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Does Competition Help or Hurt?**

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Abstract

In a general environment of increasing deregulation and promotion of competition in telecommunications markets, the effects of these changes upon the attainment of universal service objectives are coming under close scrutiny. In a rough way, universal service objectives mean that economic authorities would like to promote high telephone densities at affordable prices. Thus, empirical analysis of the effect of competition should evaluate both telephone density and price effects. We show that, when we look at aggregate data, the negative effects of the introduction of competition on telephone density depend on the econometric approach followed, and that, in the short run, no clear downward pressure on prices results from competition. Hence, the aggregate, country level effects, do not provide a clear answer to the posed question. There is a need for further research that reconciles the findings of microeconomic studies with aggregate data evolution.

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1. INTRODUCTION

In a general environment of increasing deregulation and promotion of competition in telecommunications markets, the effects of these changes upon the attainment of universal service objectives are coming under close scrutiny.

Although the term "universal service" lacks a precise content¹, it usually is meant to imply that access to services and networks should be generalised and at affordable prices². Hence the extent of universal service fulfillment can be measured by telephone density on one side, and the level or rate of decrease of prices, on the other hand.

There is sometimes the presumption of a negative effect of increased competition on telephone density, which is used as an argument to delay (or avoid) liberalisation in telecommunication markets. This presumption stems from the decrease in cross-subsidies that is expected to follow liberalisation. These cross-subsidies, whose exact amounts are widely unknown, are believed to have a beneficial effect on the accessibility of basic telephone services, lowering access and local prices at the expenses of long-distance and international prices, on one side, and household tariffs at the expense of business prices, on the other³. The importance of the issue is illustrated by the special publication of OECD (1995), devoted to the discussion of the impact of liberalisation, deregulation and increased competition in telecommunications markets.

¹ For a discussion of the concept of "universal service" see, for instance, Hills, 1989, and Compaine, B. M. and M. J. Weinraub, 1997.

² These two dimensions of the concept of universal service are implicitly or explicitly present in every public discussion of the telecommunications industry. See, for example, the European Commission communication on Universal Services for Telecommunications, 1996

³ In 1982, in testimony in the antitrust trial from which resulted AT&T's divestiture, Perl predicted that 30% of low-income customers would loose access as a consequence of liberalisation and that increased competition would prevent the attainment of universal service objectives. Dordick, H. S. and M. D. Fife, 1991.

However, recent empirical studies do not support this presumption. Mueller (1993) analysed the expansion of telephone access in the USA before and after the period of liberalisation that followed the expiration of the BELL patents, in 1893-1894, and showed that, during the eighteen years of monopoly, the annual rate of expansion of telephone connections was 5%, while in the twenty years of subsequent liberalisation, this growth rate increased to 40% a year. He also showed that cross-subsidies between services were imposed by the first time only in 1970, when 85% of US households already had telephone connections. He concluded that competition not only did not hinder, but in fact, fostered universal service of telecommunications.

The same type of analysis was carried out by Gillet (1994) but now applied to the period following AT&T's divestiture in 1984. He showed that the telephone penetration rate increased by 2.4% between 1984 and 1992, from 91.6% to 93.8%. He also demonstrated that growth rates were higher among the lower income groups, and in the regions which had, in 1984, lower telephone densities. Hence, he concluded that universality of telephone access increased with liberalisation and that equity in the distribution of telephone services improved substantially.

Hausman *et al.* (1993), using data from the Current Population Survey collected for FCC for CC Docket n° 87-359, estimated models of basic access demands as functions of their own prices and the prices of long-distance calls and concluded that cross-elasticities of demand for access relative to the prices of long-distance calls were negative and clearly different from zero. According to the authors' estimates, a re-balancing consisting of an increase in access prices accompanied by a decrease in long-distance prices could well lead to higher penetration ratios. In fact, they argue that this happened in the US in the period immediately following AT&T's divestiture (their data covered the years 1984-1988).

Using microeconomic data from the US Survey of Consumer Expenditures, Wolak (1996) specified an econometric model of a complete system of household demand equations, and reached the same type of conclusion: the increase of competition in telecommunications and the consequent decrease of cross-subsidies from long-distance to local calls not only failed to imply any significant reduction in the number of households connected to the network, but could even have led to an increase in welfare, if, as expected, it was accompanied by a sufficiently large reduction of long-distance tariffs.

To sum it all up, and contrary to conventional wisdom, the above analyses suggest that competition might have fostered the attainment of universal service objectives, as far as telephone density is concerned.

The other dimension of universal service has to do with the price effect. As mentioned above, the concept of universal service always includes the notion that services should be affordable, in the sense that they should be cheap enough to ensure that no one is excluded from the consumption of basic services because of prices. There is yet another reason why the price level is relevant for universal service. In fact, if competition lowers the prices of telecommunications services, it may well induce a higher telephone density. In particular, if demand for access is sensitive to the prices of different services, the net result upon density of the cancellation of cross-subsidies may well be towards the increase in telephone coverage. Even if telephone density remains unchanged, there are efficiency gains to be achieved from the introduction of competition. The price effect is thus likely to be a countervailing force on the possible "cream-skimming" or adverse effects of competition on universal service objectives.

Previous analysis (OCDE, 1995) strongly suggests that competition has a beneficial effect on prices. The countries where competition prevails have presented a clear downward trend for prices. However, it is also true that the countries in which the monopolist is relatively more efficient (lower average prices before liberalisation)

have shown a stronger willingness to introduce competition. There is, therefore, the need to separate the two effects, density and price, in the analysis.

In this paper we contribute to the discussion of the effects of the introduction of competition on the two dimensions of the concept of universal service mentioned above, by the analysis of aggregate data. This will uncover tendencies that are not country-specific (as could be argued regarding micro studies) and will complement the microeconomic analysis of previous studies. We try to assess, in section two, the impact of liberalisation on the level of accessibility of telephone services, measured by telephone density. Then we evaluate, in section three, the impact of introduction of competition on the other dimension of the universal service concept, that is, the "affordability" of telephone services. We do that by analysing the impact of liberalisation on prices of basic services, for both families and business. Section four concludes.

2. The Density Effect

As a first step in assessing the impact of the introduction of competition on telephone density, we estimate a linear relationship between density and the market structure of the telephone industry in the OECD countries. The effect of competition is captured by the inclusion of a dummy variable which assumes value 1 where competition exists, 0 otherwise. We also consider the possibility of a common trend to all markets (countries), associated with technological progress (which may contribute to a higher telephone penetration, other things being equal).

The linear relationships which should be regarded as reduced-form equations, are:

$$dens_{it} = a_0 + a_1 D91 - a_2 D92 - a_3 dens_{it-1} + a_4 C_{it} \quad (1)$$

where $dens_{it}$ is density in year t for country i (the sample covers three years, 1990 - 1992), $D91$ and $D92$ are dummy variables associated with years 1991 and 1992, respectively, C_{it} is a dummy variable for the existence of competition (1 means a market where there is competition; 0 corresponds to a single telecommunications operator) and $dens_{187}$ is telephone density in 1987. This last variable intends to capture initial conditions and acts as a fixed-effect specific to the country.

The data used were taken from OECD Telecommunications Outlook (1995). The definition of the dummy variable, C_{it} , is based on the OECD definition of countries with/without competition in telephone services. The common trend to all markets is captured by the yearly dummy variables, which should be interpreted as differences from the base year, 1990. Telephone densities in 1987 and 1990-92 correspond to mainlines per 100 inhabitants in the OECD area. The data represents 24 OECD countries, of which 4 (USA, GB, New Zealand and Japan) introduced competition before the period analysed, another 4 opened their telecommunications markets to competition during the period under analysis, (Australia, Sweden, Canada and Finland) and the remaining 16 are still monopolists.

Estimation on the full sample, (24 countries), by ordinary least squares yielded the following results:

$$dens_{it} = 7,78 + 1,06 D91 + 2,96 D92 + 0,92 dens_{187} - 1,22 C_{it}$$

$R^2 = 0.95, N = 72$ (9,28) (2,19) (4,03) (46,70) (-2,30)

Note: in parenthesis, t - statistics based on White (1980) robust standard errors.

This simple exercise suggests the following: firstly, the positive, statistically different from zero dummy coefficients reveal a trend, common to all countries, towards higher telephone density; secondly, there is a clear and significant negative coefficient associated with the existence of competition in the market place. The effect cannot be attributed to country-specific characteristics, as such fixed effects are captured by the starting condition variable, $dens_{187}$, whose estimated coefficient is clearly different from zero.

This result seems to corroborate, at first glance, the view that on average, in OECD countries, the introduction of competition⁴ had a negative effect upon universal service objectives. However, although statistically significant, the magnitude of the effect is rather small, amounting to a reduction of 1-2 percentage points in densities which on average amount to 46.1%.

Nevertheless, the above sample analysis embodies several problems and is open to criticism. In fact, one may argue that, although suggestive, the simple equation above is incorrectly specified if one wants to investigate the effect of introduction of competition (and that it may have biased people's perceptions against competition in telephone markets and its effects on universal service objectives).

The first line of attack is to say that the above specification does not permit a distinction between countries that already had competition in the market in 1990 (the first year in our panel) and countries that have introduced competition during this three-year period; the competition variable, C_{it} , treats the two situations in the same way. But since our main interest lies on the effects of *introducing competition* in monopolistic markets, it is desirable to make this distinction and to isolate the effect associated with the change from monopoly to competition (even if just to duopoly).

In the context of the empirical approach used here, this differentiation can be carried out by excluding from the sample all (four) countries that already had competition in 1990⁵.

Re-estimation of the equation describing telephone density gives

$$dens_{it} = 7,43 + 1,16 D91 + 3,31 D92 + 0,93 dens_{90} - 1,67 C_{it}$$

$R^2 = 0,96; N = 60$ (8,24) (2,04) (3,67) (44,21) (1,89)

⁴ Note that we cannot state that competition was harmful to telephone density in each and every OECD country.

⁵ We could have re-estimated the equation for this set of four countries, too, had we enough data. However, we only had data concerning three years which rendered the exercise useless.

Note: in parenthesis, t - statistics based on White (1980) robust standard errors.

The results on the significance of the common trend and of the initial conditions are similar to the previous ones. More interesting, the statistical significance of the competition effect decreases markedly. In fact, although it still presents a negative sign, the effect is not statistically different from zero at the usual significance levels. Thus, the evidence of a negative effect on universal service from the introduction of competition becomes weaker, leading to the conclusion that the existence of a statistically significant effect of competition in the initial estimates was, therefore, related to the intrinsic characteristics of the countries that already had competitive market structures in 1990, and not to the introduction of competition itself.⁶

Another, more fundamental, criticism can be put forward. The approach used so far has taken telephone density as the unit of observation. However, telephone density is the result of the individual decisions of households in each country. Looking at the problem in this way, the empirical relation previously estimated is inappropriate, as the error structure does not have the properties assumed under the classical linear regression model. This invalidates the statistical results obtained from usual procedures.

Take as a starting point the decision of each individual household of whether to have, or not have, a telephone. This is a discrete choice, which can be characterized as $d=1$ if the household chooses to be connected, $d=0$ otherwise. Suppose that X denotes the vector of variables that determine the decision of each household to have, or not have, a telephone. The proportion of people that have a telephone can be used to specify

$$\text{Prob}(d=1) = F(\beta X) \quad (2)$$

where β is a vector of parameters.

⁶ Alternative statistical formulations, making use of the panel characteristics of the data set (fixed or random country effects) lead to the same qualitative results. They are not reported and are available upon request from the authors.

The probability of a household deciding to have a telephone in a given country is approximated by the telephone density. Specifying a logistic functional form for F originates the following equation to be estimated:

$$\ln(dens_{it}/(1-dens_{it})) = b'X_{it} + u_{it} \quad (3)$$

where u_{it} is a random term that includes all other non-specified regressors.⁷ The variables included in the vector X are the same ones used in previous regressions: telephone density in 1987, a dummy variable reflecting the existence of competition, and time-specific dummy variables for 1991 and 1992. The properties of the error term differ from the usual ones, due to the aggregation of individual decisions.

Estimation has followed a two-step procedure, with simple least-squares estimates being used to produce the weights for estimation by weighted least squares in the second step.⁸

The empirical results of this approach are presented in Table 1, and several variants were considered (with and without country-specific fixed effects, with and without restricted sample).

The competition effect still carries a negative sign in three out of the four cases, although clearly not significantly different from zero in all cases. Thus, this framework for the empirical assessment of the introduction of competition renders substantially different results, as the level of significance of the competition effect is a good bit lower than under the usual approach.

⁷ The interested reader can find the econometric details in Greene (1993, ch.21).

⁸ See Greene (1993) for a full description of the procedure.

Table 1: Density effects of competition

	Dependent variable: $\ln(\text{densit}/(1-\text{densit}))$			
	Without fixed effects		Country-specific fixed effects	
	Full sample	Restricted sample	Full sample	restricted sample
constant	-1,89 (-14,90)	-1,97 (-26,66)	-0,11 (-9,92)	-0,10 (-4,70)
dens_{1987}	0,04 (14,07)	0,04 (25,30)		
C	0,013 (0,27)	-0,022 (-0,25)	-0,026 (-1,18)	-0,030 (-0,58)
$D91$	0,02 (0,49)	0,01 (0,13)	0,03 (0,98)	0,01 (0,11)
$D92$	0,09 (1,69)	0,09 (1,80)	0,09 (3,29)	0,09 (1,46)
R^2	0,948	0,950	0,986	0,986
Observations	72	60	72	60

(a) The estimates of fixed effects are omitted for ease of exposition.⁹

(b) The restricted sample corresponds to the exclusion of countries that already had a non-monopolistic structure in 1990.

(c) In parentheses are presented t-statistics of individual significance, based on White's standard errors.

The empirical evidence of this model shows that the negative and significant effect of competition on universal service objectives, on the side of telephone density, should not be taken at face value when simple, linear models are used. We showed that, since model mis-specification may occur, the negative effect may not be robust to the use of alternative empirical models.

⁹ Because of the fact that there are only three observations for each country, the variable density in 1987 is highly correlated with the fixed-effect for each country: accordingly, it was omitted. Qualitative results remain unchanged by this exclusion.

3. The price effect of the introduction of competition

The analysis of the impact of competition on price evolution was performed in a way similar to the analysis of its effect on telephone density. Price levels were used as endogenous variables¹⁰.

To keep the model as simple as possible, we considered time dummies and country-specific fixed-effects to capture all effects other than the introduction of competition. Different equations were estimated for household and business prices (P^r and P^b , respectively). Prices were withdrawn from OECD (1995). Both business and residential tariffs correspond to the cost of a basket. For business, this price includes a basket of 2695 calls, while the usage charge for residential users includes 956 calls. Prices are at constant 1994 US\$, adjusted by PPP, and exclude taxes. The equations estimated were of the form:

$$p_{it}^y = b_0 - b_1 D91 - b_2 D92 + b_3 dens_{it} + b_4 C_i$$

where $y=b$ (business), r (residential), and the results are presented in Table 2 below.

The results of the full sample estimation show that countries with competition in telecommunication markets have significantly lower average prices (17% lower) for both residential and business customers¹¹. This is in line with the usual presumption of the economics profession that competition is a powerful force in driving prices down.

¹⁰ Although appealing, the analysis of percentage changes in prices implies that the same percent decrease in price may have totally different implicit changes in price when countries differ substantially on average tariffs (as is the case). Thus, only the analysis on price levels is carried out.

¹¹ The exact values are 16.61% for residential customers and 17.0% for business ones.

Table 2: Price effects of competition (full sample)

	P^r	P^b	P^r	P^b
C_{it}	-55,89 (-2,43)	-141,12 (-1,61)	-53,09 (-2,44)	-136,18 (-1,64)
$D91$	21,30 (1,25)	15,22 (0,10)		
$D92$	-33,27 (-0,70)	-113,28 (-0,55)		
$D93$	-25,69 (-0,41)	-107,40 (-0,35)		
$D94$	-60,11 (-0,77)	-150,33 (-0,42)		
R^2	0,209	0,169	0,205	0,168
Mean of dep. variable	336,487	830,126		
Countries	23	23	23	23
Obs.	115	115	115	155

Note: t-ratios in parentheses, based on White robust standard errors.
Country-specific effects were estimated and are omitted.

However, in our view, these estimates mix-up two different sets of countries in the evaluation of the effect of the introduction of competition: those that already had some tradition of competition, even if a short one, at the beginning of the period under analysis, and countries that introduced competition in telecoms during the time period under review.

To probe into the issue further, we can perform the same regression analysis on a sample excluding the set of countries that had competition in 1990. The estimates are presented in Table 3.¹²

¹² An alternative approach is to limit the analysis to the set of countries that introduced competition during this period. However, such a procedure drastically reduces the sample size, to just four countries (and 20 observations), which makes econometric results rather weak. These results are available from the authors upon request.

Table 3: Price effects of competition

	P^A	P^B	P^C	P^D
C_n	-110.51 (-3.74)	-218.40 (-1.74)	-97.97 (-3.18)	-226.66 (-1.94)
$D91$	178.66 (3.11)	344.04 (1.33)		
$D92$	254.79 (2.60)	423.35 (0.93)		
$D93$	230.31 (1.61)	132.23 (0.20)		
$D94$	135.16 (0.89)	-486.07 (-0.70)		
R^2	0.249	0.224	0.213	0.185
Mean of dep. variable	332.929	820.478	332.929	820.478
Countries	19	19	19	19
Obs.	95	95	95	95

Note: t-ratios in parentheses, based on White robust standard errors.

Country-specific effects were estimated and are omitted.

These results show that competition is associated with lower prices in both residential and business market segments. However, given the earlier evidence (presented above), we take this as corroborating the view that a reclassification of countries from one group to the other induces a statistically significant result on the competition variable.

Taking both aspects together, it seems that a reverse causality problem may have plagued our way of viewing the effects of introducing competition. In fact, our analysis suggests that countries that have lower average prices from the start are more likely to open markets to competition. The statistical effect of competition in the first set of estimates (Table 2) is partly resultant from changing low-price countries from one group (no competition) to another (countries with competition), with no noticeable effect on the time evolution of the country's prices.

To further stress our point, we depict the evolution of basket prices for the four countries that introduced competition during the period 1991-1994. Figure 1 and

Figure 2 show that essentially no effect can be attributed to competition (the dates of introduction of competition are 1991 for Australia and Sweden, 1992 for Canada and 1994 for Finland).

Figure 1: Residential price evolution

Figure 2: Business price evolution

The results show that countries with competitive market structures have been able to produce greater price decreases. One may, however, argue that the main operators in those countries would have undergone essentially the same tariff reduction even if they had remained monopolists. This second set of results does not contradict such interpretation. In fact, the several pieces of evidence point to the need to distinguish, in future research, between two main effects: (a) the impact of competition on the lowering of prices, and (b) the increased likelihood of countries with lower prices to introduce competition.

4. CONCLUSIONS

The potentially negative effects of introducing competition in telecommunications markets upon universal service objectives are considered in this paper. In a rough way, universal service objectives mean that economic authorities would like to promote high telephone densities at affordable prices. Thus, empirical analysis of the effect of competition must evaluate both telephone density and price effects.

There is a widely-held presumption that the introduction of competition has an overall negative effect upon universal service: telephone density should decrease, due to the abolition of cross-subsidies between long-distance and both local calls and installation prices. This effect could be partially offset by a general decrease in the average price of phone calls, which, in turn, could increase telephone penetration (if access is sensitive to the price of use). However, the first effect should dominate.

These presumptions have been the subject of several empirical studies. Most of these either look at microeconomic data, or present an analysis based on time-series data for a particular country. Our purpose in this paper is to contribute to this discussion by the analysis of aggregate data, on a time-series cross-country comparison.

In our view, there is no definite conclusion as to whether competition is harmful or beneficial to universal service objectives: simple regression analysis of

telephone density on market structure suggests that the effects of competition on telephone density are indeterminate, with the results ranging from negative to non-significant impact. In fact, according to our results, the significance of these effects depends on the econometric approach followed.

The impact of competition on the average price of telecommunications, for both residential and business consumers, is also largely indeterminate: no clear downward pressure on prices results, in the short run, from competition.

Given the nature of our data (basket prices) we cannot jump from this analysis to welfare statements, as other aspects, such as quality of service, value of calls placed, etc, are absent from our account. We can say, nonetheless, that the presumed beneficial effects of competition on prices are not materialized immediately after competition is introduced.

Hence, the aggregate, country level, results, do not provide a clear answer to the posed questions. Furthermore, we have shown that both detractors and supporters of competition in telecommunications markets can put forward "evidence" in favour of their positions. Further analysis, able to reconcile the findings of microeconomic studies with aggregate data evolution, is strongly recommended. In fact, the strong policy implications involved require a clearer assessment of whether the results of microeconomic studies can be used to extrapolate conclusions to more general levels.

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