation of new business, while columns AR-AX and AY-BE do.

A1.68 Looking first at columns AK-AQ

(a) Costs are considered in columns AK-AM as the adjustment costs of Dublin callers (column AK), non-Dublin Irish callers (column AL) and non-Irish EU callers (column AM) who call either Dublin geographic or Irish non-geographic numbers. For each set of callers, this is calculated as the number of callers multiplied by the per caller adjustment cost. The number of callers for a given year is calculated by first arriving at the set of potential callers, i.e. the population, using current figures and growth rates and then multiplying this by the percentage of that population which calls Dublin geographic or Irish non-geographic numbers, depending on whether there is a Dublin fixed or an Irish non-geographic change.

(b) Benefits are considered in column AN, but are zero as consumer surplus associated with new business is not included in this section.

(c) Column AO calculates the present value of costs for each year, while column AP does the same for benefits. Column AQ calculates the present value of net benefits.

A1.69 Looking at columns AR-AX

(a) The costs in AR-AT are calculated in the same way as in AK-AM.

(b) The benefits are considered in AU as the consumer surplus accruing to non-Irish users who benefit from using a new service by accessing Irish non-PRS non-geographic numbers. This is calculated by using the assumption about consumer surplus as a proportion of revenue accruing to businesses in conjunction with the additional revenue accruing to Irish businesses (using Ofcom (2006) figures), discounting for the countervailing loss in business experienced by non-Irish businesses. This is essentially the consumer surplus arising from newly created business.

(c) AV-AX calculate the discounted costs, benefits and net benefits as earlier.

A1.70 Columns AY-BE replicate the calculations of AR-AX, but using survey based revenues instead of Ofcom (2006) based revenues.

Red – totalling costs and benefits

A1.71 Columns BF-BH calculate costs and benefits excluding the costs and benefits of reduced and increased traffic. Column BF totals up the present values of the costs for all the actors, column BG does the same for benefits and column BH calculates the present value of net benefits.

A1.72 Columns BI-BK include costs and benefits of reduced and increased traffic based on Ofcom (2006) figures.

A1.73 Columns BL-BN include costs and benefits of reduced and increased traffic based on survey figures.

Yellow – comparing total costs and benefits to the baseline

A1.74 In the Op 1 and Op 2 worksheets, columns BO-BW compare costs and benefits of the relevant option to the costs and benefits in the baseline scenario.

A1.75 Column BO subtracts for each year the present value of total costs of the baseline scenario (excluding costs of lost business) from the present value of total costs for the scenario associated with the worksheet, column BP does the same for benefits (excluding benefits from increased business) and column BQ does the same for net benefits.

A1.76 Columns BR-BT do the same for the case where costs and benefits of lost and gained business are included using Ofcom (2006) figures.

A1.77 Columns BU-BW do the same for the case where costs and benefits of lost and gained business are included using survey figures.

Culmination – the summary worksheet

A1.78 The summary worksheet is the first sheet in the model workbook. It lets the user choose the call volume demand scenario and the year of the eventual Dublin number change.

A1.79 It also contains summary output tables. For both options 1 and 2, it presents the present values of costs, benefits and net benefits accruing to each actor from that option totalled over all years up to 2400, with and without taking into account of the baseline. The effect of limiting the time period to 2400 is only a factor when the baseline is not taken into account.