Available online at www.sciencedirect.com
SCIENCE DIRECT®
Journal of Policy Modeling 27 (2005) 885–889
Journal of Policy Modeling

The effect of the Internet on inflation: Panel data evidence

Myung Hoon Yi, Changkyu Choi *

Department of Economics, Myongji University, 50-3 Namgajwadong, Seodaemungu, Seoul 120-728, Republic of Korea

Received 25 January 2004; received in revised form 22 February 2004; accepted 22 June 2005
Available online 8 August 2005

Abstract

The hypothesis that the Internet improves productivity and thus will reduce inflation is tested by pooled OLS and random effects model using cross-country panel data from 1991 to 2000. We found that when the ratio of the Internet users to total population increases by 1%, the inflation drops by 0.04264% point to 0.13193% point.

JEL classification: C23; E31

Keywords: Internet; Inflation; Panel data

1. Motivation

Before the wide use of the Internet, the effect of computers on an economy had been analyzed. For example, Krueger (1993) analyzed the effect of computer use on wage structure and found that workers using computers earn higher wages. Oliner and Sichel (2000, 2003) found that greater use of information capital goods drove productivity growth after 1995 in the US. Salvatore (2003) argued that economic liberalization and restructuring as well as information and communication technology (ICT) investment are important in creating the new economy.

* Corresponding author. Tel.: +82 2 300 1738; fax: +82 2 300 1912.
E-mail address: ckchoi@mju.ac.kr (C. Choi).

0161-8938/$ – see front matter
doi:10.1016/j.jpolmod.2005.06.008

The effect of the Internet on several economic variables has been studied recently. For example, the effects of the Internet on bilateral trade and foreign direct investment were studied by Freund and Weinhold (2004) and Choi (2003), respectively. Wadhwani (2000, p. 44) said,

> "the Internet will have a highly significant impact on productivity, margins, the NAIRU and inflation. It is, therefore, my belief that one should rely less on historical relationships than before, and that, in particular, there is a case for revisiting the assumptions on productivity growth and margins in our inflation projections."

Litan and Rilvin (2001) also explained the economic impact of the Internet in both cost savings and the variety of benefits to end users of the Internet. Here, we hypothesize that the Internet improves productivity and thus will reduce inflation.

However, a rigorous empirical analysis on the effect of the Internet on inflation has not been undertaken yet. As the history of the Internet is too short to deal with time series data in a specific country, we used cross-country panel data to get enough observations to analyze the relationship between the Internet and inflation. In Section 2, we derived a simple inflation equation incorporating the Internet variable. In Section 3, we perform several estimations for the inflation equation. Section 4 concludes the paper.

2. Model

To analyze the effect of the Internet on inflation, we included money growth rate, unemployment rate and oil price as control variables in the inflation equation. Here money growth stands for the demand-side variable, unemployment rate and oil price represent supply-side variables. For estimation we set up the following equation,

$$\text{Inflation}_{it} = \beta_0 + \beta_1 \text{Internet}_{it} + \beta_2 \text{Money}_{it} + \beta_3 \text{Unemployment}_{it} + \beta_4 \text{Oil}_{it} + u_{it}, \tag{1}$$

where $u_{it} = \eta_i + v_t + \varepsilon_{it}$, η_i is an individual (country) effect, and v_t is a time effect and ε_{it} is independently and identically distributed among countries and years. Inflation_{it} is the consumer price index (CPI) inflation rate of country i at year t; Internet is the log of the ratio of Internet users to total population; Money is the growth rate of money and quasi-money; Unemployment is the unemployment rate; Oil stands for the percentage change in the West Texas Intermediate price. The coefficient of Internet is expected to have a negative sign as it contributes to the knowledge spillover and thus the improvement of productivity. We expect that coefficients of money growth rate and oil price will be positive, while that of unemployment rate will be negative.

3. Data and empirical results

Internet users, population, CPI inflation rate and unemployment rate are all from World Development Indicators from the World Bank (2002). West Texas Intermediate price is

Table 1
The Internet and inflation: pooled OLS[a,b]

	Pooled OLS			Pooled OLS with time dummies[c]		
	(a)	(b)	(c)	(d)	(e)	(f)
Constant	−33.473***	−29.467**	−31.304**	−32.594***	−17.573**	−28.874*
	(11.964)	(11.699)	(12.325)	(10.444)	(7.602)	(16.749)
Internet	−5.256**	−8.385**	−8.654**	−4.264**	−10.083*	−10.083*
	(2.256)	(4.246)	(4.352)	(2.087)	(5.236)	(5.236)
Money	1.183***	1.154***	1.154***	1.173***	1.149***	1.149***
	(0.226)	(0.431)	(0.431)	(0.216)	(0.423)	(0.423)
Unemployment		−1.797	−1.818		−2.133*	−2.133*
		(1.145)	(1.154)		(1.279)	(1.279)
Oil			0.126			0.194
			(0.088)			(0.237)
$\bar{R}^2$	0.62	0.65	0.65	0.63	0.64	0.64
Sample size	878	484	484	878	484	484

[a] (***), (**) and (*) indicate significance at the 1%, 5% and 10% levels, respectively. Standard errors are in parentheses.
[b] Newey and West (1987) heteroscedasticity and autocorrelation consistent covariance matrix assuming a lag length of one is used for standard errors.
[c] Estimated coefficients of time dummies from 1991 to 2000 are not reported to save space.

from the International Financial Statistics CD-ROM of the International Monetary Fund (2002). Data range from 1991 to 2000. We included data from 207 countries. Internet users are people with access to the worldwide network. Inflation is measured by the consumer price index. Internet users are divided by total population to get Internet users ratio.[1]

Table 1 lists the regression results by pooled ordinary least squares (OLS) regressions. Columns (a–c) do not include time dummies in the pooled OLS, while columns (d–f) do include them. Newey and West (1987) heteroscedasticity and autocorrelation consistent covariance matrix assuming a lag length of one is used for standard errors.

As shown in columns (a–c), the estimated coefficients of the log of the Internet users ratio (*Internet*) are negative and significant at the 5% level and those of the money growth rate (*Money*) are positive and significant at the 1% level. Other variables have the expected signs but are insignificant. Columns (d–f) show similar results to columns (a–c). Estimated coefficients of the Internet are negative and significant at the 5% level in (d) and at the 10% level in (e and f). When we look at the coefficients of *Internet* in Table 1, the estimated coefficients range from −4.264 to −10.083. This implies that when the Internet users ratio increases by 1%, the inflation rate drops by 0.04264% point to 0.10083% point. The estimated coefficients of money growth rate (*Money*) are positive and significant at the 1% level. We found that after controlling for time dummies, estimated coefficients of unemployment rate (*Unemployment*) became negative and significant at the 10% level. The estimated coefficients of oil price (*Oil*) are positive but insignificant.

[1] Means of inflation rate and the Internet users ratio in the whole sample, are 67.35% and 0.03, respectively.

Table 2
The Internet and inflation: random effects model[a]

	Individual random effects			Individual random effects with time dummies		
	(a)	(b)	(c)	(d)	(e)	(f)[b]
Constant	−33.212**	−22.013	−24.734	−32.780	−15.834	−29.853
	(15.478)	(25.061)	(25.790)	(21.166)	(35.117)	(64.220)
Internet	−5.223**	−8.331**	−8.773**	−4.414	−13.193***	−13.193***
	(2.376)	(3.357)	(3.478)	(2.825)	(4.895)	(4.895)
Money	1.182***	1.163***	1.163***	1.177***	1.159***	1.159***
	(0.032)	(0.043)	(0.043)	(0.033)	(0.043)	(0.043)
Unemployment		−2.689	−2.736*		−3.395*	−3.395*
		(1.639)	(1.645)		(1.742)	(1.742)
Oil			0.156			0.241
			(0.314)			(1.345)
R^2	0.62	0.71	0.71	0.65	0.71	0.71
Sample size	878	484	484	878	484	484

[a] (***), (**) and (*) indicate significance at the 1%, 5% and 10% levels, respectively. Standard errors are in parentheses.
[b] Estimated coefficients of time dummies from 1991 to 2000 are not reported to save space.

In order to check the estimation robustness, we ran the regression by random-effects model without time dummies, see Table 2, columns (a–c), and with time dummies (d–f). We got quite similar results to those reported in Table 1. As shown in columns (a–c), the estimated coefficients of the log of the Internet users ratio (*Internet*) are negative and significant at the 5% level; they range from −4.414 to −13.193. Estimated coefficients of the money growth rate (*Money*) are positive and significant at the 1% level. The estimated coefficient of *Unemployment* is negative and significant at the 10% level in column (c). Columns (d–f) show similar results to columns (a–c). Estimated coefficients of *Internet* are negative but insignificant in (d) and significant at the 1% level in (e and f). Estimated coefficients of the money growth rate (*Money*) are positive and significant at the 1% level. Estimated coefficients of unemployment rate (*Unemployment*) became negative and significant at the 10% level in columns (e and f). The estimated coefficients of oil price (*Oil*) are positive but insignificant.

The negative effect on inflation found for the Internet fits well with our empirical analysis, which is robust against the various estimation methods.

4. Summary and policy implications

The hypothesis that the Internet will reduce inflation is tested using cross-country panel data with pooled OLS and a random-effects model. After controlling for money growth rate, unemployment rate and oil price, we found that the Internet significantly reduces the inflation rate.

Policy implications can be drawn from our analysis. First, increasing the investment in the Internet infrastructure in a country may help lower inflation. Second, the rapid development of the Internet can affect the traditional relationship between money and inflation. Therefore, monetary authorities should be more cautious in switching to contractionary monetary policy when confronted with the increase in employment and production, as in Salvatore (2003, p. 539), because Internet development can put downward pressure on inflation in the new economy.

References

Choi, C. (2003). Does the Internet stimulate inward FDI? *Journal of Policy Modeling*, *25*, 319–326.

Freund, C., & Weinhold, D. (2004). The effect of the Internet on international trade. *Journal of International Economics*, *62*, 171–189.

International Monetary Fund (2002). International Financial Statistics CD-ROM. International Monetary Fund, Washington, DC.

Krueger, A. B. (1993). How computers have changed the wage structure: Evidence from micro data 1984–1989. *Quarterly Journal of Economics*, *108*, 33–60.

Litan, R. E., & Rilvin, A. M. (2001). Projecting the economic impact of the Internet. *American Economic Review*, *91*, 313–317.

Newey, W. K., & West, K. D. (1987). A simple, positive semi-definite, heteroscedasticity and autocorrelation consistent covariance matrix. *Econometrica*, *55*, 703–708.

Oliner, S. D., & Sichel, D. E. (2000). The resurgence of growth in the late 1990s: Is information technology the story? *Journal of Economic Perspectives*, *14*, 3–22.

Oliner, S. D., & Sichel, D. E. (2003). Information technology and productivity: Where are we now and where are we going? *Journal of Policy Modeling*, *25*, 477–503.

Salvatore, D. (2003). The New Economy and growth in the G-7 countries. *Journal of Policy Modeling*, *25*, 531–540.

Wadhwani, S. B. (2000) The impact of the Internet on UK inflation. Bank of England Quarterly Bulletin, Bank of England: 184–198 <http://www.bankofengland.co.uk/speeches/speech72.pdf>.

World Bank (2002) World Development Indicators 2002 CD-ROM. The World Bank, Washington, DC.