

REGULATORY AND MARKET ENVIRONMENT

A Practical Guide ON BENCHMARKING TELECOMMUNICATION PRICES

Report



Telecommunication Development Sector



A practical guide on benchmarking telecommunication prices

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This report has been prepared for ITU by Mr Matthew O'Rourke and Mr David Rogerson, under the direction of the Regulatory and Market Environment Division (RME), of the Telecommunication Development Bureau (BDT). This study has been developed using data from the ITU Tariff Policies Survey, ICTEye database (www.itu.int/icteye/).



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Foreword

A "benchmark" originally described a surveyor's mark that was cut into a wall or stone in order to hold a special bracket called a "bench". Surveying equipment was mounted onto that bench and the surveyor's measurements of altitude or the level of a tract of land were made in reference to the position and height of the mark. Of course nowadays the term benchmark is used to refer to any standard or point of reference, and pretty much anything can be benchmarked.

Analysing prices through comparison to a benchmark can be a particularly useful tool for regulators, regardless of the extent to which the regulator is actually involved in price-setting. A price benchmark can help a regulator assess the appropriateness of prices submitted for approval, assess the effectiveness of competition, negotiate price reductions, identify when regulatory intervention might be warranted, or to confirm the reasonableness of outcomes from (or inputs to) a cost model. However, price benchmarking – particularly between prices that exist in different countries – can be complicated by the need to ensure like-with-like comparisons and the different potential interpretations of the benchmark results. Benchmarking can also become over-complicated through excessive effort to improve relevance and accuracy.

This practical guide explains how to develop a benchmark of telecommunication prices, why a regulator might want to do so, and how the benchmark should be interpreted and applied. The steps involved are explained with reference to hypothetical benchmarking exercises together with actual price benchmarks developed by communications sector regulators.

I trust that this practical guide will serve to assist ITU Members in designing their tariff strategy in order to improve competition in the market.



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Introduction: The case for regulatory benchmarking

One of the key tasks of regulatory authorities is to ensure that prices, especially those of dominant operators and service providers, are fair, reasonable and conducive to economically-efficient outcomes. In the broadband environment this will generally mean ensuring that the wholesale prices are cost-based and that retail prices are neither excessive (i.e. exploiting customers) nor anti-competitive (i.e. exploiting rivals). For a regulator to determine definitively whether any of these thresholds have been breached will require a detailed analysis of the service provider costs and profit margins. This can be a substantial, time-consuming and costly endeavour that depends upon detailed data provided by the service providers concerned. Although such processes may be necessary in certain circumstances, for example where required by law or to substantiate a regulatory decision under appeal, they are best avoided wherever possible given the complexity and costs (including opportunity costs) that they involve. This is where benchmarking comes in.

The role of benchmarks is to provide a simple but effective cross-check on the general level of prices in a market. They can be used to provide a measure (preferably an upper measure) of reasonable pricing; but they cannot be used to drive prices down to their lowest and most efficient level as cost-based price regulation is intended to do. Regulators therefore should only use benchmarks as short-term measures to obtain an improvement in prices pending a more detailed cost analysis. If deep price cuts are required there is no substitute for cost-based analysis and any regulator attempting to use benchmarks for this purpose will end up trying (and probably failing) to defend their benchmarks in court. It is for this reason that the ITU/*infoDev* Telecommunications Regulatory Handbook¹ recommends benchmarking only in situations where there is no available costing data, or only rudimentary data is available.

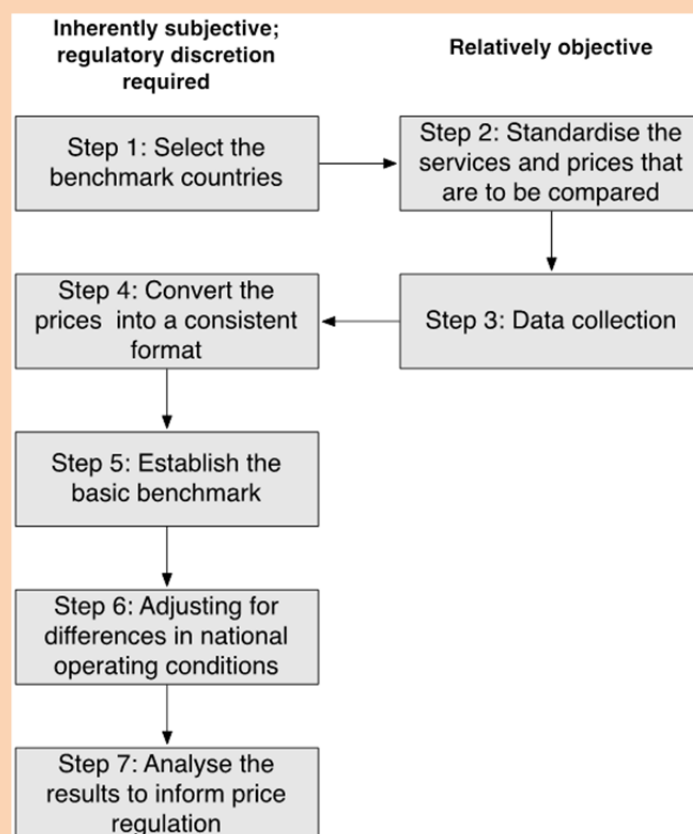
Benchmarks are thus most effectively used as a complement to cost models. This can mean that benchmarks are constructed as an interim measure, pending the development of a cost model that will ultimately provide a more accurate price determination tool. (Indeed, when explicitly deployed as a temporary price-setting tool the deficiencies of a benchmark are more likely to be excused by market players.) However, there can also be an on-going role for benchmarks even after cost-models are developed, for example to provide supporting evidence for model inputs and to crosscheck model outputs.

The steps involved in the development and application of a benchmark of telecommunication prices are summarised in Figure 1. It is neither the only nor the perfect approach, but it is a relatively simple approach to constructing an effective benchmark. There can often be a temptation to dress up benchmarks to look more scientific than they really are. Such temptation should be resisted as the additional complexity will usually result in only spurious accuracy and be of very marginal benefit, if at all.

It is always worth bearing in mind that each adjustment that is made to the benchmark data in an effort to improve comparability or relevance shifts the benchmark data further away from their actual values and ultimately towards a point where the benchmark data no longer reflects any actual prices. Further, additional adjustments create additional matters to argue and agonise over. As is highlighted in Figure 1, many of the steps in the benchmarking process are subjective by nature and require the regulator to exercise considerable discretion and accuracy. There simply is no one right answer or approach in benchmarking.

¹ www.itu.int/dms_pub/itu-d/opb/reg/D-REG-TRH.01-2011-PDF-E.pdf, p57-58

Figure 1: An overview of the benchmarking process



Source: ITU.

Key points:

- Use benchmarks for quick-wins to avoid the worst excesses of dominant service provider pricing.
- Err on the side of caution. A conservative benchmark that provides an upper limit to prices is likely to be effective; an aggressive benchmark designed to achieve a large or rapid price reduction will be hard to defend.
- Don't pretend that a benchmark is a precision tool for pricing. Keep it simple and it will be effective. Adding complexity usually results in spurious accuracy.

Step 1: Selecting the benchmark countries

The principal weakness of an international benchmarking exercise is that complex differences in the circumstances of various countries must either be normalised or disregarded. The greater the difference in the circumstances of the benchmark countries, the more adjustments will need to be made to the underlying data to make them comparable. This is an important consideration when selecting the countries that will form the benchmark. Few countries are so similar that they are immediately and directly comparable to one another, so the selection of countries to include in the benchmark must be made on the basis that their circumstances are reasonably comparable to the country being benchmarked.

Identifying countries that are "reasonably comparable" sounds easier than it often proves to be in practice as the list of potential national differences is considerable. For example:

- **countries** differ in terms of their geographic size, population and economic development;
- **telecoms markets** differ in terms of their size, stage of liberalisation, number of participants, labour costs, demand, and level of affordability;
- **telecoms networks** differ in terms of their size, topology, utilisation, technology and age;
- **network operators** differ in terms of their relative sizes, scale, operating practices and level of integration; and
- **regulatory environments** differ in terms of the level of taxes and duties, radio frequency spectrum management and cost, and the methods used to establish costs and set interconnection prices.

To insist that all that benchmark countries are comparable across all of these parameters would be unreasonable: the benchmark set would likely be empty! It is better to identify the parameters that are most important for the specific benchmark that is being constructed and then to select the countries that are most similar in terms of those parameters.

The ITU/*infoDev* Telecommunications Regulatory Handbook² advises that regulators should benchmark against countries within the same region or countries with comparable circumstances, and should focus on the factors that can justify different cost structures (such as population, population density, and the geographical dimensions of the territory). To do this it is best to begin with a long-list of potentially comparable countries from within the region and then eliminate from that list any countries that are extremely different in terms of any of the key parameters that can influence costs. Ideally the final short list of countries will comprise as many relevant countries as possible so as to avoid any one country unduly affecting the results. A good rule of thumb is to ensure the shortlist comprises of a minimum of eight relevant countries. Most importantly, the benchmark countries should also be at similar stages in their socio-economic and industrial development; thus developing countries should typically be benchmarked against other developing countries.

An example of country selection: Mobile termination rate benchmark

To illustrate the process of benchmark country selection, consider constructing a benchmark of mobile termination rates (MTR) for the country of Grenada³. The first task is to create a long list of countries from the region, which may be taken to comprise the Caribbean and Central America. In practice there may be some countries from which it is impossible to collect the necessary data and these countries may be excluded, as might any countries that operate under monopoly (e.g. Montserrat). The remaining countries need to be compared with Grenada in terms of the key cost parameters relevant to this benchmark. For an MTR benchmark these parameters might be:

1. **GDP per capita**, which measures the economic development of the country. There is a strong correlation between GDP per capita and usage of telecommunication services, which means that GDP per capita is a key measure of scale economies (since network costs are driven to a large extent by call volumes).
2. **Population**, which provides a separate measure of potential economies of scale.

² http://www.itu.int/dms_pub/itu-d/opb/reg/D-REG-TRH.01-2011-PDF-E.pdf p. 57-58

³ There is no special reason for choosing this benchmark nor for selecting Grenada within it other than as a representative example.

3. **Population density**, which affects network development costs. The more densely populated a country is, the lower the costs of serving the same total population.
4. **Mobile penetration**, which measures the number of mobile subscribers per 100 population and provides an indicator of the specific development of the mobile industry.

Much of the information necessary to select comparable countries can be found within the ITU ICTeye database⁴, which provides key statistical information for all countries as well as country profiles that outline the national regulatory and tariff policies environment. For example, using the information of the ICTeye Tariff Policies Database⁵ it would be possible to filter the long list of countries to include only those where cost-based rates have already been implemented, or only those countries that use long-run incremental cost (LRIC) models.

Figure 2 illustrates these comparisons. In the example of Grenada, it is seen to be towards the middle of the sample for most of the parameters, which suggests that this might be a relevant set of countries. However, it may be noted that certain countries appear as outliers (either extremely high or extremely low) according to the different parameters:

1. With respect to GDP per capita, Haiti could be considered as low, while Curaçao, British Virgin Islands and Cayman Islands are very high;
2. In terms of population, none of the countries is extremely low compared with Grenada, but El Salvador, Honduras, Haiti and the Dominican Republic are extremely high;
3. With respect to population density, Surinam and Guyana are extremely low while Aruba and Barbados are extremely high;
4. In terms of mobile penetration rates, Haiti and Honduras could be considered as low, while British Virgin Islands and Cayman Islands are extremely high.

⁴ www.itu.int/net4/itu-d/icteye/Default.aspx

⁵ Regional reports are available at: www.itu.int/net4/itu-d/icteye/FocusAreas.aspx?paramWorkArea=TARIFFPOLICIES under costs and tariff models. Individual country reports are also available.

On the basis of this analysis it would be appropriate to exclude British Virgin Islands, Cayman Islands, Haiti, and Honduras from the sample. These exclusions would be justifiable on the basis that those particular countries are outliers on at least two of the four parameters. However, it is important to recognise that there is a degree of subjectivity in this choice. While the exclusion of these countries may be justified as reasonable it cannot be proved to be necessary any more than the decision to retain countries such as Aruba and El Salvador, which are outliers on only one parameter. Reasonableness is the sole criteria that can be used in benchmarking, and the best outcome is the one that may be described as "most reasonable".

In some benchmarking exercises it may be important to know – in broad terms – how the prices were set in each of the countries on the long list. For example, if trying to estimate interconnection rates that are reasonably reflective of cost, it is important to include in the benchmark only those countries that have set rates based on a detailed cost study or cost modelling, and which have been formally approved on that basis by an independent regulatory authority. It is reasonable to assume that interconnection prices will closely reflect costs in a country that has set those prices based on cost modelling, and it requires a formal approval by the regulatory body to confirm or 'certify' that that is the case. In contrast, interconnection prices that have been set unilaterally by an operator or are the outcome of commercial negotiations are unlikely to be based on costs. Similarly, benchmarking against countries that have themselves used benchmarking to set interconnection rates potentially introduces a series of inappropriate comparator countries into the benchmark.

Box 1: Benchmarking in Namibia

In 2009, the Namibian Communications Commission (NCC) wanted to establish termination rates on the basis of the Long Run Incremental Costs (LRIC) of an efficient operator. It chose to use benchmarking as a simple expedient that did not require extensive co-operation from the operators. The countries selected for the benchmark were those in which LRIC models had been established and rates set on the basis of an efficient operator: these countries comprised Austria, Australia, France, Sweden and Tanzania.

The benchmark suggested that rates in Namibia should be in the range NAD 0.12–0.35 per minute. NCC conducted some simple top-down analysis to compare with the costs of the national operators, concluding that the costs of the "efficient" operator, MTC, were NAD 0.24 per minute. It decided to give a 35 per cent margin for error and set termination rates at NAD 0.30.

Several points of good practice emerge from this example:

- The benchmark set was fully comprised of cost-based rates.
- Although the countries chosen are diverse and seemingly very different from Namibia, particular attention was paid to a key feature of the country – low population density that drives up cost. It was noted that Australia closely matched these conditions.
- NCC adopted a conservative approach, recognising that it could not drive down termination rates to cost-based levels on the basis of benchmarking alone.
- NCC conducted public consultation on four "models" or implementation glide paths before reaching its final decision.
- Symmetrical rates were imposed on all operators, fixed and mobile, to aid convergence and transition to IP-based networks.

Source: "Namibia Interconnection Benchmarking Study, Final Public Report", Research ICT Africa, at the ITU ICT. Regulation toolkit: www.ictregulationtoolkit.org/en/toolkit/docs/Document/3995.

Key points:

- *Include countries in the benchmark only if there is a good reason to do so. Try to include only countries from the same region and at a similar stage of economic development.*
- *Exclude countries from the benchmark if there is a good reason to do so. Exclude outliers on the parameters that most affect costs (e.g. GDP per capita, population, population density, urbanisation and teledensity). If the benchmark is being used as a proxy cost-model, also exclude countries that have not established cost-based prices.*
- *Include as many comparable countries in the benchmark as possible. A reasonable minimum is eight countries.*

Step 2: Standardising the services and prices that are to be compared

It almost goes without saying that in order to make a comparison of any sort it is first necessary to define what it is that will be compared. At first glance this may seem straightforward – after all, if the regulator is interested in mobile call termination rates then it will obviously need its benchmark to comprise the wholesale prices that are charged for mobile call termination. However, there is often considerable variation in the structure of telecommunication prices, which makes direct comparisons difficult if not impossible. Prices may have multiple parts, charges may vary by the part of the call, type of call, duration, time of day, or geography. There may even be a charge to receive the call! Such differences will often be found between the prices of competing service providers within the same country; an international benchmark thus creates countless possibilities for structural price differences.

Even the seemingly straightforward example of mobile termination rates is not as simple as it first seems. Whereas some countries, such as Mauritius, have a very simple interconnection pricing structure with a single price for mobile termination, other countries may set different mobile termination rates (MTRs) according to time of day, distance, network utilisation and/or which network operator is terminating the call. Some MTRs may also involve a separate call-set up charge in addition to the call duration element. In the face of such differences it is essential to normalise prices before any useful comparisons can be made.

An example of service and price selection: PSTN retail tariff benchmark

A common approach to resolving these difficulties is to establish a service "basket"; that is a hypothetical shopping basket which is filled with the same amount of equivalent goods (in this case telecom services). The basket creates a standardised level of consumption that helps to smooth over effects created by different pricing structures. The overall price of the basket as a whole is then compared instead of the individual unit prices.

Such an approach is particularly appropriate when comparing retail tariffs because of the different ways in which retail structures may be structured and the prevalence of price discrimination. The use of telecommunication price baskets has been popularised and facilitated by the Organisation for Economic Co-operation and Development (OECD), which has developed a series of representative baskets of fixed (PSTN) telecommunication services, mobile telecommunication services, leased line services, fixed broadband services, and wireless broadband services.⁶

⁶ Revised OECD price benchmarking baskets: www.oecd.org/sti/broadband/41049579.pdf.

For example, the OECD establishes a PSTN (Public Switched Telephone Network) basket that comprises:

- **Installation charges:** Assuming an average service contract lasts five years, a fifth of the installation charge is attributed to each year.
- **Line rental:** The fixed recurring charges typically billed monthly or quarterly are calculated for the period of a year.
- **Fixed line calls:** The call basket comprises local and national calls, with the latter subdivided (where relevant) into two distance bands (the shortest and the longest distance bands in each country). Typical annual call volumes are assumed for each of these call types; when multiplied by the tariffs in each country they produce a weighted contribution to the basket.
- **Calls to mobiles:** A similar approach is applied to calls to mobiles, but in this case the basket comprises calls to each of the mobile networks, weighted in terms of their market shares.
- **International calls:** A similar approach is applied to international calls, but in this case the basket comprises calls to each of the other countries included in the benchmark sample, weighted by traffic volumes.

Figure 3: The OECD 100 minute PSTN call basket

Call type	Proportion	Period	Proportion	Average call duration (minutes)
Local	48%	Day	69%	1.9
		Evening	17%	2.3
		Weekend	14%	2.1
National	19%	Day	69%	2.3
		Evening	17%	3.3
		Weekend	14%	3.3
Calls to Mobile	30%	Day	69%	1.6
		Evening	18%	1.9
		Weekend	13%	1.5
International	3%	Peak	75%	3.2
		Off-peak	25%	5.4

Note: The OECD uses several different call baskets representative of different customer types. Each basket has a slightly different call composition. The 100-minute basket is representative of a residential customer.

Source: OECD.

The OECD ready-made baskets provide a convenient option for anyone wishing to construct an international benchmark of telecommunication prices. However, if the country for which the benchmark is being prepared is not a member of the OECD, and does not have a similar socio-economic profile to OECD member countries, then a degree of caution is warranted. As the OECD baskets reflect the service mix and utilisation rates of consumers from the high-income countries that make-up its membership, they will not necessarily provide a relevant reflection of the type of usage common in developing countries. Ideally a service basket specific to the focal country would be developed in such circumstances.

Although the basket methodology provides a good means of comparing the overall cost of service between countries, it does not directly assist in establishing prices in any one country. This is because it works independently of any tariff structure: the basket simply provides an aggregate view of prices. This can help in some regulatory situations (e.g. to assess the affordability of telecoms compared with income levels, or to provide price transparency to consumers) but it does not help a regulator to establish price structures or individual price levels. If a regulator wished to set actual prices on the basis of a benchmark then, instead of using the basket approach, it would need to standardise the prices that are to be benchmarked based on the particular service that is to be regulated and the unit pricing structure that is common for that service in regulator jurisdiction. Depending on what the particular service is, standardisation may require some assumptions to be made about the nature of service usage (such as call

type or time of day). This is similar to the way in which a service basket is developed but in this case the regulator is benchmarking the unit price for a particular service (possibly used under certain assumptions); whereas a service basket is concerned with the total price for a standardised level of consumption.

Some of the standardisation challenges and options that face a regulator when benchmarking unit prices are illustrated in Table 1 using the examples of mobile call termination and retail broadband access. The issues of data collection and manipulation are then considered in more detail in the sections that follow.

Table 1: Approaches to normalising tariff data in benchmarking exercises

Example of service to be benchmarked	Example variations in service or tariff structure	Possible approach to compare between countries	Assumptions/data requirements
Wholesale mobile voice call termination	Different rates for calls from/to fixed, mobile devices and international.	Weighted average of different call types.	Proportion of calls in each category.
	Time of day tariff variations.	Weighted average of peak and off-peak calls.	Call profile by time of day; definition of peak and off-peak periods in each country.
	Call-set-up and per-minute charges.	Blended per-minute charge.	Average call duration.
	Different rates for different operators.	Weighted average of rates (or rates of dominant operator).	Market shares by revenue (or identity of dominant operator).
Retail broadband access	Offered services have different upload/download bandwidths.	Entry-level service or average of most similar service offerings.	Identify most suitable service comparators for each country.
	Discounts for volume purchase and length of contract.	Set discounts based on average customer contract.	Average annual spend by customer; average contract duration.
	Service bundles (e.g. voice, data, TV and mobile) offer discounts.	Simplest service offering that includes broadband data.	Identify most suitable service comparators for each country.

Key points:

- *Clearly define what is to be benchmarked before collecting data to ensure that the correct data is collected in a useful format. The purpose of the benchmark will determine which services are included and how the service units and prices are best defined and compared.*
- *The basket approach usefully compares a standardised level of consumption. But if the benchmark is intended to inform price setting then it will need to focus on the service and unit price that is to be regulated.*
- *Be as objective as possible. The service and pricing structure that is benchmarked should be based on actual practice in the home country or on a respected independent source, such as the OECD or ITU.*

Step 3: Data collection

The key to collecting data is knowing what data to collect. It is therefore important to have clearly defined what is to be benchmarked, and if necessary standardised the service unit and its pricing, before embarking on data collection. Two sorts of data will typically be required:

- The data that will inform the structure of the benchmark. As indicated in the previous section this will either come from the operator in the home country whose prices are to be reviewed, or the data will come from an independent source such as the OECD tariff baskets.
- The data from each of the benchmark countries that will be needed to compile the benchmark. This data will be in the form of tariffs and will normally be published on the website of the service providers.

It is important to be as transparent as possible when constructing benchmarks⁷, which means that all sources should be specified along with the relevant validity date. If data is not published, a record of the source should be maintained and the raw data should be included in the published benchmark so that affected parties are able to verify (or challenge) the results through replication. Sometimes it may be appropriate for the regulator to confirm price data or the price setting methodology directly with fellow regulators, particularly where the necessary information is in a foreign language or it is unclear whether the most recent price or regulatory decision has been published.⁸ In such cases, the regulator should note such correspondence in its published decision to help substantiate the accuracy of the data in the benchmark.

⁷ Transparency is one of the main reasons for preferring a benchmark to other forms of price-setting such as cost modelling. It should be possible for a third party to verify and replicate the benchmark in its entirety.

⁸ Updated contact information of all NRAs is available from the ITU Membership website at: www.itu.int/online/mm/scripts/mm.list?_search=ITUstates&_languageid=1

Box 2: Rules applied by ITU to standardize its collection of data for a global benchmark of cellular mobile call prices

1. The prices of the operator with the largest market share (measured by the number of subscriptions) are used. If prices vary between different regions of the country, prices refer to those applied in the largest city (in terms of population). If that information is not available, the prices applying to the capital city are used.
2. Prices include taxes.
3. Prices are reported and collected in national currency and then converted to USD and PPP\$.
4. Prices refer to prepaid plans. Where the operator offers different packages with a certain number of calls and/or SMS messages included, the one that comes closest to the 30 calls and 100 SMS included is used. In countries where prepaid subscriptions account for less than 2 per cent of the total subscription base, postpaid prices may be used. In this case, the monthly subscription fee, plus any free minutes, will be taken into consideration for the calculation of the mobile-cellular sub-basket.
5. If per-minute prices are only advertised in internal units rather than in national currency, the price of the top-up/refill charge is used to convert internal units into national currency. If there are different refill prices, then the 'cheapest/smallest' refill card is used. If different refill charges exist depending on the validity period, the validity period for 30 days (or closest to 30 days) is used.
6. Special offers and plans with limited availability (for example, and among others, those reserved for a limited number of customers, or with a limited time period) are not taken into consideration.
7. If subscribers can choose "favourite" numbers (for family, friends, etc.) with a special price, this special price will not be taken into consideration, irrespective of the quantity of numbers involved.
8. Prices refer to outgoing local calls. If different rates apply for local and national calls, then the local rate is used. If charges apply to incoming calls, these are not taken into consideration.
9. If prices vary between minutes (1st minute = price A, 2nd minute = price B, 3rd minute = price C), the sum of the different prices is divided by the number of different prices (for example: price per minute = $(A+B+C)/3$).
10. If prices vary beyond three minutes, the average price per minute is calculated based on the first three minutes.
11. If there is a connection cost per call, then this is taken into consideration in the formula for the mobile-cellular sub-basket, based on 30 calls.
12. If there are different off-peak prices, then the one that is the cheapest before midnight is used. If the only off-peak period is after midnight, then this is not used. Instead, the peak price is used.
13. If there are different peak prices, the most expensive one during the daytime is used.
14. If there are different weekend prices, the price that applies Sundays during the daytime is used (or the equivalent day in countries where weekends are not on Sundays).
15. If there is no weekend price, the average peak and off-peak price that is valid during the week is used.
16. If peak and off-peak SMS prices exist, the average of both is used for on-net and off-net SMS.
17. If calls are charged by call or by hour (and not by the minute), the mobile-cellular sub-basket formula will be calculated on the basis of 30 calls or 50.9 minutes. Similarly, if calls are charged by call or by number of minutes for a specific network/time of the day, this will be taken into account for that particular network/time of the day.
18. Where monthly, recurring charges exist, they are added to the sub-basket.

Box 3: Rules applied by ITU to standardize its collection of data for a global benchmark of entry-level mobile-broadband prices

1. Mobile-broadband prices are collected from the operator with the largest market share in the country, measured by the number of mobile-broadband subscriptions. If this information is not available, mobile-broadband prices are collected from the mobile-cellular operator with the largest market share measured by the number of mobile-cellular subscriptions.
2. Prices include taxes.
3. Prices are reported and collected in the national currency and then converted to USD and PPP\$.
4. Where operators propose different commitment periods for postpaid mobile-broadband plans, the 12-month plan (or the closest to this commitment period) is selected.
5. Only residential, single-user prices are collected. If prices vary between different regions of the country, the prices applying to the largest city (in terms of population) or to the capital city are used.
6. Prices are collected for one of the following technologies: UMTS, HSDPA+/HSDPA, CDMA2000 and IEEE 802.16e. Prices applying to Wi-Fi or hotspots are excluded.
7. Prices are collected for both a) handset-based mobile-broadband subscriptions and b) computer-based mobile-broadband subscriptions.
8. Prices are collected for prepaid and postpaid services, for both handset-based and computer-based plans.
9. Prices are collected for the least expensive plan with a (minimum) data allowance of:
 - i. 1 GB for computer-based subscriptions
 - ii. 250 MB and 500 MB for handset-based subscriptions providing access to the greater Internet over (a minimum of) 30 days.
10. Data volumes refer to both uploaded and downloaded data.
11. Time-based offers linked to 'hours of use' and not to data volumes are excluded.
12. Preference is given to packages that are not bundled (with voice or other services). If the plan chosen includes other services besides mobile broadband, this is specified in a note.
13. Prices refer to a regular (non-promotional) plan and exclude promotional offers and discounts limited in time or to special user groups (for example, existing clients). Special prices that apply to a certain type of device only (iPhone/Blackberry, iPad, etc.) are excluded.

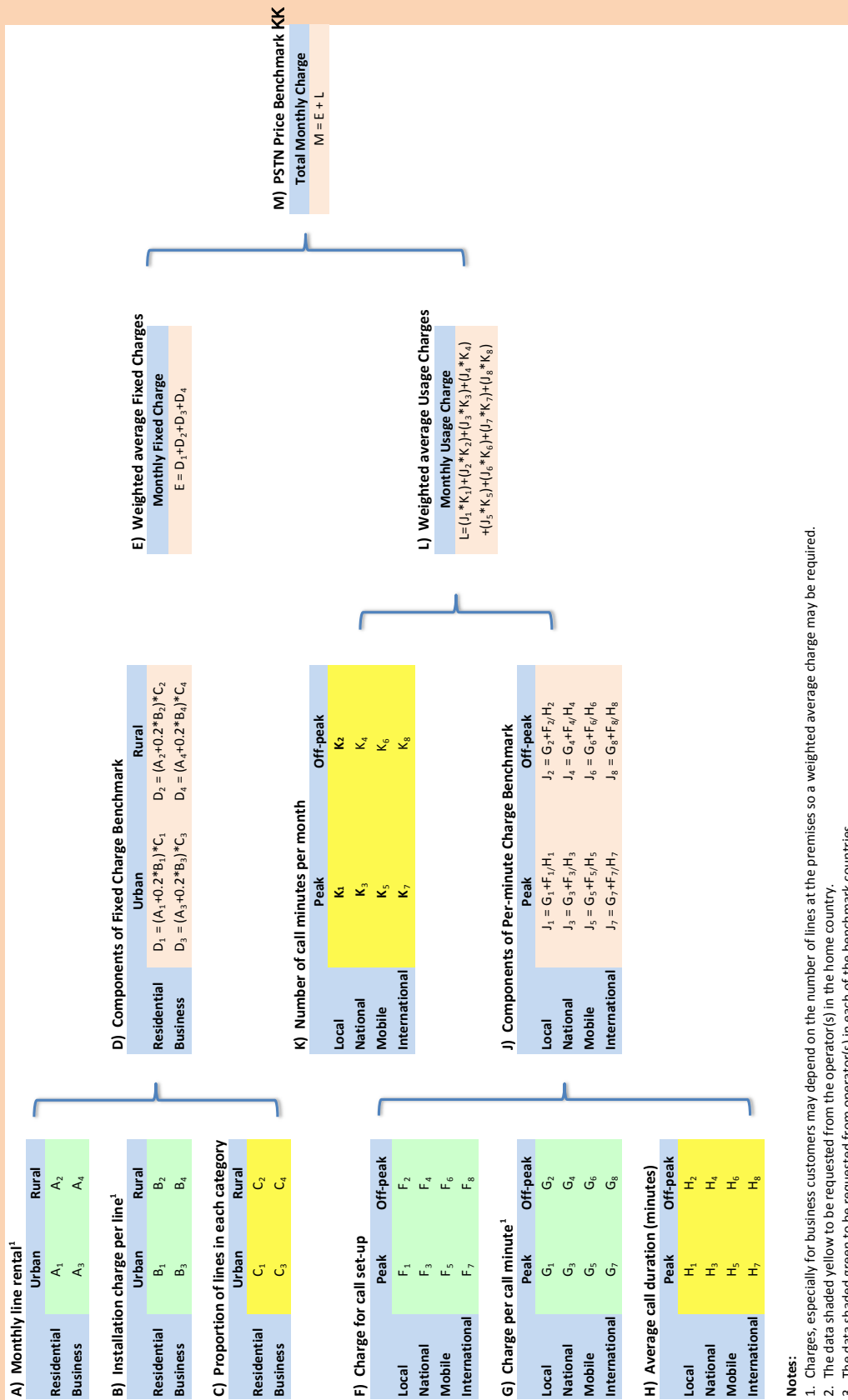
Key point: *To foster acceptance and demonstrate accuracy, benchmarks should be fully replicable. For this to happen all data should be derived from published sources or otherwise included in the published decision.*

Step 4: Converting the prices into a consistent data set

A key challenge in any international benchmarking exercise (and one which will arise whether using the basket approach or converting other countries' prices into the structure of the home country) is manipulating the collected data to achieve a consistent data set. There are a few basic approaches to be aware of:

- Creating a weighted average price. This is the standard means of achieving consistency between sub-categories of service: e.g. installation charges and line rentals may be separated into residential and business or urban and rural; call charges may be separated into different distance bands or calls to different operators or countries. The relevant weightings should be as objective as possible. If using the basket approach, the OECD parameters provide such objectivity; if creating a benchmark to set specific prices, then it is best to use the actual data of the operator in the home country. See Figure 4 for an example.
- Converting to a standard unit of measurement. For example, prices are generally quoted per minute, which means that average call duration is required if call set-up charges are to be converted into equivalent per minute charges. However, some tariffs may be set per meter unit, or they may be billed per-second rather than per-minute, in which case they will need to be converted into per minute equivalent prices based on typical call duration. Equally, if call minutes and monthly rentals are to be combined into a single charge (which is increasingly common pricing practice in "big bucket" or "all you can eat" retail pricing plans), then monthly call volumes will be needed. This is also shown in Figure 4.
- Converting between currencies. In almost every international benchmark set there will be a variety of currencies in use. The question then arises as to how to convert to a common currency. The simplest approach is to use exchange rates, in which case an averaged rate over a reasonable period of time should be used to smooth out any exchange rate fluctuations. An alternative approach is to convert prices into a common currency on the basis of purchasing power parity (PPP), which takes account of the amount of goods and services that can be bought with a given unit of currency. Converting prices on the basis of PPP is particularly relevant when benchmarking retail prices as consumers tend to compare prices against the cost of other potential purchases. Price conversions on the basis of averaged exchange rates will generally be more appropriate for benchmarks of wholesale prices, although in some case it may be more appropriate to use a blend of exchange rates and PPP conversion rates based on a weighting that reflects the proportions of an operator costs that derive from international markets (e.g. network equipment purchases) and which are incurred locally (e.g. labour).

Figure 4: Example approach to creating a benchmark of PSTN charges



Notes:
 1. Charges, especially for business customers may depend on the number of lines at the premises so a weighted average charge may be required.
 2. The data shaded yellow to be requested from the operator(s) in the home country.
 3. The data shaded green to be requested from operator(s) in each of the benchmark countries.

Box 4: Experiences in the collection of comparable data for the ITU global benchmark of entry-level fixed-broadband prices

Two major factors affect the comparability of fixed-broadband prices across countries: differences in speed and differences in data allowance. The minimum downstream speed of a broadband connection is defined at 256 kbit/s, and the tariff data are collected for plans based on this minimum speed. Where several offers (with differing speeds) are available, preference is given to the cheapest available connection that offers a speed of at least 256 kbit/s. However, in the majority of countries it transpired that no plans at 256 kbit/s are offered and advertised speeds are often much higher. In 2012, plans with an advertised speed of 256 kbit/s were offered in a mere 39 (all of them developing countries) of 169 countries, whereas in 40 countries the recorded plans come with an advertised speed of over 2 Mbit/s. The highest entry-level broadband speeds (for FTTH/B connections) were advertised in the Republic of Korea and Romania, where there were no offers below 50 Mbit/s.⁶ This significant difference in speed, and hence quality of service and user experience, limits the comparability of prices. On the other hand, it has to be remembered that information is based on speeds as advertised by operators and not on actual speeds which can vary significantly. Some countries require operators to publish information on real speeds achieved, but they remain a minority.

Fixed-broadband plans are based on a monthly usage of (a minimum of) 1 Gigabyte (GB). All 169 countries included in the 2012 fixed-broadband price analysis had offers equal to or above this data cap. However, only 12 countries had offers at exactly 1 GB per month, whereas in the majority of countries (101) unlimited data allowances were offered. In these latter countries, no capped plans for fixed-broadband were available. While plans limited to 1 GB per month are not directly comparable with unlimited offers, the price of these unlimited offers is still very competitive and most of the top-ranking countries have unlimited plans.

Further issues concerning the comparability of data were revealed by the data-collection exercise. In some cases, the price for the rental of a fixed-telephone line or other services, such as television, is bundled and cannot be extracted from the monthly charge. Postpaid fixed-broadband subscriptions can vary in terms of commitment periods, with some operators only offering subscriptions for a minimum of 24 months. Furthermore, it is not always clear whether taxes are included in the advertised price.

Source: ITU (2013), Measuring the Information Society.

Key points:

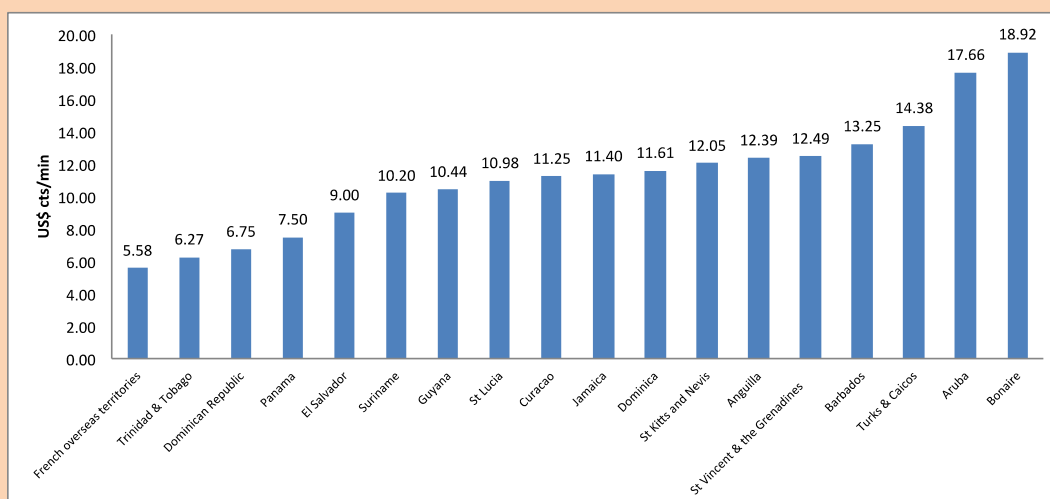
- *When benchmarking for price comparisons purposes, standardise pricing data from different countries (or different service providers) using an objective reference point, such as average customer profiles or the OECD service baskets.*
- *When benchmarking to inform price regulation, standardise pricing data from different countries so that it aligns with the actual service units and pricing structure of the product or service provider that is to be regulated.*
- *The conversion of prices into a common currency should generally be based on averaged currency exchange rates, but conversion on the basis of purchasing power parity may be appropriate in a benchmark of retail prices or where locally incurred costs account for a significant proportion of service providers' total costs.*

Step 5: Establishing the basic benchmark

Once a consistent set of prices for a standardised set of services (or service unit) has been collected for each of the countries in the benchmark, it is time to establish the basic benchmark. There are many ways to derive a benchmark: options include the average, the median, a standard deviation either above or below the average, or the average of a sub-group of countries within the benchmark set (e.g. the three highest or three lowest rates). The most appropriate choice will largely depend on the purpose of the benchmark and the extent to which the regulator feels that its choice can be justified and defended, if necessary in a court of law. However, it should be remembered that even the best benchmark will provide only an approximation of the actual operating costs (and thus cost-based prices) of any service provider so it is prudent to derive and apply the results cautiously. Establishing the benchmark based on a straight average is probably the most prudent approach and an alternative approach should only be adopted with a very good reason. Cicero, the philosopher and statesman from Ancient Rome, is reputed to have said that the wise are instructed by reason, average minds by experience. However, if he had been talking about benchmarking he could have swapped his words around and said that both wise minds and experienced minds instruct the use of averages.

To illustrate how the different ways of establishing the benchmark can shape the result, let us return to the hypothetical benchmark of MTRs for Grenada (refer Figure 2). After the exclusion of countries that are substantially dissimilar to Grenada, a shortlist of 18 countries remained. The average mobile termination charges that were in effect in each of those countries in mid-2011 are shown in Figure 5.

Figure 5: Illustrative mobile termination benchmark (Grenada, 2011)



Source: National regulatory authorities.

There are many credible approaches in which that data can be used to establish a benchmark MTR for Grenada. For example, one could adopt the:

- mean, which produces a benchmark MTR of 11.23 US cents per minute;
- median, which produces a benchmark MTR of 11.33 US cents per minute;
- mean of the eight countries with the lowest MTRs, which produces a benchmark MTR of 8.34 US cents per minute;
- mean of the eight countries with the highest MTRs, which produces a benchmark MTR of 14.06 US cents per minute;
- mean plus one standard deviation of the sample, which produces a benchmark MTR of 14.79 US cents per minute; or
- mean less one standard deviation of the sample, which produces a benchmark MTR of 7.67 US cents per minute.

A regulator faced with this sort of benchmark will want to establish MTRs at the lowest level that can be justified because the lower the rate the greater the consumer benefits will be. But if the regulator goes too far and sets rates that are below economic costs, it will inhibit investment and more likely face a legal challenge. On this basis it is hard to argue against establishing rates using the mean (or possibly the median) of the sample. Regulators that have adopted such an approach, including the TRA in Bahrain⁹ and the Communications Commission in the Isle of Man,¹⁰ have generally not had their decisions challenged. This is no doubt a consequence of many factors, however it is instructive to note that those regulators that have sought to establish a benchmark through a more aggressive technique have inevitably faced more opposition from the operators concerned¹¹ (see the example of New Zealand in Text Box 5).

Key points:

- *Mean what you say! It's generally best to use a simple mean to establish the benchmark. There should be a very good reason, supported with clear rationale and substantiated by data, to apply other potential methods to fix the benchmark rate.*
- *Always remember that benchmarks can provide only an approximation of the actual operating costs of a particular service provider, so establish and apply the benchmark cautiously.*

⁹ See: www.tra.org.bh/media/document/2011PricesBenchmarkingRepforArabCountries.pdf

¹⁰ See: www.gov.im/lib/docs/cc/consultations/mobileterminationratesconsultatio.pdf It is notable that a key reason for the use of benchmarks in IoM was the disproportionate cost of developing LRIC models in such a small jurisdiction.

¹¹ One good example of deviations from the mean was provided by an early approach of the European Commission to mobile termination rates. The 1997 Interconnection Directive allowed the use of a benchmark as a proxy for cost-based rates but required that the benchmark was based on the mean of the lowest three MTRs in the European Union. This was proposed as a temporary solution in the period before cost models were constructed by national regulatory authorities. See: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997L0033:EN:HTML>

Box 5: Benchmarking in New Zealand

New Zealand provides a very comprehensive case study on the use of price benchmarking in telecommunication regulation. Decision 724 of the New Zealand Commerce Commission of 5 May 2011 is essential reading for anyone interested in this topic. It presents arguments from all parties about how benchmarks should be constructed and used to set prices, specifically wholesale termination rates for mobile voice and SMS. At very least this 358-page report demonstrates that benchmarking is not always an easy option compared with cost models.

The Commerce Commission (ComCom) decided that it was best to make the benchmark set as large as possible subject to specified criteria:

- a similar service had to be provided (and cost data publicly available);
- the country had to be comparable to New Zealand (determined on the basis of urbanisation levels);
- a bottom-up forward-looking LRIC methodology had to be used to establish the costs of call termination.

ComCom rejected the idea of adjusting benchmark outcomes for factors that influence costs. It considered this neither feasible nor desirable, even though a range of such factors was proposed by industry. To demonstrate the point, its consultants analysed the impact of population density and concluded that no more than 30 per cent cost variations could be imputed to this variable, whereas cost model outcomes varied by well over 100 per cent. ComCom concluded that making any adjustments to the benchmark thus ran considerable risk of unintentional bias. As a result it preferred to use as large a benchmark set as possible, without making adjustments for exogenous cost factors.

Given its scepticism about adjustment factors, it is perhaps strange that ComCom nevertheless chose to limit the benchmark set on the basis of one such factor: urbanization. A range of otherwise appropriate countries were excluded because their urbanization did not fit between 60 and 100 per cent. Other countries that did fit the urbanization criterion were excluded because the cost models were constructed by the operator rather than the regulator, were top-down rather than bottom-up, or were not published in sufficient detail as to guarantee the methodology used. As a result, the large benchmark set that ComCom sought to establish ended up consisting of just 10 countries as shown below.

Country	Urbanisation	Cost standard	Year of model	Benchmarked cost estimate (NZ cpm, 2011)
Hungary	68%	LRIC+	2008	10.89
Belgium	97%	LRIC+	2010	10.13
Denmark	87%	LRAIC	2011	7.23
Australia	89%	TSLRIC+	2008	6.37
Norway	79%	LRAIC	2011	6.27
UK	80%	LRIC+	2011-12	5.25
Malaysia	71%	TSLRIC	2008	5.05
Sweden	85%	LRIC+	2011	4.58
Netherlands	82%	LRIC+	2010-11	4.39
Lithuania	67%	LRAIC	2009	3.93
France	85%	LRIC+	2011	3.57
Israel	92%	LRIC+	2011	2.77
75th percentile				6.58
Median				5.15
25th percentile				4.28

The benchmark outcome was set at the level of the 25th percentile rather than the median or mean of the sample. The operators challenged this approach, with some arguing for the median and others for the 75th percentile given the error margins created by the small sample. In fact ComCom had itself suggested using the 37.5th percentile in its draft decision, but was persuaded to use the lower figure by its consultants.

Finally, as a matter "very finely judged" the Commission decided to implement the new rate on a 1-year glide path. One of the Commissioners preferred an immediate move to the cost-proxy rate, but the overall feeling was that a change of this magnitude (more than 50 per cent reduction in rates) should be phased in.

Source: <http://www.comcom.govt.nz/regulated-industries/telecommunications/regulated-services/standard-terms-determinations/mobile-termination-access-service/>

Step 6: Adjusting for differences in national operating conditions

If a regulator wants to deviate from the mean of a benchmark sample another approach is to do so through some explicit adjustment to the raw data of the benchmark to reflect differences in national operating environments. The aim should be to adjust the benchmarking data so as to normalise for significant differences between the countries in the benchmark set that affect the cost of service provision. Both of the underlined terms are important because adjustments risk overcomplicating the benchmarking exercise, particularly if the benchmark is intended to be used simply as a common sense check on the outcome of a cost model rather than the principal or only basis for determining rates. The more adjustments that are made the easier it will be for vested interests to disparage the conclusion either by criticising the adjustments that have been made or by pointing to other adjustments that might equally have been on account of other differences between the benchmark countries. Table 2 shows some of the factors for which benchmark adjustments may be justified.

Table 2: Common adjustments to normalise national differences in benchmarking exercises¹²

Factor	Reason
Population density	The number of inhabitants per square kilometre in each country can affect network development costs. Countries with high population densities tend to have lower network costs than countries with lower population densities.
Local area size	This may affect the proportion of short and long distance calls and therefore the costs of interconnection.
Extent of urbanization	Network development costs are lower for urban areas than rural areas. Countries with a high degree of urbanization tend to have lower network costs than countries with less urbanization.
Call duration	This may vary widely across countries for several reasons. For example, if customers pay a flat rate for unlimited local calling, average call duration is likely to be longer than in countries where customers pay a per-minute rate. Networks with higher call durations need more network capacity, and so will have higher costs.
Input prices	The costs of key inputs will vary across countries, and this will affect interconnection costs. For example, the cost of capital will be significantly higher for most developing countries than for developed countries, due to higher risk in developing markets.
Scale economies	If a firm faces significant fixed costs, average cost is likely to decline as output increases. Markets with greater scale generally have lower average costs. When attempting to extrapolate prices or costs from countries with scale advantages to a country with a smaller market, it may be necessary to adjust the benchmarked data.
Taxes	Price data included in the exercise should either all include, or all exclude retail taxes.

The choice of adjustment factors depends on the nature and purpose of the benchmark. For example, in the case of retail broadband prices, the key consideration is whether consumers in the home country are as well able to afford broadband access as they are in the benchmark countries. Many of the factors in Table 2 are not relevant in this case: neither factors that concern cost of service (e.g. population density, urbanisation, scale economies and input prices), nor those that concern usage-based tariffs (e.g. local area size and call duration). The only factor in Table 2 that is definitely relevant is the issue of taxes, especially for residential users who have no means of recovering those taxes. Other factors that may be considered relevant to a retail broadband price benchmark include inflation (as a predictor of future prices in real terms) and consumer buying power (perhaps through the conversion of foreign currencies on the basis of PPP instead of exchange rates).

¹² Source: infoDev/ITU ICT Regulation Toolkit, available at www.ictregulationtoolkit.org.

An example of adjusting for national differences: mobile termination rate benchmark

Returning to the hypothetical benchmark of MTRs in the Caribbean, we can look at the correlation between several parameters that might be considered both to vary significantly between benchmark countries and to have a significant impact on the costs of mobile termination. Figure 7 looks at these correlations across the benchmark sample for GDP per capita, population, population density and mobile teledensity.

Figure 8 demonstrates that there is a correlation, albeit fairly weak, between each of the factors and MTRs. MTRs fall as GDP per capita and population increase, and as mobile teledensity and population density decrease. The trend lines shown in red on the graphs show how adjustments could in theory be made to the benchmark results to take account of the national variations. As shown in Figure 7, given these national differences a regulator might choose to use this insight to increase by 18.7 per cent the MTR benchmark for Grenada.

Figure 7: Adjusting a basic benchmark for differences in socio-economic factors (Caribbean MTRs, 2011)

	GDP/CAP (\$)	POPs	POP/km2	SUBS/km2	TOTAL
Grenada	5,591	110,000	320	336	
Benchmark set	13,667	1,615,260	222	250	
Benchmark variation*	0.01%	9.82%	4.27%	3.66%	18.72%

* The variation represents the increase in the benchmark results justified in Grenada on account of the socio-economic factors mentioned.

Source: ITU.

In this particular example though, there are at least three reasons why the kind of adjustment shown in Figure 7 should not be made. Firstly, the impact of the various factors on MTRs does not appear to be especially significant (i.e. the trend lines are fairly flat). For example, a 20 per cent increase in MTRs (from 10 to 12 cents per minute) correlates with a five-fold increase in population density or a three-fold reduction GDP per capita.

Secondly, such variations in the MTRs as there are cannot, with any reliability, be attributed to changes in the socio-economic factors. The key parameter here is the co-efficient of determination known as R^2 . This coefficient ranges from 0 to 1 with higher numbers being associated with greater confidence in the correlation. The highest R^2 in the four examples shown is 0.3 which means that no more than 30 per cent of the calculated variation may be attributed to the factor identified.¹³

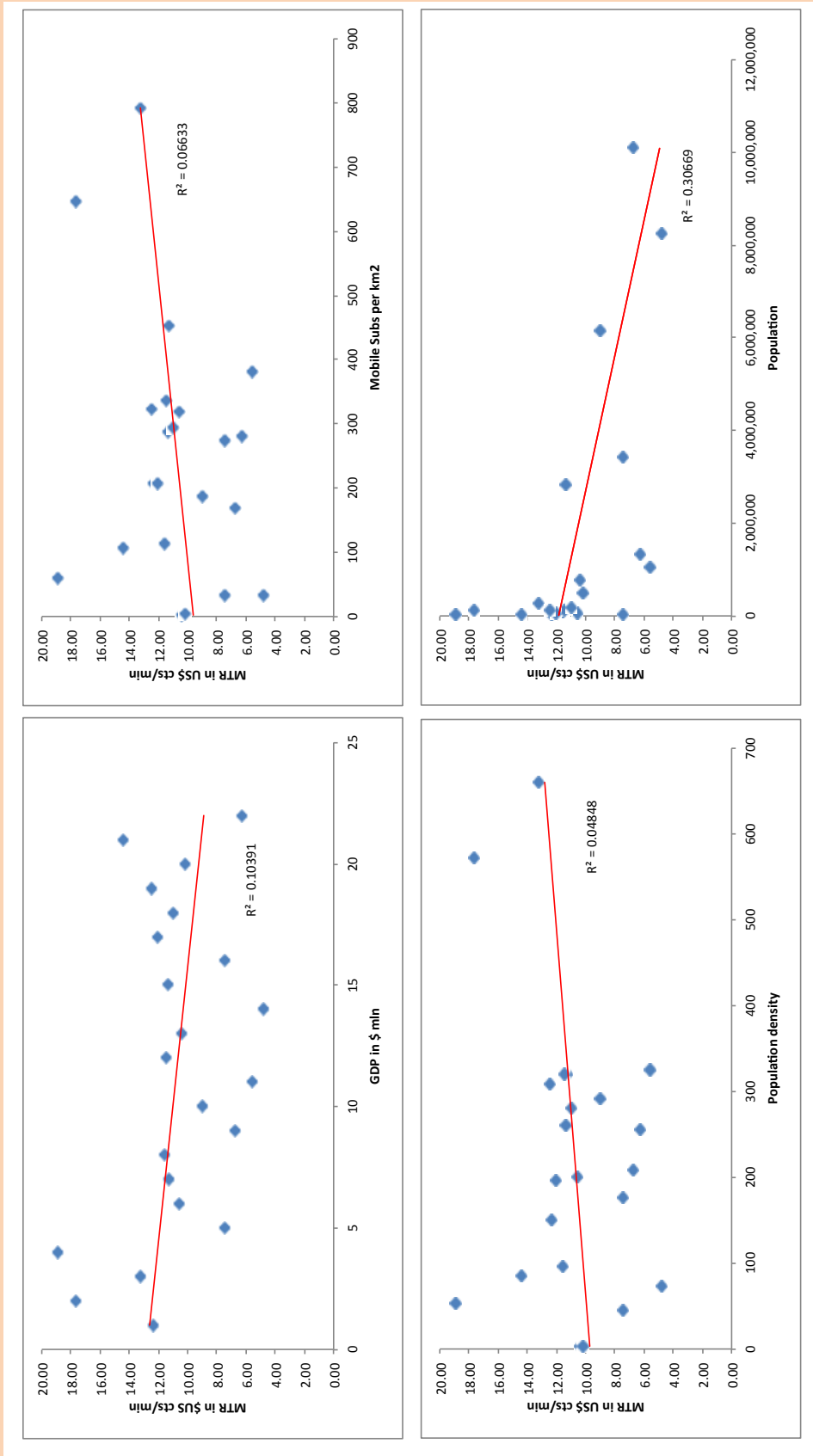
Thirdly, in some cases the perceived correlation is counter-intuitive. For example, it might have been expected that increasing teledensity would lower costs as the fixed costs of network coverage would be spread across more subscribers¹⁴. However, in the sample benchmark countries the opposite effect is witnessed.

Although it would be unwise to derive general conclusions from this specific example, it does illustrate the sort of problems that can be created when a basic benchmark is supposedly improved through adjustments of this kind. It is often better to accept that the appeal of benchmarks is their relative simplicity, and that any unnecessary adjustments will compromise that quality and do so without sufficient gain in terms of the accuracy or reliability.

¹³ R^2 , or the coefficient of determination, is a statistical measure that represents the proportion of the variation in the dependent variable that is “explained” by variation in the independent variables.

¹⁴ Although at very high levels of teledensity the correlation might reverse as additional micro and pico cells need to be added to cope with higher subscriber and traffic volumes.

Figure 8: Relationship between socio-economic factors and MTRs (Caribbean, 2011)



Source: ITU

Key points:

- *As a general rule, refrain from attempting to improve a benchmark by adjusting for differences in the operating conditions in the benchmark countries as the additional complexity will usually result in only spurious accuracy and be of very marginal benefit, if at all.*
- *Only adjust benchmark results to address factors that are demonstrated both to vary significantly between benchmark countries and to have a sizeable impact on the cost/price of the service being benchmarked.*

Step 7: Analysing the results to inform price regulation

There is no point in a regulator establishing a benchmark unless it is going to be used, either directly or indirectly, in setting prices (which includes decisions to forebear from intervention). How a benchmark is best used depends, obviously, on the purpose for which it was constructed, but it is also prudent to take account of how robust are the results of the benchmark. It is important to form a view as to whether the results of the benchmark are sufficiently accurate and reliable to be used in the determination of prices. Since there is a high degree of subjectivity in the construction of a benchmark, it is appropriate to be cautious when using its results.

The first and simplest thing that the regulator should do is to publish the results of the benchmark as a reference point for customers. In doing so, a caveat should be included stating that while the regulator has taken made effort to validate the benchmark, it cannot guarantee that the benchmark is error free and should not be held liable for any decisions taken on the basis of the benchmark; the benchmark is offered for information only.

While this approach should help minimise the risks of litigation, it will have limited market impact. Some service providers might reduce their prices as a result, but the regulator will have no real leverage to enforce such price reductions. Nevertheless, publication on its own is good practice and can help to drive down prices¹⁵.

An example of using a benchmark to set prices: mobile termination

If the regulator wants to go further and use the benchmark actually to set prices (e.g. mobile termination rates) then a much higher burden of proof is required. The essential subjectivity of benchmarks makes this difficult. Nevertheless, so long as the regulator is not too ambitious, decisions can be made, justified and defended. In our hypothetical benchmark of Caribbean MTRs, the mean MTR is shown to be 11.23 US cents per minute (cpm) and the mean of any eight countries within the sample is always under 14.03 cpm. If, a regulator were to set the MTR at 14.03 cpm on the basis of that benchmark it would be difficult for such a decision to be criticised as "unreasonable" (and hence it is unlikely to be challenged in court). However, the closer that the regulator goes to the mean of 11.23 cpm, and certainly if it sets a rate lower than this, the more likely it is to be challenged and the less convincing a legal defence on the grounds of reasonableness is likely to be.

Before using the benchmark to set prices, it would also be wise for the regulator to carry out an analysis of the key socio-economic factors that affect costs and prices (such as those shown in Table 2 above) to confirm the reasonableness of the benchmark results. In our Caribbean example, analysing the four factors of population, population density, mobile teledensity and GDP per capita to demonstrate that the

¹⁵ This assumes that the benchmark demonstrates that prices are too high. In other situations it may be appropriate to publish a benchmark to demonstrate that prices are at reasonable levels.

benchmark does produce reasonable results at least to within ± 20 per cent (i.e. as low as 13.3 cpm). A regulator could therefore proceed with a high degree of confidence to set prices at, for example, 14 cpm.

One commonly used technique to dissipate some of the criticism that is likely to arise when price reductions are mandated, is the use of glide paths. Glide paths are attractive when a significant step-change in rates is required, as is often the case when a cost model is introduced to set call termination rates. However, such a step-change in rates is unlikely to occur in relation to benchmark results, so a glide path is not usually required. It should also be noted that whereas cost-models may justify a glide path on the basis of forward-looking cost-based prices, benchmarks provide a snapshot of current (or recent) prices. This means that rates based on benchmarks should be implemented with immediate effect.

Key points:

- *Always bear in mind that setting prices based on a benchmark may lead to a legal challenge, and act accordingly.*
- *Make great effort to demonstrate the reasonableness of the benchmark and any decision based on it. For safety, err on the high side.*
- *Do not use glide paths to implement prices based on benchmarks.*

Conclusion

International comparisons of telecommunication prices can often be a useful input into regulatory decision-making, particularly where they are used as a complement to the more robust (and thus time consuming) process of cost modelling. However, the benchmarking process can itself become complicated and controversial because of the importance of ensuring comparisons are made on a like-with-like basis. Many of the steps in the benchmarking process are inherently subjective and will require the exercise of regulatory discretion. This is particularly so for the selection of the comparator countries, the standardisation of pricing (or other) data, and the method used to establish the benchmark rate – each of which can have a significant bearing on the final outcome. It is best to resist the temptation to dress up benchmarks to look more scientific than they really are by making adjustments to the benchmark data to improve comparability or relevance. The additional complexity will usually result in only spurious accuracy and be of marginal benefit, if at all. Indeed, this is perhaps signalled by the origins of the term in surveying, which is often defined as both an art and the science of accurately determining the relative position of points on, above or below the surface of the earth.¹⁶ Price benchmarking can provide a regulator with insight into the reasonableness of prevailing prices and inform price regulation but it remains, alas, more art than science.

¹⁶ Saikia, M.D., Das, B.M, and Das, M.M. (2010) *Surveying*, PHI Learning, New Delhi.

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