



**NEW ZEALAND INSTITUTE FOR THE STUDY
OF COMPETITION AND REGULATION INC.**

DIVERSE DIMENSIONS OF THE 'DIGITAL DIVIDE': PERSPECTIVES FROM NEW ZEALAND

Presented at the session *Digital Divide in Asia-Pacific* at the Keio University Global COE Programme Conference on Designing Governance for Civil Society, Tokyo, February 5 2012

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CAVEATS

A 'developed economy' perspective

Conclusions from academic research

- not a summary of NZ government policy position
- albeit illustrated with examples from NZ

From an economist

- (albeit with extensive information technology industry experience and a 'track record' of challenging 'established thinking' in telecommunications policy)
- so assumes that ANY policy intervention altering the market-led allocation of scarce resources in the economy (e.g. in the pursuit of equity – however defined) necessarily invokes efficiency trade-offs of benefits and costs in both public and private dimensions



OUTLINE

New Zealand and its 'Digital Divides'

Summary of NZ Policy Responses

The need for principled policy analysis

Economics as a frame for analysis

- three NZ case studies arising from a simple economic model
 - supply and demand

Conclusions



NEW ZEALAND

Small

- 4.4 million people

Distant, isolated

- world's most isolated developed economy
 - but dropping in OECD GDP per capita rankings (23rd)
- heavily reliant upon agricultural exports, tourism

Low population density

- 15 per square km

Highly urbanised

- by some measures, e.g. World Bank 87%, Japan 67%
- albeit comparatively low urban density
 - Auckland 316/sq km, Sydney 362; Tokyo 6703



NEW ZEALAND (cont)

Long history of

- early, widespread availability of digital technologies
 - telephone (fully digital in 1995)
 - ADSL (first commercial service January 1999; 85% of lines ADSL-capable by 2002; 95% from 2005)
- universal service pricing (rural and urban line rentals equalised)
- world-leading dial-up internet uptake, usage
- broadband uptake per capita consistent or even higher than expected given low population density and GDP per capita
 - OECD rankings bb/capita 18th, GDP/capita 23rd

But claims that many 'digital divides' are 'alive and well'

- rural vs urban; socioeconomic; demographic (Maori, Polynesian)
- and tyrannies of both scale and distance
 - RTT Wellington-Sydney 120 ms, West Coast USA 220 ms; UK 330 ms
 - cf. average US Google RTT < 80ms; world <100ms



NEW ZEALAND POLICY RESPONSES

Government-subsidised Ultra-fast broadband network (PPPs)

- G-PON fibre 100Mbps to 70% of NZ customers (cost NZ\$1.35 billion) by 2018; prioritising schools and businesses
- to address perceived low (lagging?) broadband uptake and to enable a “step-change in economic performance” “in line with our competitors” (i.e. Australia, but also likely Korea and Japan)

Rural Broadband Initiative

- any technology (including wireless, satellite) covering all schools and 252,000 households (15% of population) with minimum 5Mbps (cost NZ\$400 million)
- to address perceived lack of rural facilities

e-Government policy (Government service delivery)



SOME PRINCIPLED ANALYSIS OF POLICIES

What is the 'digital divide'?

- how do we define it?

How do we measure it?

- does it actually exist?

If it does exist, can we actually do anything constructive to address it?

- i.e. will policies make any difference?

How do we know that our policies have had any effect?

- what is the counterfactual?
- will 'divides' resolve themselves despite intervention?
- is 'speeding up' resolution worth the costs?
- are there any negative side-effects?



WHICH DIVIDE?

Infrastructure

- access or uptake?
- application, appliance or network?

Geography

- urban vs rural
- population density: sparse vs dense
- degree of urbanisation
- proximate vs distant populations



WHOSE DIVISION?

Demographic/Socioeconomic

- age
- gender
- ethnicity
- Income
- disability

Individuals, household, families or ????

Business or residential?

Social or commercial?



HOW TO MEASURE IT?

Infrastructure/applications

- per capita?
- per dollar of GDP?
- absolute rates?
- growth rates?

And how is 'equity' defined?

- equalised indicator statistics?
- paying the same price?
- receiving the same quality of service?
- equivalent levels of consumer surplus?



WHO CARES (AND WHY)? - INCENTIVES

Government(s)

- service push
- other policy objectives
 - social equity
 - enabling capture of external social benefits (distinct from private)
 - regional development
 - economic aspirations
 - international infrastructure 'arms races'
 - a reason to regulate telcos more intensively
 - vote-farming

Disadvantaged 'communities' (however defined)

- addressing real or perceived needs or inequities
 - private gains available as well as social
- other
 - advantages in relative rivalries
 - subsidy-gathering



WHO CARES (AND WHY)? (cont)

Infrastructure and application provider firms

- growing the market size/bringing forward deployment in some locations
 - lowering average fixed costs per customer
- competing for subsidies
 - lowering shareholder risk/potential profit increases



DO DIFFERENCES EVEN MATTER?

Are all digital consumers (or digits) actually (or aspire to be) equal anyway?

- e.g. equalised rural-urban prices advantage affluent farmers and managerial-class telecommuters at the same time as they disadvantage poor, urban blue-collar households
- e.g. equalised access and pricing for recreational vs commercial activities

Why so much emphasis on closing the ‘digital divide’?

- at the expense of allocating (scarce) policy attention and resources to closing other ‘divides’ – e.g. food, housing, transport etc. – many of which follow the same dimensions as the ‘digital divide’
 - the ‘aircon’ divide (Fink & Kenny, 2004)
 - legacy of the (data, regulation) availability bias?



AN ECONOMIC FRAME FOR ANALYSIS

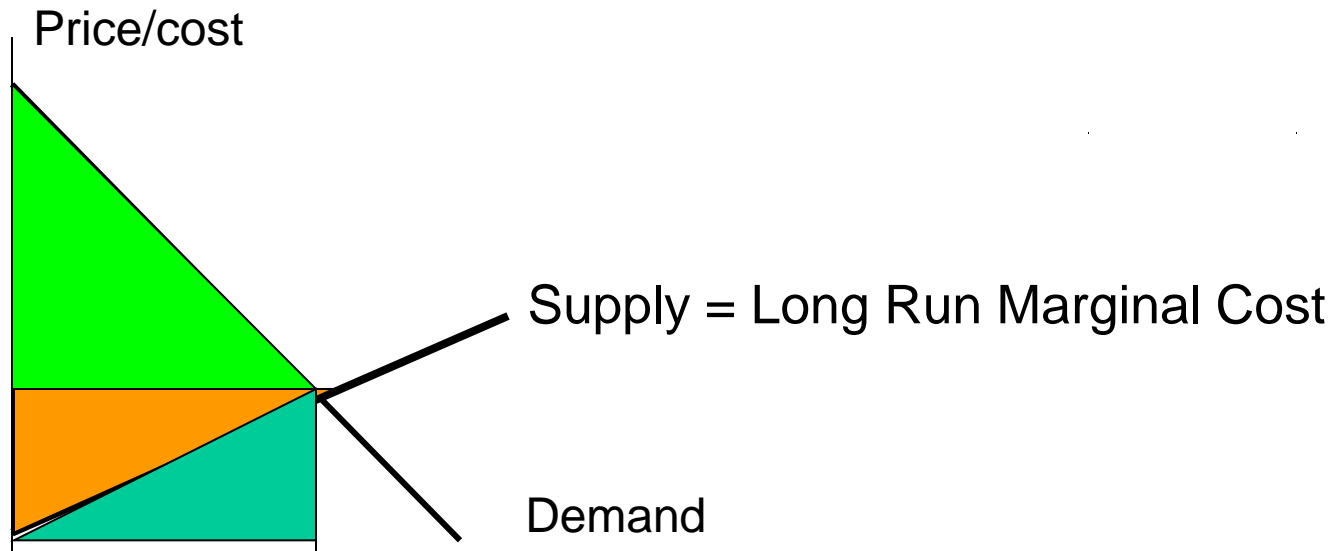
Competitive (or well-regulated) markets do a reasonably good job of supplying infrastructure and applications to consumers who value them above the cost of production




Starting point for analysis is models of supply and demand

- if a 'divide' is discerned, how is it explained in a supply and demand context?
- knowing this,
 1. is it feasible to 'close the divide' with a policy intervention?
 2. what are the costs/benefits available from and tradeoffs invoked by intervening?



MARKET DEMAND AND SUPPLY



-  Consumer's surplus (rent)
-  Producers' surplus (rent)
-  Resource cost of producing q^*



DIVINING DIMENSIONS OF THE DIVIDE

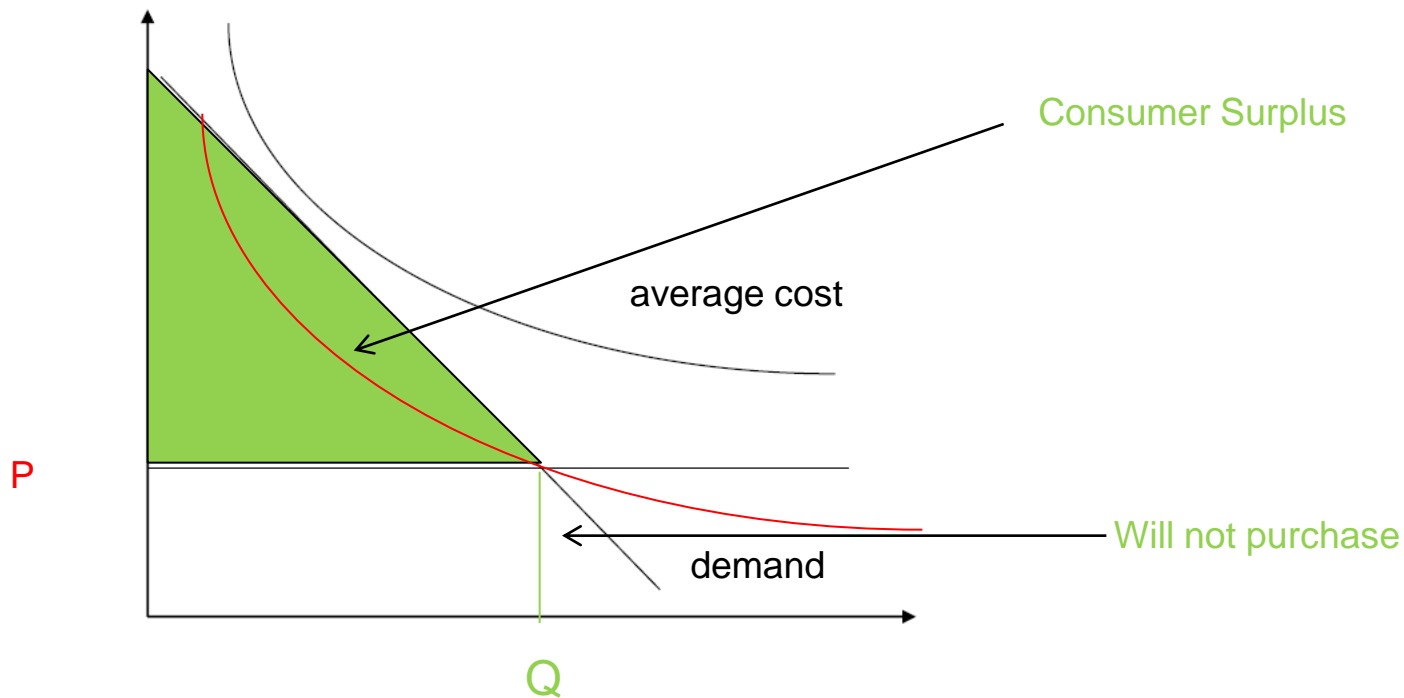
‘Divides in availability’ of infrastructure/applications arise when the average cost of supplying a given market lies above the willingness to pay (‘demand’) of consumers in that market

- amenable to supply-side intervention (e.g. subsidised network)
 - but note other alternatives, e.g. Price Discrimination

‘Divides in uptake’ of infrastructures/applications arise when the willingness to pay of some consumers falls below the price at which it is offered in a given market

- amenable to (targeted) demand-side intervention
 - supply-side interventions (e.g. universal pricing) applied to ‘demand-side’ problems are ‘blunt instruments’ with potentially distortionary consequences





Demand below Average Cost
 Good not provided or consumed
 at any price

Subsidy lowers effective cost
 Good now provided and
 consumed at price P

By the Q consumers valuing it
 at P or above
 Consumers valuing it below P
 will not purchase



DEMAND CURVES ARE DOWNWARD-SLOPING PRECISELY *BECAUSE* INDIVIDUALS HAVE INHERENTLY DIFFERENT VALUATIONS FOR THE GOOD

Market demand curves are the aggregate of individual valuations

- individuals make the purchase choice in a constrained budget environment based upon their relative valuations of the private benefit derived from a range of available goods

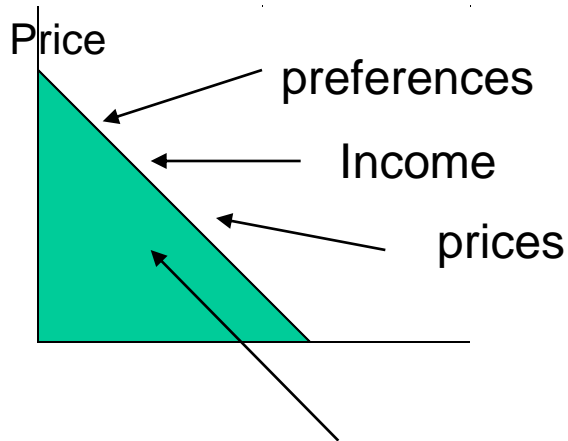
Ceteris Paribus – uptake differences amongst different consumer groups with different demand valuations is THE NORM

- intervention indicated only if there are external (public) costs/benefits not taken into consideration



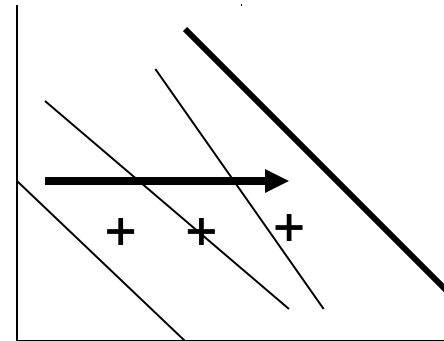
CONSUMER DEMAND

Individual Demand



total willingness to pay

Market Demand



Consumer surplus is the total willingness to pay less what is actually paid: it is a money measure of welfare in certain circumstances

DIFFERENT DEMAND LEVELS AND ELASTICITIES

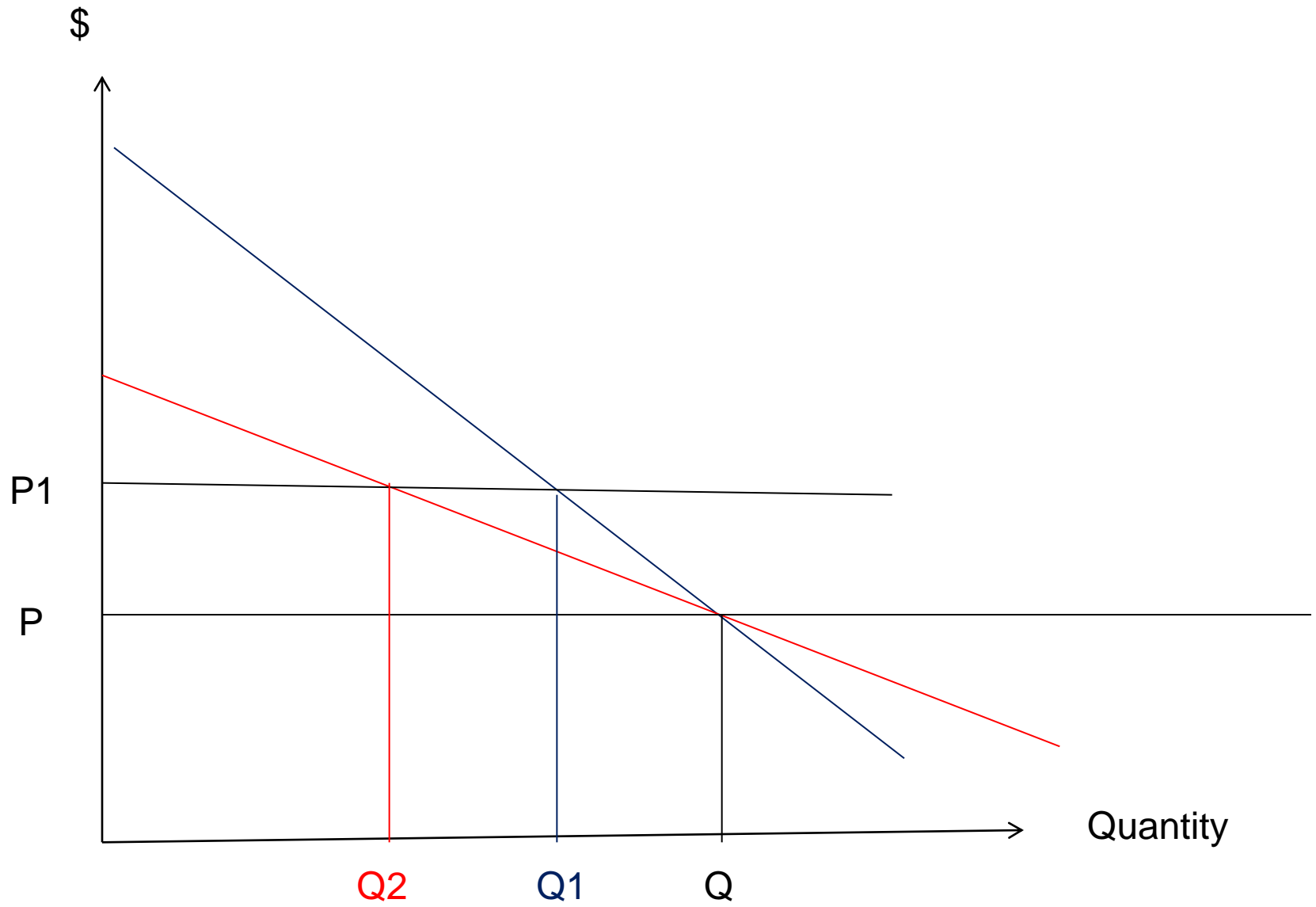
“Steeper” demand curves arise because consumers have fewer substitutes in their product choice set

- a large change in price has very little effect on choice to purchase
- “flatter” demand curves => would prefer to buy something else if price changes even by only a little bit

Higher valuation means greater benefit is derived

- usually because the alternatives/substitutes that could deliver similar outcomes are high-priced
 - examples – alternative leisure activities; costs of communication alternatives





NEW ZEALAND CASE STUDY 1 – RURAL EMAIL (Howell, 2001)

Business use of email

- substitute for other more costly forms of communication
 - phone, fax, standard post (means long journey to post centre for rural businesses compared to urban)

Population data – September 2000

- ‘Yellow Pages’ Business Directory (monopoly), by region
- NZ fixed line network 100% digitised
- email only available if a telephone connection is purchased
- if telephone number/email address advertised (paid for) then being used (so has value to the business)
 - no difference in line rental rural vs urban but rural users make (and receive) more high-cost long-distance calls
- ratio of email advertisers to total listings



RESULTS: EMAIL

Aggregate figures suggest a divide

But disaggregated by region, many provincial and rural areas had a higher proportion of businesses listing email addresses than urban

- more rural South Island leads more urban North Island
- highest ranking rural area listing rate 50% higher than highest-ranking urban
- (some) rural areas early adopters as substitutes more costly

Not carried through to website listings

- substitutes for a different set of activities
 - all businesses use post, fax but not all suited to web trading
- infrastructure quality would have some effect in rural areas



Figure 3: Yellow Pages Website and Email Listing Percentages: North Island v South Island

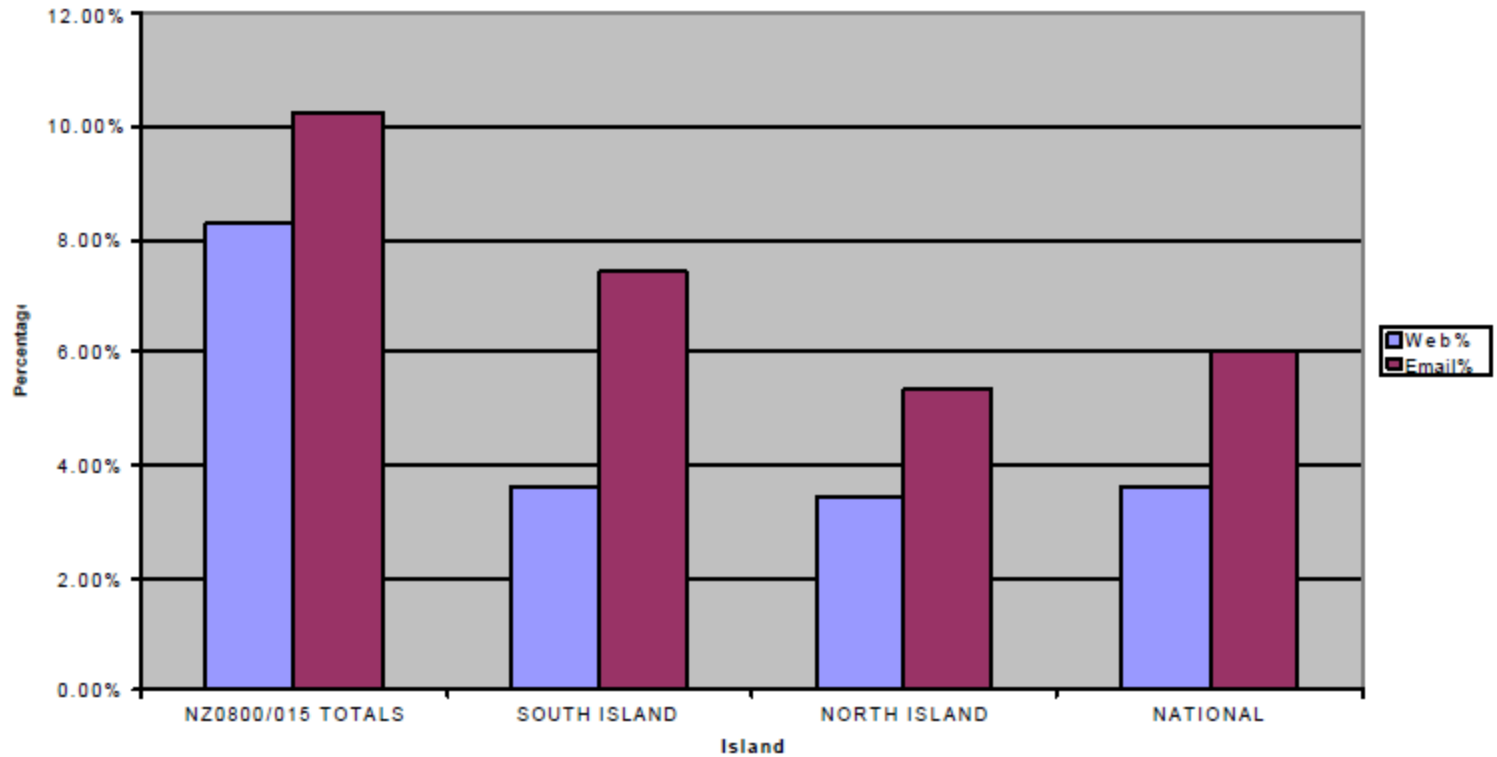


Figure 4: Yellow Pages Website and Email Percentages of Listings

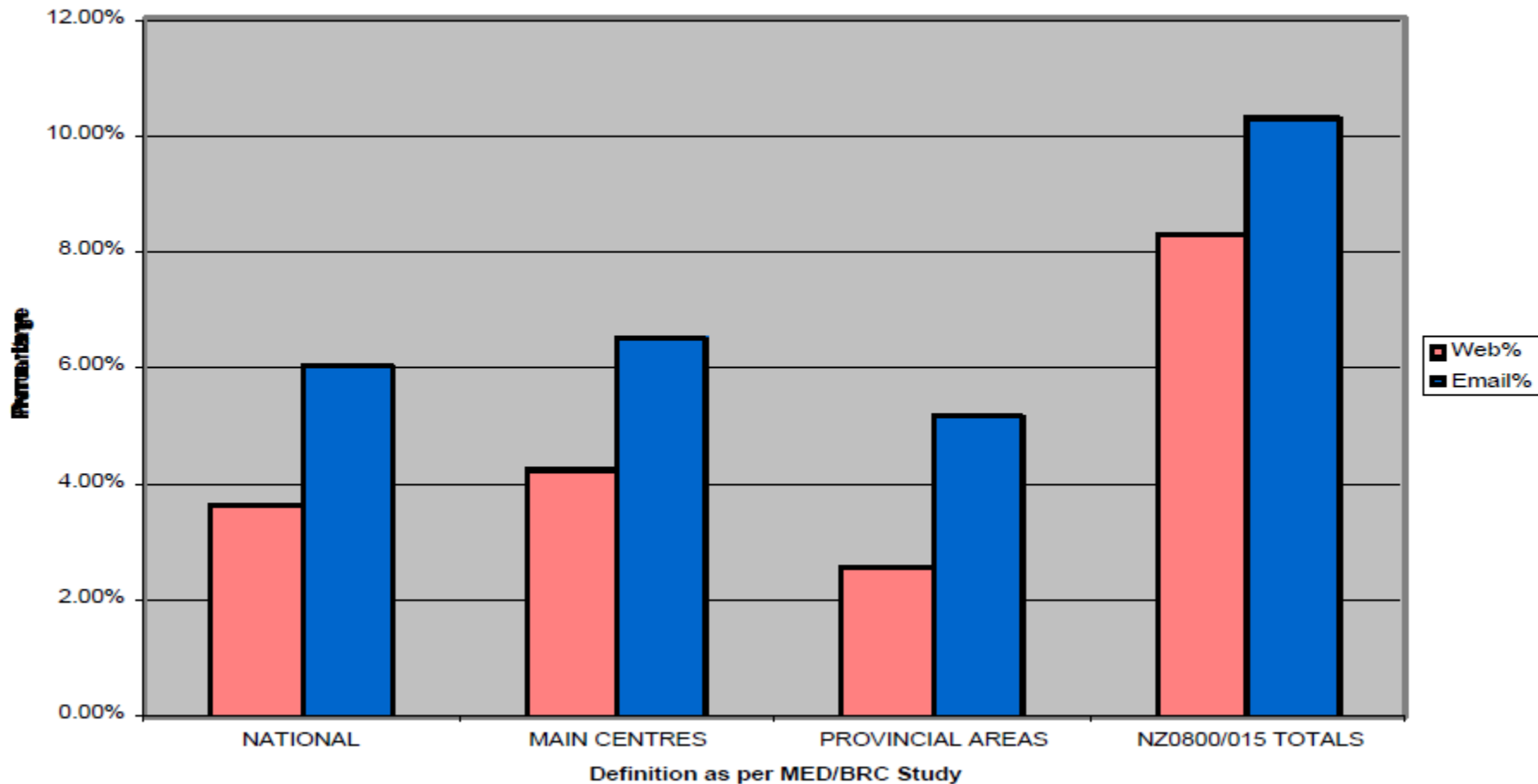
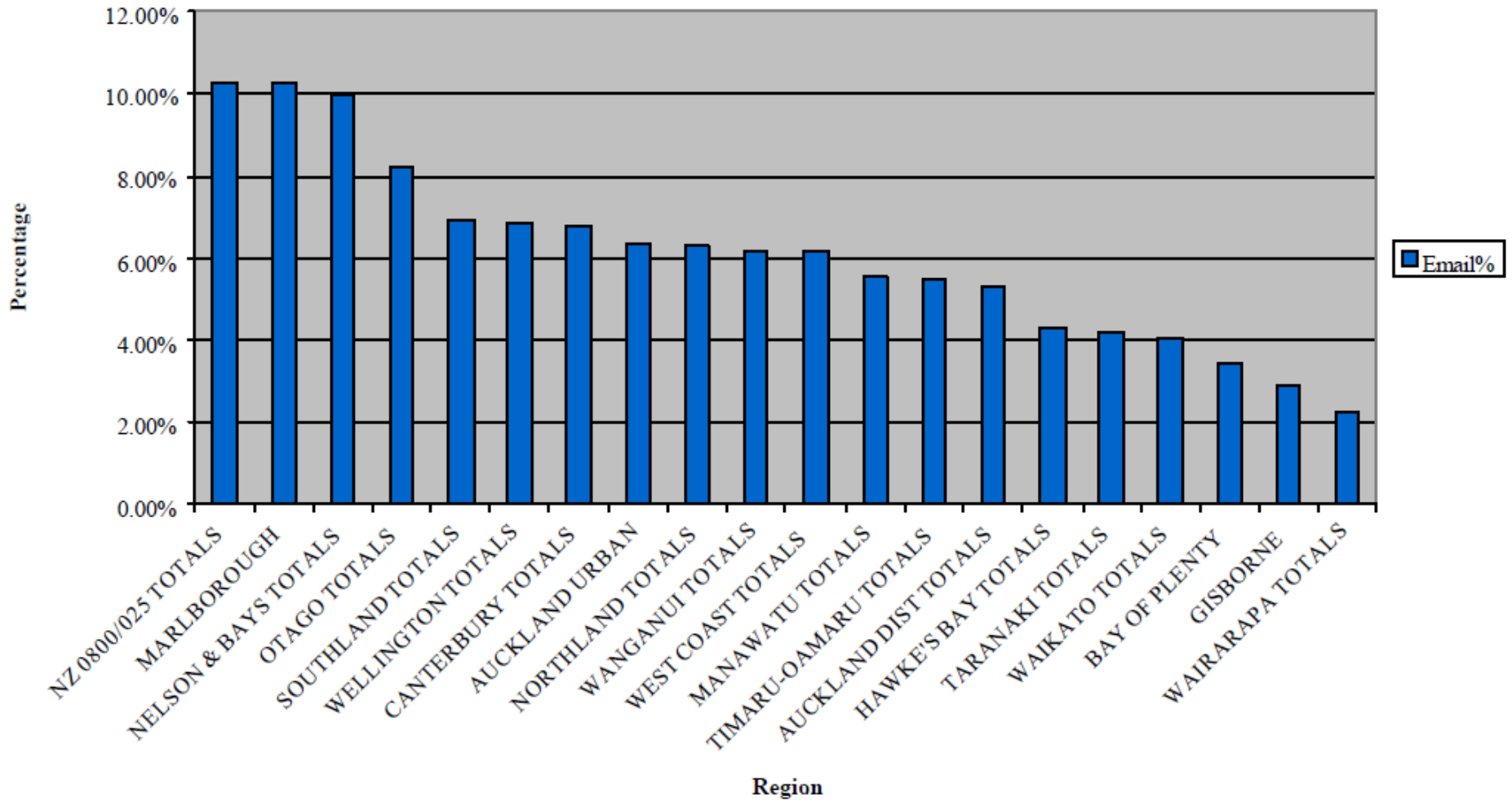


Figure 1: Yellow Pages Email as a Percentage of Listings



TWO YEARS LATER (Howell & Marriott, 2002)

North-south divide still evident, but reducing

- expected as technology matures

Provincial areas consolidating the lead over urban



NEW ZEALAND CASE STUDY 2: UNIVERSAL SERVICE PRICING (Heatley & Howell, 2010)

Line rentals equalised nationwide (since 1881)

- follows historic pattern of ‘postalised’ tariffs for Government-owned monopoly Post and Telephony services
- despite very different costs of provision
 - rural-urban
 - Auckland urban (33% of popn, density 316/sq km and highest density) and other NZ (Wellington – 2nd at 59/sq km; non-Auckland average 14/sq km)

Original objectives

- regional development (‘settling the interior’)
- equity

Now enshrined in artefact and legislation in NZ

- political, economic power in rural (and non-Auckland) NZ



DIGITAL DIVIDE ASSUMPTIONS

Rural populations disadvantaged

- socially isolated
 - so will likely place a premium on access to social media
- more costly to access information, information-based resources
 - libraries, cinemas

So, relative to rural consumers, all else held constant, they can be expected to place a higher valuation on an internet/broadband connection

- as borne out in previous case study



APPLYING SUPPLY AND DEMAND MODEL

Urban cost is less than rural cost

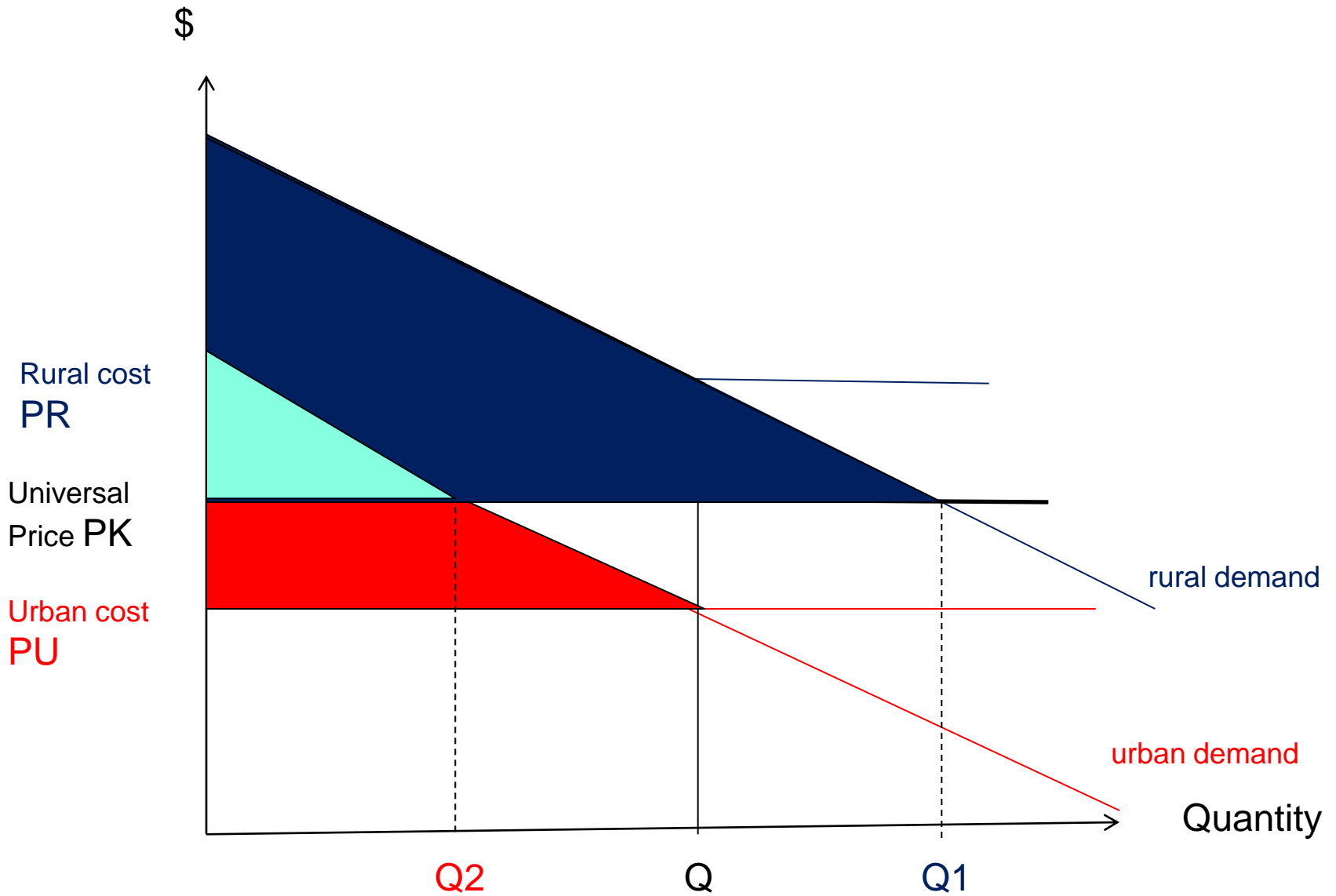
- assume price equals average cost, consumer surplus identical at each average cost

What does applying 'universal price' do?

- rural quantity increases from Q to Q_R
- rural consumer surplus increases
- urban quantity decreases from Q to Q_U
- urban consumer surplus decreases – now only a small proportion of rural surplus
 - poor, budget-constrained urban residents will not buy (even though they value it more than cost of provision), whilst high-valuing residents, who would have purchased at the high price, get a 'windfall' surplus bonus

Is this 'fair'?





LESSONS

Surpluses are ‘private gains’

But what about social gains?

Externalities associated with network effects

- economies of scale

Historically ameliorated by **PRICE DISCRIMINATION**

- charging lower prices to lower-valuing consumers to increase the total number sold and reduce average cost
 - e.g. pensioner discounts
- and will induce operators to supply in areas where otherwise a subsidy would be necessary

But is ***prevented by regulation*** in most countries

- discriminates against **competitive entrants**
- but ultimately harms end consumers?



CASE STUDY 3: PRICE DISCRIMINATION

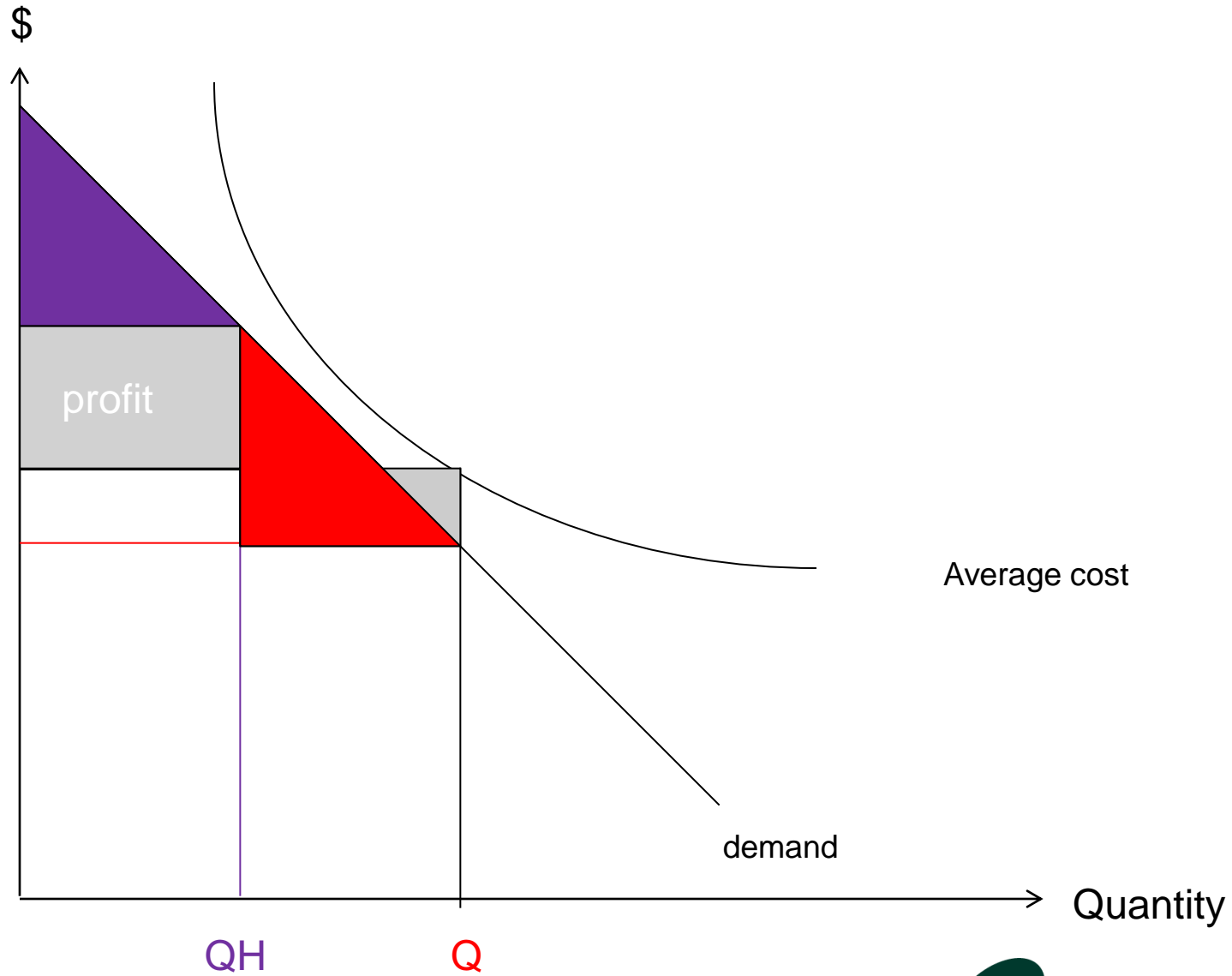
Demand below average cost

- no supply at a single price (without subsidy)

If high-valuing consumers (demand-inelastic) and low-valuing (demand-elastic) consumers can be identified and resale prevented, then

- sell to low-valuers at low price, high-valuers at high price
- maximum quantity sold – lowest average cost per unit
- if profits from selling to high-valuers compensate for losses on units sold to low-valuers, then network will be supplied without need for subsidies
 - high-valuers, low-valuers both get surplus
 - and network operator may also get profits





PRICE DISCRIMINATION (Howell & Wallsten, forthcoming)

Impossible in New Zealand fixed line networks

- non-discrimination provisions in Structural Separation

Worldwide, has likely led to intense competition in network speed as a proxy means to extract additional surplus from high-valuing consumers

- yet evidence of most consumers placing a high premium on speed is sparse

Manifest in mobile networks

- business customer discounting widespread
- little evidence of speed differences on one network as a means of attracting customers
 - all customers get 'best efforts on network at time' broadband speed
- no apparent interest in a 'mobile digital divide' or policies to prevent



CONCLUSIONS

Differences in prices and statistical artefacts are not necessarily evidence of real ‘divides’ amenable to policy instruments

- indeed, policies designed to close some observed ‘divides’ may actually exacerbate inequalities and decrease total welfare

There is no substitute for policy-makers first understanding the underlying multiple dimensions of perceived ‘divides’ before imposing policies that will alter the status quo

Resources for policy analysis are scarce

- but the costs of getting policies wrong are substantial
- it needs to be wisely spent
- more economic analysis of digital divide policies indicated



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