



FINAL REPORT

Telstra's Price Premium

The premium paid by consumers for fixed and mobile services

*Prepared for
Vodafone Hutchison Australia
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THE CENTRE FOR INTERNATIONAL ECONOMICS
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CANBERRA

Centre for International Economics
Ground Floor, 11 Lancaster Place
Canberra Airport ACT 2609

GPO Box 2203
Canberra ACT Australia 2601

Telephone +61 2 6245 7800
Facsimile +61 2 6245 7888
Email cie@TheCIE.com.au
Website www.TheCIE.com.au

SYDNEY

Centre for International Economics
Suite 1, Level 16, 1 York Street
Sydney NSW 2000

GPO Box 397
Sydney NSW Australia 2001

Telephone +61 2 9250 0800
Facsimile +61 2 9250 0888
Email ciesyd@TheCIE.com.au
Website www.TheCIE.com.au

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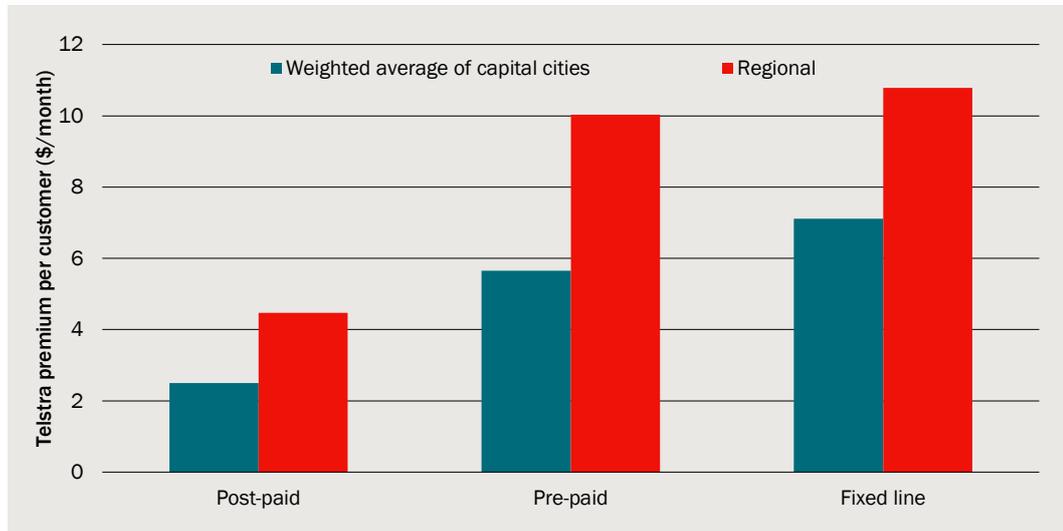
Executive summary

Australian telecommunications consumers pay a substantial price premium to Telstra over other operators in both fixed and mobile services.

- The price premium paid by a Telstra customer is \$10 per month for a post-paid mobile plan, \$5 per month for a post-paid SIM-only mobile plan or mobile broadband plan, \$17 per month for a pre-paid mobile plan and \$18 per month for fixed line services.
- **This premium amounts to a total of \$1.4 billion extra paid each year for Telstra mobile phone services and \$1.8 billion extra paid each year for Telstra fixed line services above the average price charged for the same services by other carriers.**
- To put the premium paid by Telstra customers into perspective, it is equivalent to a 14 cent per litre increase in fuel prices.
- The level of price premium for the incumbent in the Australian market does not appear in overseas markets we have considered in previous analysis (The CIE, 2015). This suggests that structural issues are limiting the ability for competition to drive down market prices.
- In regional areas, Telstra's premium has a greater impact because Telstra holds a greater proportion of mobile services market share and a greater proportion of services are pre-paid rather than post-paid.
- For a customer receiving only Telstra services, such as some regional customers, the price premium could be between \$270 and \$450 per household, depending on how many services they use.

Chart 1 shows Telstra's premium per customer for capital cities compared to regional areas. The premium per post-paid, pre-paid and fixed line customer is substantially higher in regional areas mainly because Telstra has greater market share in regional areas.

1 Comparison of Telstra's premium for mobile and fixed line services between capital cities and regional areas



Data source: The CIE.

The premium for mobile services is higher than similar analysis conducted by The CIE in 2015. In 2015, the Telstra premium for post-paid mobile services was estimated at \$9 per month per plan. The overall Telstra price premium has slightly increased since that study because of greater customer numbers and the inclusion of pre-paid services in the analysis that have a higher premium.¹

The fixed line premium has fallen slightly from 2015, from \$20 per customer per month to \$18 per customer per month, with the overall premium remaining similar.

Our 2015 work identified five main impediments to the functioning of telecommunications markets that have led to the market price premiums observed.

- 1 Telstra has historically received, and continues to receive, subsidies such as the Universal Service Obligation and NBN Co. agreement
 - Telstra has not used these subsidies to provide lower prices for Australian consumers
 - Instead, these subsidies have allowed Telstra to entrench its market dominance
- 2 Regulated transmission prices
 - The regulatory approach could lead to transmission prices exceeding the cost of supply
 - Telstra faces lower costs to providing downstream services than firms that are not vertically integrated, creating barriers to competition

¹ The total premium calculated by The CIE (2015) was \$1.6 billion, however this included Machine to Machine, Satellite and Wholesale mobile customers. Adjusting this estimate to exclude these customers, the estimated total premium in 2015 falls to \$1.37 billion for mobile customers, which is slightly lower than the \$1.44 billion premium estimated in the analysis presented in this report.

- The ACCC has recently reduced regulated price premiums for regional areas by 78 per cent, reducing the influence of regulated transmission prices as an impediment to competition
- 3 Disparity in spectrum holdings in regional areas
- The disparity in spectrum holdings between operators and the lower availability of spectrum in regional areas act as a barrier to competition
 - The release of more spectrum in regional areas will improve network quality for mobile communications if the licence holder utilises that spectrum
 - The high cost of spectrum creates a barrier to entry to the mobile market
- 4 Ownership and access to facilities (such as mobile base stations)
- Co-location avoids unnecessary duplication of infrastructure and promotes competition
 - The current facilities access regime does not set prices, and therefore facilities access is effectively not mandatory
 - While access arbitrations have been effective at resolving disputes, they are rare
 - Co-location of mobile facilities is not common in regional areas where Telstra owns the vast majority of mobile base stations
- 5 Consumer decisions over telecommunications services show that consumers are slow to change
- Shifts in market share away from Telstra as markets become more competitive shows that consumers take time to change to better value providers
 - Slow consumer response to better deals is evident in fixed line markets in particular
 - Changes to competition and reductions in Telstra's price premium over other networks will take time to be reflected in market share as consumers will only change providers gradually
 - Impediments to better consumer decisions include a lack of systematic information about coverage and quality of mobile and fixed line services.

Removing these impediments is not only good for Australian consumers; it will also help drive Australia's productivity growth. These reforms would deliver lower prices and improved services at no cost to taxpayers.

1 *Telstra's customers are paying a substantial price premium for fixed and mobile services*

Australian telecommunications consumers pay a substantial price premium to Telstra over other operators in both fixed and mobile services.

- The price premium paid by a Telstra customer is \$10 per month for a post-paid mobile plan, \$5 per month for a post-paid SIM-only mobile plan or mobile broadband plan, \$17 per month for a pre-paid mobile plan and \$18 per month for fixed line services.
- This premium amounts to a total of \$1.4 billion extra paid each year for Telstra mobile services and \$1.8 billion extra paid each year for Telstra fixed line services above the weighted average price charged for the same services by other carriers.
- For a customer receiving only Telstra services, such as some regional customers, the price premium could be between \$270² and \$450³ per household, depending on how many services they use.

The total premium for mobile subscribers is \$1.4 billion (including a total premium of \$0.2 billion for mobile broadband customers) and the premium for fixed line subscribers is \$1.8 billion. Table 1.1 shows the total market premium paid by Telstra mobile and fixed line subscribers by region. It shows that regional areas pay the greatest premium due to Telstra having a greater market share and a greater proportion of customers being on pre-paid plans. In regional areas, Telstra's fixed line premium has a greater impact because Telstra holds a greater proportion of fixed line services market share.

1.1 Total premium paid by Telstra customers by region

| Region | Total post-paid premium | Total pre-paid premium | Total fixed line premium |
|-----------|-------------------------|------------------------|--------------------------|
| | \$million/year | \$million/year | \$million/year |
| Sydney | 91 | 72 | 278 |
| Melbourne | 108 | 65 | 290 |
| Brisbane | 51 | 40 | 140 |
| Adelaide | 28 | 23 | 68 |
| Perth | 50 | 37 | 119 |
| Regional | 346 | 311 | 891 |
| All areas | 672 | 533 | 1 787 |

Note: Regional areas include all areas other than the five state capital cities listed. This table does not include mobile broadband customers, for which regional market share data is not available.

Source: The CIE, based on Roy Morgan Single Source data 2015-2016 supplied by VHA.

² For one fixed line and one Sim-only mobile plan

³ For one fixed line and two post-paid mobile plans with handsets

Table 1.2 shows the cost per customer (across all providers) of Telstra’s premium for each service type.

1.2 The price premium for Telstra mobile and fixed line services

| Region | Post-paid | Pre-paid | Fixed line |
|-----------|-----------|----------|------------|
| | \$/month | \$/month | \$/month |
| Sydney | 2.2 | 4.9 | 6.9 |
| Melbourne | 2.6 | 5.9 | 7.5 |
| Brisbane | 2.6 | 5.9 | 7.5 |
| Adelaide | 2.6 | 6.0 | 5.9 |
| Perth | 3.0 | 6.7 | 7.0 |
| Regional | 4.5 | 10.0 | 10.8 |
| All areas | 3.2 | 7.3 | 8.6 |

Source: The CIE, based on Roy Morgan Single Source data supplied by VHA.

The additional price that consumers pay for purchasing mobile and fixed line telecommunication services from Telstra can be measured by comparing the prices for otherwise similar services. For example, we can compare the price differences between providers of equivalent plans with the same data allowance and other inclusions.

The formal method for comparing similar plans is called ‘hedonic pricing’. This breaks up the overall price of a plan into the prices of sub-components, such as voice minutes, provider and data allowances. It does so using statistical models to decompose the price paid for products into the value of each characteristic. It has been used to determine the value placed on various characteristics of real estate, automobiles and other products such as personal computers.⁴ This method has also been used for the valuation of characteristics of mobile phone handsets and phone plans.⁵

The hedonic pricing method assumes that the value of a product is based on the value consumers place on the characteristics of the product. For example, in the context of mobile phones, the value of a phone plan is dependent on characteristics such as:

- number of included call minutes
- amount of included data usage
- entertainment content included, and
- mobile network providing the service.

We have collected data on 628 different post-paid phone plans, 65 pre-paid plans and 273 fixed line plans in order to determine the extra amount consumers are willing to pay for each characteristic. For example, it estimates the price consumers are willing to pay for an extra gigabyte of included data usage. Importantly, it estimates the extra price

⁴ Triplett, J. (2004), *Handbook on Hedonic Indexes and Quality Adjustments in Price Indexes – Special Application to Information Technology Products*, Organisation for Economic Cooperation and Development, Paris. <http://browse.oecdbookshop.org/oecd/pdfs/free/9306081e.pdf>

⁵ Karamti, C. & Grzybowski, L. (2010), ‘Hedonic study on mobile telephony market in France: pricing-quality strategies’, *Netnomics* 11, 255-289.

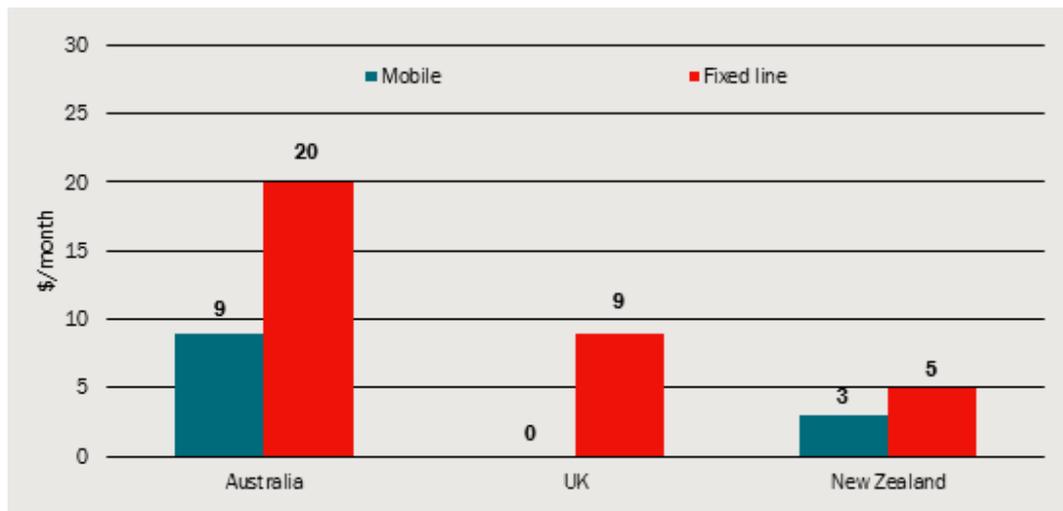
consumers are willing to pay for an identical plan from Telstra compared to one from Optus, Vodafone Hutchison Australia ('VHA') and other providers.

Background

The price premium estimated in this report builds on earlier work conducted by the CIE for VHA.⁶ In that study, the CIE found Telstra had a substantial price premium to other providers in mobile and fixed line services (\$20 per plan per month for fixed line and \$9 per plan per month for mobile). The total estimated premium paid by consumers was \$3.1 billion.⁷

In contrast, overseas markets analysed (New Zealand and the UK) did not have price premiums in fixed line or mobile markets at a level commensurate with those seen in Australia (chart 1.3).

1.3 Price premiums for the dominant provider



Data source: The CIE.

The premium for Telstra reflects both limited competition and differences in service coverage, both of which have emerged from structural issues within the Australian telecommunications market. There are many areas where Telstra is the only service provider, particularly in regional areas. This means regional consumers are heavily affected by Australia's telecommunications market structure.

Our 2015 work identified five main impediments to the functioning of telecommunications markets that have led to the market price premiums observed.

⁶ The CIE 2015, *Australia's telecommunications market structure: the price premium paid by consumers*, prepared for VHA.

⁷ The total mobile premium calculated by The CIE (2015) was \$1.6 billion, however this included Machine to Machine, Satellite and Wholesale mobile customers, which have not been included in the analysis presented in this report. Adjusting this estimate to exclude these customers, the estimated total mobile premium in 2015 falls to \$1.37 billion.

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 - Impediments to better consumer decisions include a lack of systematic information about coverage and quality of mobile and fixed line services.

Statistical method

A simple hedonic pricing regression model for telecommunication plans has the following form:

$$Price_t = \beta_0 + \sum_{n=1}^N \beta_n \times X_{nt} + \varepsilon_t$$

$Price_t$ is the price of plan t , and X_{nt} is a series of N plan characteristics for plan t such as included data usage and dummy variables indicating the provider of the plan.

The model predicts the price of each plan after adjusting for differences in plan characteristics and the average price of plans from each carrier.

We estimate models of this form for post-paid phone plans, pre-paid phone plans and fixed line plans separately, and these model specifications are discussed further in this chapter.

These types of plans have been modelled separately on the basis that they are different products. That is, a post-paid and pre-paid plan with the same data allowance, included minutes, and other characteristics will not be valued at the same price as each other. Customers have preferences over whether the plan has to be paid before or after, and this may affect the value per gigabyte of data, value per included call, and other values of characteristics.

Weighting of plan observations in regression modelling

We have weighted regression observations by the market share of each plan (w_t). The market share of each plan is the multiple of the market share of the plan's provider and the share of that providers sales accounted for by that plan.

That is, each plan is weighted in our regression model by the following term:

$$w_t = market\ share_t = market\ share_{provider} \times \frac{1}{number\ of\ plans_{provider}}$$

$market\ share_t$ is the market share of plan t , $market\ share_{provider}$ is the market share of the provider, and $number\ of\ plans_{provider}$ is the number of plans offered by that provider in the dataset. The weights used for each provider in the post-paid modelling are summarised in table 1.4 below. Note, for example, VHA has 258 post-paid mobile plans (over 40 per cent of the number of post-paid plans in the dataset) yet only 17.3 per cent of market share. This highlights the importance of accounting for the greater number of VHA plans in the dataset in determining the weighting applied in the regression modelling.

1.4 Weighting used in post-paid regressions

| Provider | Market share | Number of plans in dataset | Weight |
|----------|--------------|----------------------------|----------|
| | Per cent | No. | No./plan |
| Telstra | 43.0 | 137 | 0.00314 |

| Provider | Market share | Number of plans in dataset | Weight |
|----------|--------------|----------------------------|---------|
| Optus | 23.7 | 127 | 0.00187 |
| VHA | 17.3 | 258 | 0.00067 |
| Virgin | 4.0 | 96 | 0.00042 |
| Amaysim | 3.1 | 5 | 0.00620 |
| iiNet | 2.4 | 4 | 0.00609 |

Note: This list includes all providers included in the post-paid dataset, and does not include some providers for whom plans data was not collected. The weighting procedure (with respect to using the market share of each provider) would imply that plans data for smaller providers would be weighted less than those of larger providers, making the benefit to the estimates of adding data from more small providers very low.

Source: The CIE.

The same weighting procedure is used for pre-paid plans and fixed line plans.

Weighting each plan by market share is an approach to ‘quantity weighting’⁸. Quantity weighting aims to make the regression model *representative*⁹ of the plans sold in the marketplace. Consider that without weighting by market share, the plans of iiNet would be weighted equally to those of Telstra. Given that the purpose of the hedonic model is to determine the willingness of customers to pay for different characteristics of mobile plans, clearly those plans that more customers are subscribed to should be weighted more heavily.

This weighting process applies an equal weight to each plan from a given provider. If sufficient data were available it would be possible to different weight plans from the same provider according to the number of subscribers to that plan. However, the market share data we have available is only disaggregated between post-paid and pre-paid plans. This additional weighting approach would be unlikely to yield substantially different results, given that fairly consistent pricing patterns are evident in the plans from each provider.

Weighting each plan by the reciprocal of the number of plans by provider ensures that simply having a greater number of different available plans does not result in plans of that provider being more highly weighted. Consider, for example, if Telstra only had one available plan, yet Optus had 10 available plans. There would be no reason to weight Optus plans more highly in determining the value of each characteristic (such as additional gigabytes of data allowance) since it would not imply that Optus plans are more representative of consumer preferences.

Included entertainment and other content

There has been an increase in the amount of mobile plans that include entertainment content such as video, music or sports streaming subscriptions since our 2015 work. For

⁸ See Diewert (2010) for discussion of quantity weighting and other weighting issues in Hedonic Regressions: Diewert, E., 2003, *Hedonic Regressions: A Review of Some Unresolved Issues*, available at: <http://www.nber.org/ciw/papers/diewert.pdf>, accessed on 28 October 2016.

⁹ Diewert (2010): p.5. Weighting by market share (or quantity of transactions) effectively repeats the observation of plan t an amount of times equivalent to the market share of that provider. Consider if Telstra has 75 per cent of market share (say 30 customers) and VHA has 25 per cent (say 10 customers). Weighting by market share will result in the same estimated coefficients as repeating the observed Telstra plan 30 times in the dataset and the VHA plan 10 times in the dataset.

example, Optus offers mobile subscribers under certain plans access to viewing English Premier League football games. Non-entertainment content is sometimes also included, such as Telstra's inclusion of Telstra Air free Wi-Fi data¹⁰. Table 1.5 summarises the included entertainment and other content in plans from each provider.

1.5 Entertainment content included in mobile plans

| Provider | Included content | Which plans? |
|----------|--|--------------------------|
| Telstra | Apple music 6/12-month membership and free streaming | Post-paid only |
| | Free and unlimited Telstra Air data | All plans |
| | NRL/AFL 2016 digital streaming | Post-paid only |
| | Onedrive 200GB | Post-paid only |
| | 3-month Netflix/Stan/Presto/Bigpond use (data charges apply) | Selected post-paid plans |
| | Telstra TV access | All plans |
| | 2016/17 NBL Live Pass | Selected post-paid plans |
| Optus | Mobile TV - Netflix, Stan, Presto and ABC streaming without using plan data | Selected post-paid plans |
| | Optus Sport - including English Premier League and Australian Cricket (data charges apply) | Selected post-paid plans |
| | Spotify, Pandora and other music streaming without using plan's data | All plans |
| VHA | Spotify, Stan or SMH 6/12-month subscription | Selected post-paid plans |
| Virgin | Spotify, Pandora and other music streaming without using plan's data | Selected post-paid plans |

Note: The inclusions are current as at October 2016.

Source: Provider websites, The CIE.

Included content cannot be accounted for using our hedonic regression approach since there is not enough variation within providers for most included content. For example, the AFL streaming service is available to all Telstra mobile subscribers, regardless of what plan they are on, making it difficult to value. Essentially, because for much of the included content the inclusion of content can be perfectly predicted by what provider the plan is with, it is not possible to isolate the value of the content apart from the value of that provider.

Therefore, to estimate the price premium for Telstra mobile plans excluding content, we perform back-of-the-envelope calculations of the value of the included content, and subtract this from the estimated premium.

Fixed line plans sometimes include content in the form of subscriptions to television services such as Foxtel or Fetch TV. These only affect a subset of plans and are a

¹⁰ Telstra Air provides free Wi-Fi data at certain hotspot locations for Telstra mobile customers. See <https://www.telstra.com.au/latest-offers/telstra-air-free-wifi-offer?ti=TR:TR:mar16:joinair:link>.

significantly differentiated product. Thus, we have not included calculation of the premium for bundled television and fixed line (broadband internet access and phone) services. However, we are still able to calculate the premium for fixed line services by excluding plans with bundled television services from the data.

2 *Dataset and plan characteristics*

Mobile plans

We collected data on the post-paid and pre-paid mobile plans offered by the following providers:

- Telstra
- Optus
- VHA
- Virgin
- Amaysim
- iiNet – post-paid only
- ALDI – pre-paid only

Table 2.1 compares the market share of each provider reported by a number of different sources including:

- ACCC Telecommunications Report (June 2015)¹¹ – The ACCC report market share for mobile services, but only show market share of the three network operators. The ACCC data shows a slightly higher market share for Telstra, however is less recent than Kantar Worldpanel or Roy Morgan data.
- Kantar Worldpanel (June 2016) – Kantar Worldpanel data has been obtained for all providers listed in the table¹²
- Roy Morgan Single Source (2015/16) – Roy Morgan data has been supplied by Vodafone Hutchison Australia (VHA).

In this analysis we have used a combination of Roy Morgan and Kantar Worldpanel data. The Roy Morgan data was used for Telstra, Optus, VHA, Virgin and Other data points, while to determine the split of market share among smaller providers such as Amaysim, we apply the shares from the Kantar Worldpanel data to the ‘Other’ category of the VHA data.

¹¹ ACCC Telecommunications Report 2014-15, pg. 29, accessed 21 November 2016, available at https://www.accc.gov.au/system/files/ACCC%20Telecommunications%20reports%202014%E2%80%9315_Div%2011%20and%2012_web_FA.pdf

¹² Kantar Worldpanel data, accessed 26 October 2016, available at: <https://www.finder.com.au/telstra-still-tops-in-australian-mobile-market-share>

2.1 Market share of mobile service providers

| Summary of market share | ACCC Telecommunications Report (June 2015) | Kantar Worldpanel (2016) | Roy Morgan | Market share used in analysis |
|-------------------------|--|--------------------------|------------|-------------------------------|
| | Per cent | Per cent | Per cent | Per cent |
| Telstra | 45.0 | 41.8 | 43.0 | 43.0 |
| Optus | 27.0 | 21.8 | 23.7 | 23.7 |
| Vodafone | 18.0 | 15.2 | 17.3 | 17.3 |
| Virgin | N/A | 5.4 | 4.0 | 4.0 |
| Other | 10.0 | 0.7 | 12.0 | 12.0 |
| ▪ Boost | N/A | 4.5 | N/A | 0.4 |
| ▪ Amaysim | N/A | 2.2 | N/A | 3.1 |
| ▪ ALDI | N/A | 2.8 | N/A | 1.3 |
| ▪ iiNet | N/A | 5.5 | N/A | 2.4 |
| ▪ Other MVNOS | N/A | 0.1 | N/A | 4.7 |

Source: The CIE, based on Roy Morgan Single Source data 2015-2016 supplied by VHA.

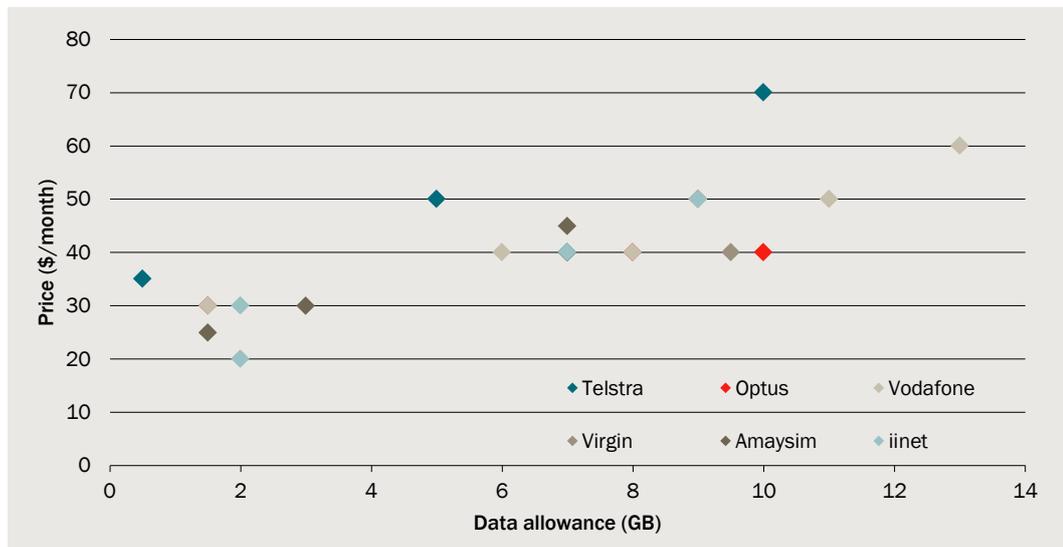
Other providers in the market represent the remaining 6.4 per cent of the mobile plans market. We did not collect plans data for providers with fewer than 1 per cent market share. In our regression model these observations would have an insignificant impact on the estimated premiums due to our weighting process, and so there is little benefit in collecting this additional data.

Post-paid mobile plans

In the process of collecting data on all characteristics of post-paid plans, a few key variables were identified:

- Data allowance – the number of included data allowance (gigabytes/month) appears to be the key determinant of plan value, with little variation across providers that is uncorrelated with prices. Chart 2.2 shows the relationship between data allowance and price per month of plans without handsets. It shows that there is a roughly linear relationship between price and the data allowance of a plan. Also, it shows that Telstra plans are more expensive for a given data allowance than the plans of any other provider.

2.2 Data allowance and the price of mobile post-paid plans



Note: Telstra, VHA and Optus plans are under 12-month contracts, while iinet and Amaysim plans are on month-to-month contracts. iinet and Amaysim do not offer 12/24-month contracts to compare with Telstra/Optus/VHA.

Data source: Providers websites, The CIE.

- Included calls and texts – while this variable was important in The CIE’s previous hedonic analysis of phone plans, the vast majority of plans (93 per cent) collected for this analysis had an unlimited calls/text allowance.
- Included international calls and texts – a subset of plans (such as the VHA ‘Global’ plans¹³) include additional international calls and text messages, and these plans are more expensive for a given data allowance and other characteristics.
- Handset – data for plans with all handsets available from Telstra, Optus, VHA and Virgin has been collected, and the included handset is a key determinant of price.
- Contract length – the various providers offer options of month-to-month plans that do not require the customer to stay with that plan for 12/24 months, however a premium is charged in return for these shorter contract terms.
- Music streaming – some plans supplied by Optus and Telstra allow for unlimited free data usage by music streaming applications such as Spotify or Apple Music. These inclusions are generally applicable to all or most plans from a given provider.
- Content – some providers and plans include additional entertainment or other content, such as subscriptions to Netflix, included data storage with Microsoft OneDrive or subscriptions to music streaming services.

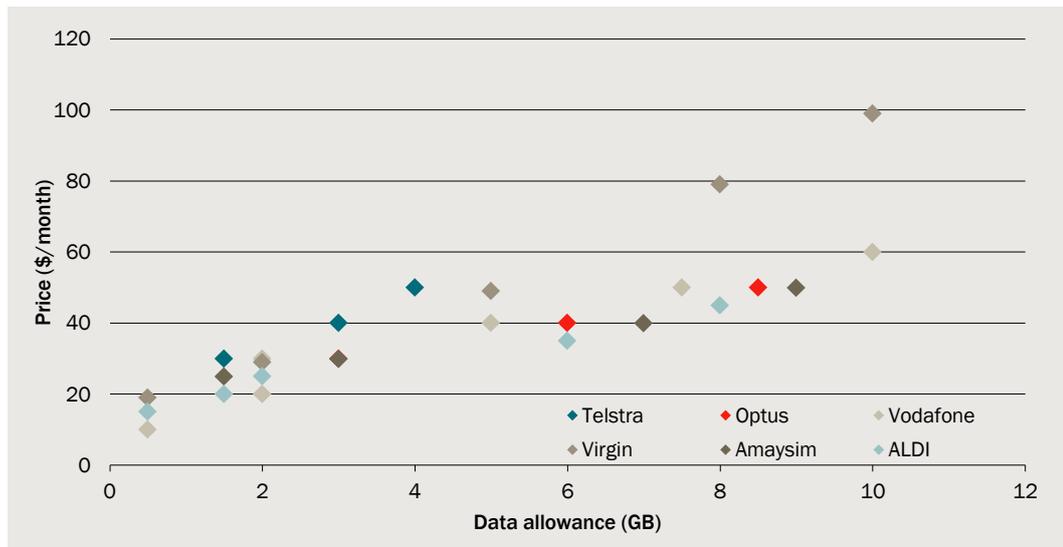
Pre-paid mobile plans

We have collected data on pre-paid plans. In general, pre-paid plans exhibit greater diversity in pricing structure and included features (both between different plans of a single provider and between different providers). The following characteristics are key determinants of the price of pre-paid plans:

¹³ See VHA’s available plans here: <http://www.VHA.com.au/plans/qantas>

- Data allowance – the data allowances in pre-paid plans are significantly lower than post-paid plans for a given price, with data perhaps being a less important component of usage for pre-paid customers. Chart 2.3 shows the price of selected pre-paid plus plans, generally with 28-day expiry periods.

2.3 Data allowance and price for pre-paid plans



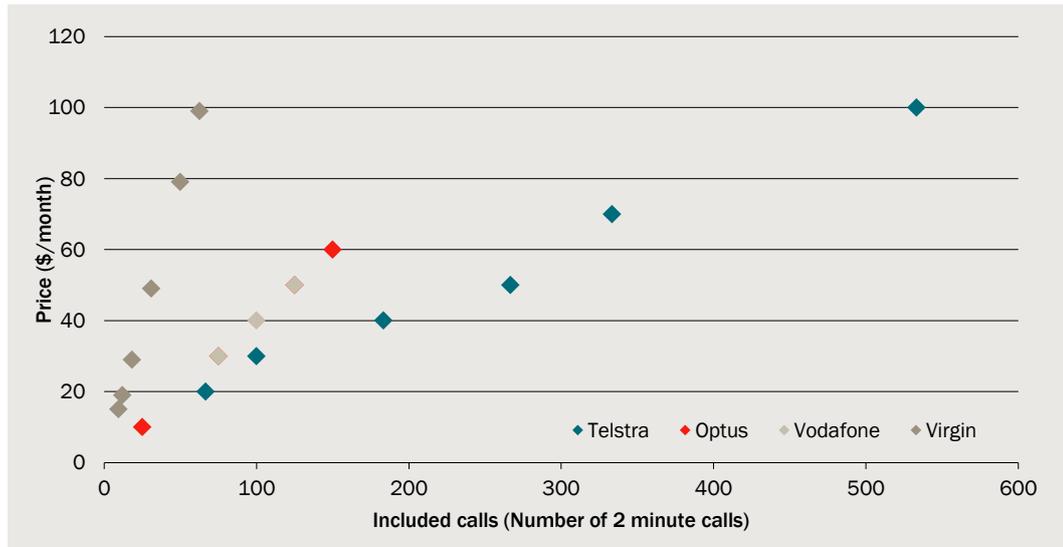
Data source: Provider websites, The CIE.

- Including calls and texts – while post-paid plans generally included unlimited minutes and text messages, pre-paid plans generally had a cap on the value of included calls and texts. The price of included calls and texts also varied substantially between providers and plans. For example, Telstra’s Pre-paid Plus \$30 plan charges a standard 2 minute call at \$2.17, while the same call would cost \$0.30 on Telstra’s Simplicity or Long Life pre-paid plans. Thus, we have converted the included value (in dollars) under each plan into a figure for the number of included 2-minute phone calls (using the plan-specific price for a 2-minute call). Chart 2.4 shows the different prices of ‘Long Life’ pre-paid plans, which are designed to have longer expiry periods. It shows Virgin plans are significantly more expensive than other plans, with a different gradient of included calls compared to price.
- Included international calls and texts – a small number of plans include additional international calls and text messages. More commonly, however, plans include an allowance of \$5-15 to be spent on ‘extras’, including international calls. These features are difficult to include given that they rarely vary between plans in a way that isn’t highly correlated with the amount of included calls or data in the plan.
- Expiry and roll-over – plans vary in terms of the duration of time before the credit expires. Many plans allow for unused credit at the time of expiry to be ‘rolled-over’ into the next recharge period, meaning that the credit can still be used in the next recharge cycle. For certain plan types, the expiry duration is a major determinant of price. Consider again, for example, long-life plans, for which longer expiry times are a key feature of plans with higher prices. Chart 2.5 shows the relationship between expiry duration and price for these plans. It shows that expiry duration predicts some variation for these type of plans. Regression modelling is useful in this content to

disentangle between the higher price customers are willing to pay for more included minutes (per chart 2.4) and the higher price customers are willing to pay for longer expiry durations (per chart 2.5).

- Content – Telstra is the only provider that includes additional content in pre-paid plans (namely Telstra Air Wi-Fi free data usage).

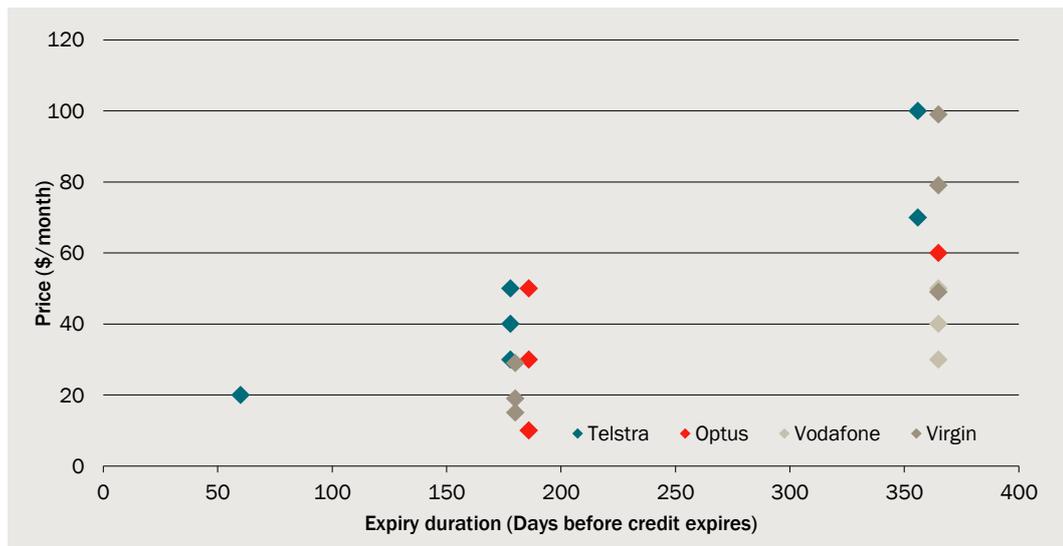
2.4 Included calls and price for pre-paid plans



Note: These plans vary in expiry duration, as depicted in chart 2.5.

Data source: Provider websites, The CIE.

2.5 Expiry duration and price for pre-paid plans



Data source: Provider websites, The CIE.

Fixed line plans

We collected data on the post-paid and pre-paid mobile plans offered by the following providers:

- Telstra
- Optus
- iiNet
- TPG Internet
- Dodo
- Internode
- iPrimus
- Westnet

Table 2.6 shows the market share of each provider. Data from the ACCC Telecommunications Report 2014-15 is compared to market share data supplied by VHA Hutchison Australia (VHA) produced by Roy Morgan.¹⁴ ACCC data presented in the Telecommunications Report are integer values for market share. We have used Roy Morgan market share data in our analysis since it is disaggregated by region.

2.6 Fixed broadband market share

| Provider | Roy Morgan fixed broadband market share | ACCC fixed line broadband market share |
|----------------|---|--|
| | Per Cent | Per Cent |
| Telstra | 48.8 | 41 |
| Optus | 14.6 | 14 |
| iiNet | 10.1 | 14 |
| TPG Internet | 9.1 | 13 |
| Dodo | 4.8 | a |
| Internode | 2.8 | |
| iPrimus | 1.6 | a |
| Westnet | 1.3 | |
| Other provider | 6.9 | 9 |

^a Combined broadband market share for Dodo and iPrimus is 9 per cent.

Source: The CIE, based on Roy Morgan Single Source data 2015-2016 supplied by VHA. ACCC Telecommunications Report 2014-15, pg 23.

Other providers in the market represent the remaining 6.8 per cent of the fixed line market. We did not collect plans data for providers with fewer than 1 per cent market share. In our regression model these observations would have an insignificant impact on the estimated premiums due to our weighting process, and so there is little benefit in collecting this additional data.

The key variables affecting fixed line plans are:

¹⁴ Kantar Worldpanel data, accessed 26 October 2016, available at:

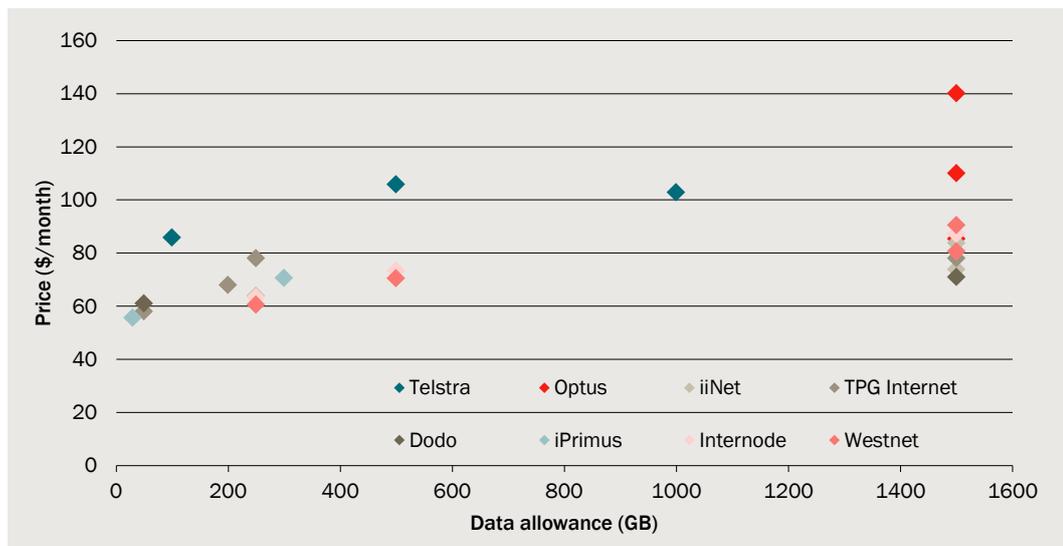
<https://www.finder.com.au/telstra-still-tops-in-australian-mobile-market-share>

- Technology – the technologies used to deliver the fixed line services in our dataset include ADSL2+, Cable, or NBN. We have split ‘Cable’ into TPG’s Fibre to the Basement (FTTB) fibre cable technology and other ‘Cable’ technologies because the FTTB technology is substantially different to the other cable networks (such as Optus’ Hybrid Fibre-Coaxial (HFC) network).
- Speed – the NBN and Cable network plans offer a range of different available speeds that the customer may choose between. For example, customers may pay extra for the NBN ‘Super speed boost’ plans provided by Telstra, which offer maximum download speeds of 100Mbps.
- Line rental and included calls – line rental is included in all ADSL plans in the dataset. The cost of bundling phone services with a broadband plan (with line rental) is generally very low, however prices are higher for plans with more included call types (e.g. local/national/mobile/international calls).

Chart 2.7 shows a selection of ADSL bundled broadband and phone plans and the relationship between the included data allowance and average monthly price for these plans. The average monthly price is the average price over 24 months accounting for upfront costs such as activation, setup, modem and modem shipping. The included data allowance include off-peak usage. A number of plans are shown here with a data allowance of 1500 gigabytes/month, however, these plans actually have an unlimited data allowance. They have been presented on this chart with a usage allowance of 1500 gigabytes in order to illustrate their relative price for data usage.

Overall, there is considerable variation between providers in prices for a given amount of data, especially for plans with unlimited data. There are a number of plan characteristics that are relevant for fixed line plans that make the relationship between price and data less precise. This implies that regression modelling will be useful to isolate the value placed on specific plan characteristics.

2.7 Data allowance and average monthly price for ADSL plans



Note: Plans shown with 1500GB/month data allowance actually have an unlimited data allowance. 1000GB is used as a proxy for their included data allowance because it is the highest data allowance among fixed line plans in the dataset.

Data source: The CIE.

3 *Estimates of Telstra's price premium for mobile and fixed line services*

We have estimated hedonic regression models for the prices of post-paid plans, pre-paid plans and fixed line plans.

Characteristics of plans in terms of included content have not been included in these regressions. Content is accounted for in subsequent analysis discussed in the following sections.

Post-paid plan estimates

We estimated the following main model specification for post-paid plans:

$$\begin{aligned}
 Price_t = & \beta_0 + \beta_1 \times unlimited\ calls_t + \beta_2 \times month - to - month_t \\
 & + \sum_{i=1}^6 (\beta_{i+2} \times provider_i \times data_t + \beta_{2i+2} \times provider_i \times handset_t + \beta_{3i+2} \\
 & \times provider_i \times (1 - handset_t)) + \sum_{h=1}^H \beta_{h+20} \times handset_t + \varepsilon_t
 \end{aligned}$$

which estimates the price of plan t for providers i and handsets h . Variables are included indicating whether the plan includes unlimited calls, and the contract duration of the plan. Each provider has a provider-specific estimated value of data ($\beta_{3i+2} \times provider_i$ gives the 6 provider-specific data values), and a different premium associated with handset plans and SIM-only plans. Further, we estimate the additional value associated with each handset that is included in plans (e.g. iPhone 7, Samsung Galaxy S6, etc.).

Our modelling approach generally has sought to minimise the number of included variables, resulting in a relatively parsimonious regression model. This is to reduce the impact of multicollinearity, whereby correlated between explanatory variables leads to biased coefficient estimates. This is a prevalent issue with mobile plan hedonic models, because many desirable characteristics of phone plans are more common among higher priced plans. For example, data allowance and included call minutes are highly correlated, with higher-price plans including both unlimited minutes and high download allowances.

To avoid this, we have sought to include only one key measure of the value of the plan where possible, and in the case of post-paid plans, this key measure is the included data allowance. Fortunately, there is little variation in the included national calls among plans, with most plans including unlimited domestic calls and texts. Further, relatively

few plans include international minutes, which is also correlated with both plan price and data allowance.

We expect the provider-specific value of data allowance to more closely replicate the actual relationship between data allowance and price. Chart 2.3 shows that different carriers seem to have different prices for additional GB of data in plans, thus justifying the inclusion of this variable. Additionally, the fit of the model improves with the inclusion of this variable (using the adjusted- R^2 as measure of fit that accounts for a penalty associated with adding variables that are not useful).

Table 3.1 presents estimates of the value of post-paid plan characteristics. The coefficients of all desirable plan characteristics (such as included data and whether the plan includes unlimited calls) are positive. The coefficients may be interpreted according to the ‘units’ column in the table. For example, the coefficient on the data variable for Telstra plans is 3.97, meaning that the price of a plan is \$3.97 higher for each additional gigabyte of data allowance (with all other factors held constant).

3.1 Estimated post-paid model coefficients

| Variable | Estimated coefficients | P-value | Units |
|--|------------------------|---------|----------------------|
| Dependent variable: Price per month | | | |
| Unlimited calls? | -4.07 | 0.00 | \$ if unlimited |
| Month-to-month contract? | 7.31 | 0.00 | \$ if month-to-month |
| Data (by provider) | | | |
| Telstra | 3.97 | 0.00 | \$/GB |
| Optus | 2.96 | 0.00 | \$/GB |
| VHA | 2.58 | 0.00 | \$/GB |
| Virgin | 4.26 | 0.00 | \$/GB |
| iiNet | 3.74 | 0.00 | \$/GB |
| Amaysim | 3.27 | 0.00 | \$/GB |
| Provider (SIM-only and handset plans) | | | |
| Telstra | 9.82 | 0.00 | |
| Optus | 6.67 | 0.00 | |
| VHA | 10.44 | 0.00 | |
| Virgin | -9.42 | 0.00 | |
| iiNet | -4.65 | 0.00 | |
| Amaysim | 0.00 | | |
| Provider (handset-only premium) | | | |
| Telstra | 7.26 | 0.00 | |
| Optus | 1.42 | 0.00 | |
| VHA | 0.00 | 0.00 | |
| Virgin | -1.09 | 0.12 | |
| iiNet | 0.00 | 0.00 | |
| Amaysim | 0.00 | 0.00 | |

Source: The CIE.

We have considered a number of variations to this model specification:

- **SIM-only model:** We have considered modelling SIM-only (i.e. no handset) plans separately from handset plans on the basis that the prices of characteristics may be different for SIM-only plans and handset-inclusive plans. We believe the combined model is yielding appropriate estimates of the value of data by provider, and thus it is not necessary to estimate a separate model.
- **Single value-of-data variable and non-linear value of data:** We also tested specifications with only a single value-of-data variable (rather than a carrier-specific value of data). This model gave similar estimated premiums for Telstra plans however, the model fit is worse under this specification.

The data (by provider) estimates and provider-premiums can be combined with market share data to determine the weighted average difference between Telstra and non-Telstra plan prices. Table 3.2 presents these results. The ‘Estimated coefficient’ column shows the estimated coefficients presented in table 3.1. The ‘Value of average data column’ shows the value of an average amount of data allowance using the provider-specific estimated value-of-data. This is equal to the product of the estimated coefficient and the average data allowance across all providers (4.3GB/month).¹⁵ That is:

$$\text{Value of average data}_i = 4.3 \times \beta_{i+2}$$

for provider i , using the coefficient for each provider estimated in the main model.

The final column presents the average premium for Telstra plans relative to the weighted average price of non-Telstra plans. These premia are the sum of the handset or non-handset premium and Telstra’s premium for an average amount of data. It shows that the additional cost of a plan with an average amount of data is \$8.3 for plans without handsets (\$4.2 + \$4.1) and \$10.9 for plans that include handsets (\$4.2 + \$6.7).

3.2 Calculation of estimated price premia for Telstra plans

| Variable | Estimated coefficient | Market share | Value of average data | Provider | Average premium |
|---------------------------|-----------------------|--------------|-----------------------|---------------------|-----------------|
| | \$/GB or \$ | Per cent | \$/month | | \$ |
| Data (by provider) | | | | | |
| Telstra | 3.97 | 43.0 | 17.0 | Telstra | 17.0 |
| Optus | 2.96 | 23.7 | 12.7 | Non-Telstra average | 12.8 |
| VHA | 2.58 | 17.3 | 11.0 | Difference | 4.2 |
| Virgin | 4.26 | 4.0 | 18.3 | | |

¹⁵ The ACCC Telecommunications Report 2014-15 (available at: https://www.accc.gov.au/system/files/ACCC%20Telecommunications%20reports%202014%E2%80%9315_Div%2011%20and%2012_web_FA.pdf, see page 26) states that for post-paid plans, the average data allowance increased from 2.1GB to 3GB in the year to 2014-15. We project, using the same growth rate, that the average data allowance would be 4.3GB for 2015-16.

| Variable | Estimated coefficient | Market share | Value of average data | Provider | Average premium |
|--|-----------------------|--------------|-----------------------|---------------------|-----------------|
| | \$/GB or \$ | Per cent | \$/month | | \$ |
| iiNet | 3.74 | 2.4 | 16.0 | | |
| Amaysim | 3.27 | 3.1 | 14.0 | | |
| Provider (non-handset premium) | | | | | |
| Telstra | 9.82 | 43.0 | | Telstra | 9.8 |
| Optus | 6.67 | 23.7 | | Non-Telstra average | 5.7 |
| VHA | 10.44 | 17.3 | | Difference | 4.1 |
| Virgin | -9.42 | 4.0 | | | |
| iiNet | -4.65 | 2.4 | | | |
| Amaysim | 0.00 | 3.1 | | | |
| Provider (handset premium) | | | | | |
| Telstra | 17.08 | 43.0 | | Telstra | 17.1 |
| Optus | 11.25 | 23.7 | | Non-Telstra average | 7.8 |
| VHA | 10.44 | 17.3 | | Difference | 9.3 |
| Virgin | -10.50 | 4.0 | | | |
| iiNet | -4.65 | 2.4 | | | |
| Amaysim | 0.00 | 3.1 | | | |
| Total premium (sum of data and handset/non-handset premium) | | | | | |
| Telstra non-handset plans | | | | | 8.3 |
| Telstra handset plans | | | | | 13.5 |

Note: The premium for each provider relative to non-Telstra plans is the difference between the total premium for a provider (price of average data plus handset/non-handset premium) and the average premium for non-Telstra customers. For example, the VHA premium for non-handset plans is 27.57 plus 10.44 (38.01) minus the non-Telstra average premium (31.98 + 5.72 = 37.70). This approach is used to calculate the premium for Telstra plans relative to non-Telstra plans.

Source: The CIE.

Table 3.3 shows our estimates of the value of included content (See Appendix A).

3.3 Value of included content by provider

| Provider | Value adjusted for proportion of plans included | Market share |
|--------------------------------|---|--------------|
| | \$/month | Per cent |
| Telstra | 3.65 | 43.0 |
| Optus | 0.50 | 23.7 |
| VHA | 0.13 | 17.3 |
| Virgin | 0.00 | 4.0 |
| Non-Telstra (weighted average) | 0.25 | |

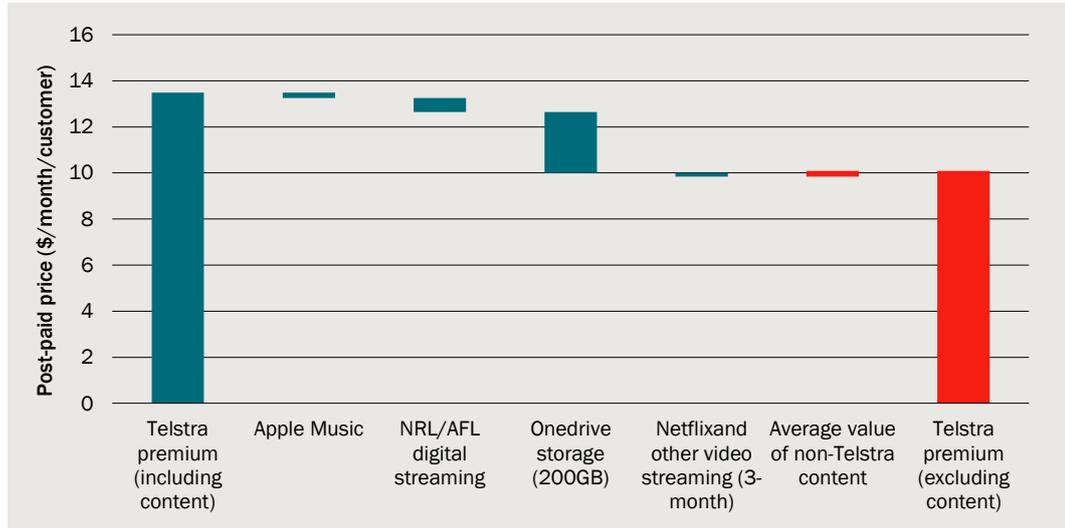
Note: The 'Non-Telstra (weighted average)' estimate is the average value of content among Non-Telstra providers, weighted by market share.

Source: The CIE.

Chart 3.4 shows Telstra's premium for plans with handsets. It shows the premium estimated for Telstra from the statistical models (including content), the value of Telstra

content (shown by the teal series), the average value of non-Telstra content and the average price premium for Telstra plans (excluding content, shown by the red series). The premium for handset-inclusive plans is \$10 after accounting for included content.

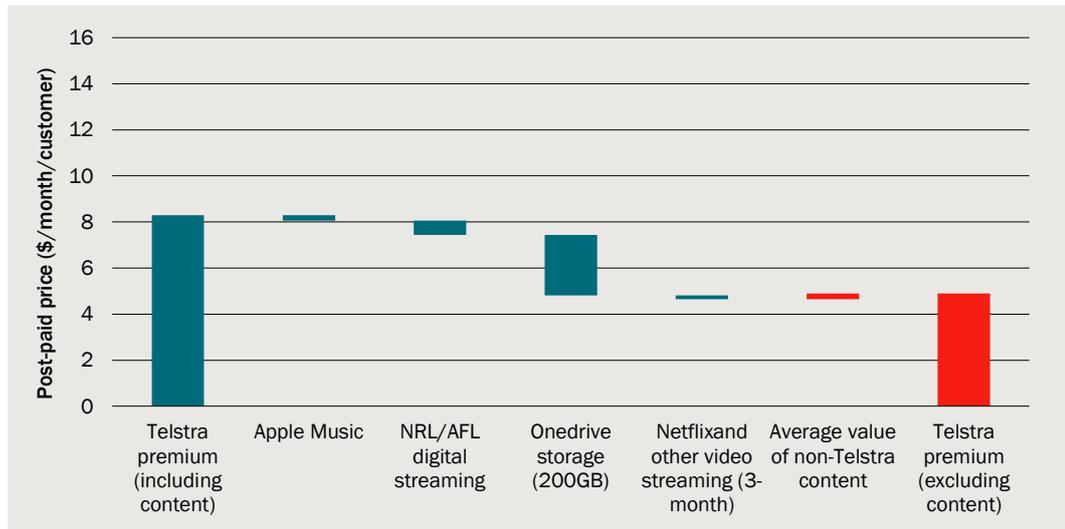
3.4 Telstra’s premium excluding content – handset-inclusive plans



Data source: The CIE.

Chart 3.5 shows the estimated premium for plans without handsets. The premium estimated by the statistical models is lower (\$8.3 rather than \$13.5 for handset-inclusive plans). The premium for SIM-only plans is \$4.9 after accounting for included content.

3.5 Telstra’s premium excluding content – SIM-only plans



Data source: The CIE.

Pre-paid plan estimates

We estimated the following main model specification for pre-paid plans:

$$Price_t = \beta_0 + \beta_1 \times \text{value of calls}_t + \beta_2 \times \text{expiry}_t + \beta_3 \times (\text{expiry}_t)^2 + \beta_4 \times \text{rollover}_t + \sum_{i=1}^6 \beta_{i+4} \times \text{provider}_i + \varepsilon_t$$

where there are i different providers of pre-paid plans.

Table 3.6 presents estimates of the value of pre-paid plan characteristics. Note that all desirable plan characteristics (such as data included or the length of time before expiry of credit) are positive, indicating that the model has not been mis-specified. In other model specifications, some coefficients were negative, which in those cases was likely attributable to omitted variable bias. Some variables, which are known to be desirable, have been excluded from the model on the basis that they are too highly correlated with other variables (often included data allowance), and thus do not result in sensible coefficient estimates.

The variables may be interpreted according to the ‘units’ column in the table. For example, the coefficient on the data variable is 1.89, meaning that the price of a plan is \$1.89 higher for each additional gigabyte of data allowance (with all other factors held constant).

3.6 Estimated pre-paid model coefficients

| Variable | Estimated coefficients | P-value | Units |
|--------------------------------|------------------------|---------|-----------|
| Data | 1.89 | 0.00 | \$/GB |
| Value of calls included | 0.08 | 0.00 | \$/minute |
| Expiry duration | 0.19 | 0.00 | \$/day |
| (Expiry duration) ² | 0.00 | 0.00 | |
| Does credit rollover? | 4.83 | 0.00 | Yes/No |
| Provider: | | | |
| ▪ Telstra | 27.18 | 0.00 | |
| ▪ Optus | 12.35 | 0.00 | |
| ▪ VHA | 6.56 | 0.00 | |
| ▪ Virgin | 24.68 | 0.00 | |
| ▪ Amaysim | -0.50 | 0.21 | |
| ▪ ALDI | 0.00 | | |

Source: The CIE.

We have considered alternative model specifications for the pre-paid model:

- **Models with international call minutes:** International call minutes are included in the value of some pre-paid plans. Not including international call minutes will lead to overestimation of the value of variables that are correlated with international call minutes, such as national call value or included data.

- **Models with dummy variables indicating expiry duration:** We have consider models that, rather than using a squared term for the expiry duration variable (to capture non-linear value of expiry duration), use dummy variables for each expiry duration offered among the plans in the dataset. The problem with these models is that

Table 3.7 presents the calculation of the Telstra price premium for mobile pre-paid plans. It combines market share data with the estimated premium for each provider to determine the average premium charged by Telstra above other providers. The estimated premium is \$17, which is larger than the premia estimated for mobile post-paid plans.

3.7 Calculation of Telstra price premium - prepaid

| Variable | Market share | Provider premium |
|--|--------------|------------------|
| | Per cent | \$ |
| Dependent variable: Price of plan (\$/month) | | |
| Providers | | |
| Telstra | 43.0 | 27.2 |
| Optus | 23.7 | 12.4 |
| VHA | 17.3 | 6.6 |
| Virgin | 4.0 | 24.7 |
| ALDI | 1.3 | 0.0 |
| Amaysim | 3.1 | -0.5 |
| Telstra compared to Non-Telstra | | |
| Telstra | | 27.2 |
| Non-Telstra | | 10.2 |
| Difference | | 17.0 |

Source: The CIE.

Fixed line plan estimates

We estimated the following main model specification for post-paid plans:

$$\begin{aligned}
 Price_t = & \beta_0 + \beta_1 \times unlimited\ data_t + \beta_2 \times data_t + \beta_3 \times data_t^2 + \sum_{c=1}^4 \beta_{c+3} \times contract_t \\
 & + \sum_{i=1}^7 \beta_{i+8} \times provider_i + \sum_{t=1}^7 \beta_{t+15} \times technology_i + \beta_{22} \times line\ rental_t \\
 & + \beta_{23} \times local\ calls_t + \beta_{24} \times national\ calls_t + \beta_{25} \times mobile\ calls_t + \varepsilon_t
 \end{aligned}$$

which estimates the price of plan t for providers i , contract lengths c and technology types t . The technology dummy variables specify both the technology used and the speed. For example, a separate price effect for Cable (30Mbps maximum speed) and Cable (100Mbps maximum speed) is estimated.

We have not included a variable indicating the inclusion of international calls because the inclusions in plans from different providers are too different. For example, some providers offer discounted international calls, while others offer unlimited international calls to selected providers. These inclusions will likely have substantially different values, yet are too highly correlated with the provider dummy variables to allow for robust estimation.

Table 3.8 presents estimates of the value of post-paid plan characteristics. The coefficients of all desirable plan characteristics (such as included data and whether the plan includes unlimited calls) are positive. The coefficients may be interpreted according to the ‘units’ column in the table. For example, the coefficient on the unlimited data variable is 26.55, meaning that the price of a plan with unlimited data is \$26.55 higher than a plan without unlimited data (with all other factors held constant).

3.8 Estimated coefficients – fixed line

| Variable | Estimated coefficient | P-value |
|--|-----------------------|---------|
| \$ | | |
| Dependent variable: Price of plan (\$/month) | | |
| Coefficient estimates | | |
| Unlimited data | 26.55 | 0.00 |
| Data | 0.049 | 0.00 |
| Data ² | -0.000001 | 0.47 |
| Contract | | |
| ▪ 6 months | 2.63 | 0.28 |
| ▪ 12 months | -2.22 | 0.11 |
| ▪ 18 months | -2.20 | 0.08 |
| ▪ 24 months | -6.24 | 0.00 |
| Provider | | |
| ▪ Telstra | 18.18 | 0.00 |
| ▪ Optus | 7.56 | 0.00 |
| ▪ iiNet | -3.07 | 0.01 |
| ▪ TPG Internet | -6.13 | 0.00 |
| ▪ Dodo | 0.00 | |
| ▪ Internode | -0.05 | 0.97 |
| ▪ iPrimus | 2.65 | 0.08 |
| ▪ Westnet | 0.19 | 0.91 |
| Technology | | |
| ▪ Cable (30Mbps) | 1.93 | 0.01 |
| ▪ Cable (100Mbps) | 7.66 | 0.00 |
| ▪ FTTB (12Mbps) | -28.63 | 0.00 |
| ▪ FTTB (50Mbps) | -9.38 | 0.00 |
| ▪ NBN (12Mbps) | -10.62 | 0.00 |
| ▪ NBN (25Mbps) | 1.59 | 0.01 |

| Variable | Estimated coefficient | P-value |
|-----------------|-----------------------|---------|
| ▪ NBN (50Mbps) | 3.92 | 0.00 |
| ▪ NBN (100Mbps) | 14.94 | 0.00 |
| Line rental | -1.82 | 0.14 |
| Local calls | 3.39 | 0.00 |
| National calls | -2.02 | 0.04 |
| Mobile calls | 2.86 | 0.00 |

Source: The CIE.

Table 3.9 presents the estimated price premiums for each provider of fixed line plans. Telstra fixed line plans (controlling for plan characteristics such as data allowance) are \$17.6 higher than non-Telstra fixed line plans.

3.9 Estimated Telstra price premium – fixed line

| Variable | Estimated coefficient | Market share |
|---|-----------------------|--------------|
| | \$ | Per cent |
| Provider | | |
| Telstra | 18.2 | 52.4 |
| Optus | 7.6 | 15.6 |
| iiNet | -3.1 | 10.8 |
| TPG Internet | -6.1 | 9.7 |
| Dodo | 0.0 | 5.2 |
| Internode | 0.0 | 3.0 |
| iPrimus | 2.7 | 1.8 |
| Westnet | 0.2 | 1.4 |
| Difference between Telstra and weighted average of non-Telstra providers | 17.6 | |

Source: The CIE.

Impact of the price premium across Australia

Mobile services

We can measure the total impact of Telstra's price premium on the price paid for mobile services by consumers by combining the estimated premia with the number of post-paid and pre-paid customers of Telstra. Table 3.10 presents estimates of the number of post-paid and pre-paid Telstra customers by region.

These estimates are based on Roy Morgan Single Survey data for April 2015-March 2016, and are the multiple of

- pre-paid and post-paid customers by area (across all providers),
- the number of customers by provider and area (among both post-paid and pre-paid)

- Adjustment factors of 137% for post-paid and 98% for pre-paid to align the number of customers with mobile services (from the Roy Morgan Single Survey) to the number of mobile services reported in Telstra's Annual Report.¹⁶

3.10 Number of post-paid and pre-paid services by region

| Region | Number of post-paid customers | Number of pre-paid customers | Proportion of customers that are post-paid |
|------------------|-------------------------------|------------------------------|--|
| | 000's | 000's | |
| Sydney | 3 516 | 1 221 | 74.2 |
| Melbourne | 3 499 | 924 | 79.1 |
| Brisbane | 1 627 | 570 | 74.0 |
| Adelaide | 893 | 325 | 73.3 |
| Perth | 1 414 | 460 | 75.5 |
| Regional | 6 450 | 2 583 | 71.4 |
| All areas | 17 398 | 6 083 | 74.1 |

Source: Roy Morgan Single Source April 2015-March 2016, Telstra Annual Report (2016), The CIE.

Table 3.11 shows the total premium paid by Telstra mobile (post-paid and pre-paid) customers in different areas. The cost of the premium per mobile subscriber is shown in the final column, which is the total premium divided among the number of customers in each region. It shows that, as a result of greater Telstra market share, regional areas are paying the largest premiums per customer. The total premium paid across post-paid and pre-paid plans is \$1.2 billion/year.

3.11 Total premium paid per mobile customer by region

| Region | Telstra market share | Number of Telstra post-paid customers | Number of Telstra pre-paid customers | Total handset and SIM-only premium | Total pre-paid premium | Telstra premium per mobile subscriber (all providers) |
|------------------|----------------------|---------------------------------------|--------------------------------------|------------------------------------|------------------------|---|
| | Per cent | 000's | 000's | \$million/year | \$million/year | \$/month |
| Sydney | 28.8 | 1 012 | 351 | 91 | 72 | 2.9 |
| Melbourne | 34.5 | 1 207 | 319 | 108 | 65 | 3.3 |
| Brisbane | 34.7 | 564 | 198 | 51 | 40 | 3.5 |
| Adelaide | 35.2 | 314 | 114 | 28 | 23 | 3.5 |
| Perth | 39.7 | 561 | 182 | 50 | 37 | 3.9 |
| Regional | 60.3 | 3 850 | 1 525 | 346 | 311 | 6.1 |
| All areas | 43.0 | 7 476 | 2 614 | 672 | 533 | 4.3 |

¹⁶ Telstra's Annual Report (2016) full-year results (available at: <https://www.telstra.com.au/aboutus/investors/latest-results>, accessed on 29 November 2016) indicate that Telstra has 7.4 million post-paid mobile services and 2.6 million pre-paid services. Roy Morgan Single Survey data indicates that there are approximately 5.5 million Telstra post-paid mobile and 2.7 pre-paid mobile customers. We have used the adjustment process described above to align the Roy Morgan totals to the number of services as reported by Telstra.

Source: The CIE.

Market share data by region is not available for mobile broadband services, and we have not collected data on mobile broadband plans. Instead, in order to estimate the total premium paid by mobile broadband services, we simply assume that the premium is equal to the SIM-only premium for mobile postpaid services. Thus, with a premium of \$4.9 per month, the total premium for mobile broadband services is \$0.2 billion per year.

Thus the total premium for mobile services including post-paid, pre-paid and mobile broadband is \$1.4 billion per year.

Fixed line services

The total premium for fixed line services is calculated by combining the estimated premium for Telstra fixed line plans (\$17.6/month) with the number of Telstra fixed line customers by region. Telstra market share data is determined from Roy Morgan Single Source June 2015 to June 2016 survey data, supplied by VHA.

The total premium paid across Australia is \$1.8 billion/year, and the premium per fixed line customer (across all providers) is \$7.2 (see table 3.12). The premium per customer is highest in regional areas, where Telstra's market share is greater than 60 per cent.

3.12 Total premium paid per fixed line customer by region

| Region | Telstra market share | Telstra customers | Total premium paid | Premium per fixed line customer |
|--------------|----------------------|-------------------|--------------------|---------------------------------|
| | Per cent | 000's | \$million/year | \$million/month |
| Sydney | 39.4 | 1 319 | 278 | 5.7 |
| Melbourne | 43.0 | 1 378 | 290 | 6.4 |
| Brisbane | 42.6 | 666 | 140 | 6.2 |
| Adelaide | 33.7 | 323 | 68 | 5.1 |
| Perth | 39.8 | 566 | 119 | 5.9 |
| Regional | 61.4 | 4 232 | 891 | 9.1 |
| Total | 48.8 | 8 483 | 1 787 | 7.2 |

Source: The CIE, Roy Morgan Single Source data supplied by VHA.

Comparison of the estimated price premium to the previous estimates

The CIE (2015) estimated the price premium for Telstra's post-paid mobile services to be \$9 per month per customer. Our hedonic models estimate the price premium to be similar to this estimate (approximately \$8-14 before accounting for entertainment content and \$5-10 after accounting entertainment content).

The primary factor hindering this comparison is the proliferation of included entertainment and other content in mobile phone plans since the last study. While we have attempted to estimate the value of this content, these estimates are less certain than the hedonic regression

estimates. Our results are likely to be less precise than those of the previous study because of the inability of the hedonic modelling to cope with these plan characteristics.

The previous study did not estimate a premium for pre-paid customers.

The CIE (2015) estimated the price premium for fixed line services to be \$20/month, which is slightly higher than the \$17.6 premium estimated in the model presented in this report.

These results suggest that there has not been an overall trend towards increasingly competitive pricing since the CIE's previous study.

A The value of content included in mobile plans

There are two broad approaches we have considered to account for the value of included content in these estimates:

- 1 Directly including variables indicating the inclusion of content such as OneDrive storage, Netflix subscriptions or free English Premier League streaming.
- 2 Performing separate calculations to estimate the value of this included content to mobile plans, and then subtracting this from the estimated premiums to calculate the premium for Telstra's network and other non-content factors affecting consumer decisions.

The first approach was found not to be possible in this analysis because there is insufficient variation in the inclusion of content. Consider, for example, the inclusion of NRL and AFL streaming which is available to most new Telstra post-paid plans. Only Telstra offers this inclusion with mobile plans, and it applies to all post-paid plans in the dataset. Therefore, an AFL/NRL streaming variable would be perfectly collinear with the Telstra carrier variable, making estimation of each separate effect impossible.

Thus, we follow the second approach. Table A.1 shows estimates of the value of each type of included content and the basis for these valuations. Where possible, we have determined the value by comparing the amount paid by the provider company for the rights to the entertainment streaming rights (such as with Optus' English Premier League rights) to the number of post-paid customers of that provider.

Where that is not possible, we have used the average subscription fee to determine the average valuation. The average price paid by a subscriber for a type of included content is estimated by determining the proportion of the Australian (or USA) population that subscribes to the service currently. This is used as an estimate of the proportion of the Telstra customer population that values the content at least as much as the price paid by other subscribers. This method may be a lower bound to the average value placed on the content by Telstra customers, as Telstra customers may select Telstra plans because they value the content provided, thus having a higher average valuation than the general population.

Nonetheless, using the price paid by the provider to the digital streaming rights is preferable because, given a competitive market for these rights, the price should accurately reflect the expected additional revenue from all sources that the content brings to the provider.

A.1 Estimates of the value of included content

| Provider | Included content | Value of content | Cost per month per plan |
|----------|--|--|---|
| Telstra | Apple music 6/12-month membership | Apple Music subscription costs \$11.99 per month. A 6-month subscription is valued at \$6/month over a 12-month contract. Apple Music has 15 million paid subscribers ¹⁷ globally, but are in the USA, this amounts to approximately 2.5% of the USA population subscribing to Apple Music. Thus, an approximate lower bound for the number of Telstra customers that value Apple Music at \$12/month is 5%, and we estimate that the 6-month subscription over 12 months is worth \$0.15 per month per customer for a 6-month subscription and \$0.30/month for a 12-month subscription. | $(\$12 / 2) * 2.5\% = \$0.30/\text{month}$ |
| | Free music streaming | This benefit is hard to value, however it effectively increases the download limit of users who stream music | |
| | Free and unlimited Telstra Air data | Applies to all Telstra plans, and serves to effectively increase data allowance by allowing for some free unmetered downloads at certain locations. | |
| | NRL/AFL 2016 digital streaming | Telstra paid \$300 million for the rights to digital streaming of AFL games over 6 years (\$50 million/year) ¹⁸ . Assume the NRL digital rights are worth \$200 million/year ¹⁹ . \$500 million/year is equivalent to \$6.9 million/month, which is slightly over \$0.60/month among Telstra's 11.3 million post-paid customers. ²⁰ | $(\$300\text{million} + \$200\text{million}) / 6 / 12 / 11.3\text{million} = \$0.62/\text{month}$ |
| | Onedrive 200GB | Microsoft charges 2USD/month (2.63AUD) for 50GB and 9USD for 1TB bundled with Microsoft Office 365. \$2.63 is likely a reasonable average valuation for this service given that consumers likely receive diminishing marginal benefit from additional storage, so the average valuation should be less than half the highest valuation (9USD). | 2USD = \$2.63/month |
| | 3-month Netflix/Stan/Presto/BigPond use (data charges apply) | In the wider Australia population Netflix has 1.7million paid subscriptions paying \$9-15/month, Stan has 0.3million paying \$10/month and Presto has 0.1million paying \$10-15/month ²¹ . These 2.1million people (or approximately 10% of the population) pay \$11.75/month on average. The subscription is free for 3 months of the 12-month contract (25% of the year). That implies the average Telstra user values the subscription at \$0.29/month/customer. | $11.75 * 10\% * 25\% = \$0.29/\text{month}$ |

¹⁷ <http://www.afr.com/technology/technology-companies/apple/apple-redesigns-its-music-streaming-app-has-15-million-paid-subscribers-20160613-gpia59>

¹⁸ <http://www.smh.com.au/business/media-and-marketing/free-to-air-networks-unite-to-put-live-tv-on-mobiles-before-december-20161009-gryk8f.html>

¹⁹ <http://www.smh.com.au/rugby-league/league-news/how-rupert-murdoch-helped-nrl-hit-2-billion-tv-rights-jackpot-20151126-gl8zod.html>

²⁰ <http://www.businessinsider.com.au/how-optus-stole-the-english-premier-league-from-foxtel-2016-5> and VHA market share data

²¹ <http://www.roymorgan.com/findings/6839-netflix-stan-presto-subscription-video-on-demand-may-2016-201606141025>

| Provider | Included content | Value of content | Cost per month per plan |
|--------------|---|---|--|
| Optus | Optus Sport - including English Premier League (data charges apply) | Optus paid \$200 million for digital rights over 3 years, which among Optus 6.3 million customers, equates to \$0.88 per month | \$200million / 3 year / 6.3million = \$0.88/month |
| VHA | Spotify, Stan or SMH 6/12-month subscription | Considering the Stan subscription, there are 0.3million subscribers in Australia paying an average of \$10/month. This equates to \$0.01/month per customer for 12 months or \$0.005/month for 6 months. Spotify costs \$11.99/month, and given there are 30million paid subscribers, if 50% were in the USA (5% of the population), a 6 month subscription would be worth \$0.30 and a 12-month subscription worth \$0.60. If the SMH subscription were worth the average of the Stan or Spotify subscriptions, then it would be worth \$0.15/month for 6 months and \$0.30/month for 12 months. | \$10 * 1% = \$0.011 or \$0.06 for 6 months; \$12 * 5% = \$0.60/month or \$0.30/month for 6 months; SMH = average of Stan/Spotify; Total = \$0.91 or \$0.46 |

Source: The CIE.

Table A.2 shows the proportion of plans by provider with included content, and the value of that content. It also shows the value of the content adjusted for the proportion of plans with that content included. For example, VHA's offer of a 6-month Spotify/Stan/SMH subscription is available to 7 per cent of plans, meaning that it is worth \$0.91 multiplied by 7 per cent, which implies a value of \$0.06 per VHA plan.

A.2 Average value of content included by provider

| Provider | Included content | Proportion of plans with content (by provider) | Value of content | Value adjusted for proportion of plans included |
|----------------|--|--|------------------|---|
| | | Per cent | \$/month | \$/month |
| Telstra | Apple music 6-month membership | 43.1 | 0.15 | 0.06 |
| | Apple music 12-month membership | 56.9 | 0.30 | 0.17 |
| | Free music streaming | 100 | | |
| | Free and unlimited Telstra Air data | 100 | | |
| | NRL/AFL 2016 digital streaming | 100 | 0.62 | 0.62 |
| | Onedrive 200GB | 100 | 2.63 | 2.63 |
| | 3-month Netflix/Stan/Presto/Bigpond use (data charges apply) | 56.9 | 0.30 | 0.17 |
| Optus | Mobile TV - Netflix, Stan, Presto and ABC streaming without using plan data | 37.8 | | |
| | Optus Sport - including English Premier League and Australian Cricket (data charges apply) | 56.7 | 0.88 | 0.50 |
| | Spotify, Pandora and other music streaming without using plan's data | 100.0 | 0.00 | 0.00 |
| VHA | Spotify, Stan or SMH 6-month subscription | 7.0 | 0.91 | 0.06 |
| | Spotify, Stan or SMH 12-month subscription | 15.1 | 0.46 | 0.07 |

| Provider | Included content | Proportion of plans with content (by provider) | Value of content | Value adjusted for proportion of plans included |
|--|--|--|------------------|---|
| Virgin | Spotify, Pandora and other music streaming without using plan's data | 74.2 | 0.00 | 0.00 |
| Total value of included content | | | | |
| Telstra | | | | 3.65 |
| Optus | | | | 0.50 |
| VHA | | | | 0.13 |
| Virgin | | | | 0.00 |

Source: Provider websites, The CIE.



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