

THE NEW ECONOMY AND THE DOLLAR PUZZLE: THE CASE OF AUSTRALIA

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Abstract:

The revolutionary changes in information technology (IT), globalisation and financial innovation have overturned the Solow productivity paradox and spawned a New Economy (NE) in Australia in the late 1990s. Both growth accounting estimates and the use of the information superhighway ranks Australia next to the USA as a NE. Australia is an avid user but not a producer of IT that propels the NE. The debate on the need for a new paradigm for the new economy on the grounds that key mechanisms of the old paradigm have become obsolete is reviewed. The breakdown of the short-run Phillips curve tradeoff and the redundancy of the long-run speed limits to growth are examined and dismissed as poppycock both on theoretical and empirical grounds. The IT technology because it is subject to severe diminishing returns and problems of information overload fails to rank with the great inventions of the past and will not be a harbinger of the Third Industrial Revolution. Nonetheless, on the basis of the 'delay hypothesis' the dismissal of the case for a new paradigm for the NE may be premature at this stage. The paper also examines the puzzling nose-dive of the dollar during the first half of the year 2001. This occurred despite the strong macroeconomic fundamentals and the emergent NE. The paper concludes commenting on the policy reaction function for a small open NE committed to inflation targeting.

Key Words: New Economy. Information Technology. Productivity. Conventional Paradigm. Exchange Rate. Inflation Targeting. Policy reaction function. Open Economy. Australia.

JEL Classification: B40, D24, E10, E40, E50, O50, O58.

I. INTRODUCTION

The investment in information technology (IT) has brought about revolutionary changes in methods of production and distribution and has catalysed the resource based manufacturing economy or the ‘old economy’ into a ‘new economy’ where symbol crunching has become the major source of value-adding and productivity growth. Australia has invested in IT and reorganised production and has emerged as leading user of the Internet for electronic commerce. The IT investments have resulted in complementary innovations leading to a resurgence in productivity growth and a reduction in the costs imposed by the ‘tyranny of distance’. In the mid-1990s these revolutionary changes due to IT investments combined with the processes of globalisation and financial innovations reversed the productivity slowdown witnessed over the previous two decades leading to the observation that ‘there are computers everywhere but not in the productivity statistics’ (Solow, 1987). The reversal of the Solow productivity paradox was due to the joint impact of Moore’s law, the doubling of computing power every 18 months, and Metcalfe’s law, the increase of the value of a network by value of the square of every new user (Economist, 2000). Although Australia was major user of IT unlike USA it was not a producer of IT hardware and goods and therefore it lacked the high-tech stocks and shares that lured the portfolio investors to the ‘new economy’ in the USA. Australia because it lacked a vibrant IT producing sector was tagged pejoratively as an ‘old economy’. It failed to attract the capital inflows that poured into high-tech stocks and shares in the USA strengthening the US dollar and at the same time weakening the Australia dollar in the latter part of the 1990s.

The paper is motivated by the need to shed light on the pros and cons on the case for a new paradigm for the NE. Section II of the paper presents the stylised facts on how the Australian economy has been reshaped into a NE. Stylised facts based on growth accounting methods and on the use of the information superhighway show that Australia has arrived as a NE trailing behind USA. Section III reviews the case advanced for a new paradigm for the NE. Both short-run Phillips curve tradeoffs and the long-run speed limits to growth prescribed in the conventional paradigm are reviewed. Section IV finds no support for a new paradigm on the grounds of mis-measurement of key variables in the conventional paradigm. Nor is there clear-cut evidence that IT is a general purpose technology in the same league as the great inventions of the past. Therefore, the case for a new paradigm for the NE is dismissed as poppycock. Section

V reviews critically the puzzling nosedive of the dollar during the first half of 2001, despite strong fundamentals and an emerging NE. Section VI concludes providing some policy perspectives

II. THE NEW ECONOMY

The emergence of the New Economy (NE) in Australia in the mid-1990s is revealed by the decomposition of productivity statistics based on growth accounting techniques¹. Estimates based on growth accounting show that Australia's labour productivity doubled in the second half of 1990s compared to the first half of the decade (Parham 1999, Gruen 2000, Simon, 2001). Most of the labour productivity resurgence was attributable to both capital deepening due to investment in IT and the surge in total factor productivity due to the spillover effects of IT use. Total labour productivity refers to the increase in output per labour unit, capital deepening defines the growth of capital per labour unit and total factor productivity (TFP) refers to growth in labour productivity due to increase in output, due to complementary innovations and reorganisation, whilst using the same factor inputs. The growth accounting methodology used to decompose labour productivity growth into the constituents according to some analysts fail to measure adequately the contribution of IT capital to the increase of productivity that underpins the emergence of the NE.

¹ Growth accounting methodology

The methodology underpinning the decomposition of growth of labour productivity to capital deepening and total factor productivity could be explained as follows.

The growth accounting equation (1) postulates that growth rate of GDP ($\Delta Y/Y$) equals the growth rate of capital ($\Delta K/K$), labour ($\Delta N/N$) weighted by their respective factor shares (θ) and $(1-\theta)$ plus total factor productivity ($\Delta A/A$) and is derived by differentiating a Cobb-Douglas production function under assumptions of perfect competition, constant returns to scale, etc. giving the relationship shown below:

Given Y: Output, L: Labour, K: Capital, θ : Factor share.

$$\Delta Y/Y = \theta \Delta K/K + (1-\theta) \Delta N/N + \Delta A/A \quad (1)$$

The growth of labour productivity or output per worker is derived by subtracting from both sides of equation (1) $\Delta N/N$ and showing that it is the sum of the growth of capital deepening and growth of total factor productivity as shown in equation (2) below:

$$(\Delta Y/Y - \Delta N/N) = \theta (\Delta K/K - \Delta N/N) + \Delta A/A \quad (2)$$

Notating the per capita terms in small case letters we show that labour productivity equals capital deepening and total factor productivity in equation (3) furthermore we can decompose capital deepening into the contributions of ITC and other capital thus: ($\theta \Delta k/k = \theta_1 \Delta k_1/k_1 + \theta_2 \Delta k_2/k_2$)

$$\Delta y/y = \theta_1 \Delta k_1/k_1 + \theta_2 \Delta k_2/k_2 + \Delta A/A \quad (3)$$

Nearly half of the increase in labour productivity ($\Delta y/y$) was due to capital deepening ($\theta \Delta k/k$) resulting from the application of ITC ($\theta_1 \Delta k_1/k_1$), about one-fifth was due to growth of total factor productivity (TFP) or the Solow residual. ($\Delta A/A$) and relevant details are reported in Table 1.

Based on the growth accounting methodology the doubling of labour productivity in Australia in the second half of 1990s compared to the first half and decomposition of this growth into contributions by IT capital deepening and the growth of labour productivity as estimated by Simon (2001) is shown in Table 1. The comparison with growth accounting estimates for the USA by Oliner and Sichel (2000) reveals that Australia outperformed the USA in the NE productivity growth stakes in the latter half of the 1990s.

Table 1 Labour Productivity Decomposition.

Growth accounting estimate	Australia (market sector)			USA (non-farm business)		
	91-95	96-99	% Δ	91-95	96-99	% Δ
Growth rate % p.a.						
IT Capital (Δk_1)	0.9	1.3	44	0.5	1.0	100
Other capita (Δk_2) & labour quality	0.4	0.6	15	0.5	0.4	-20
Total factor productivity TFP ($\Delta A/A$)	0.8	2.2	175	0.5	1.2	140
Labour productivity ($\Delta y/y$)	2.1	4.1	95	1.5	2.6	73

Source: Gruen (2001) and Simon (2001): p.68 base

According to microeconomic empirics or firm level case studies, the growth accounting method seriously underestimates the productivity contributions of IT by failing to value intangible capital accumulation due to complementary innovations generated by IT investments. Stock market valuation of IT capital is 10 times more than that of non-IT capital, after discounting for the effect of high-tech bubbles. It is pointed out that when IT investments are estimated for the whole economy using a Tobin's q type of measure² the valuations of IT investments are 10 times greater than valuations from non-IT investments. The resultant Tobin's q exceeds unity (Brynjolfsson and Hitt 2000: 81). Australia's speeding up the information superhighway as measured by its uptake of various types of e-commerce in the late 1990s was nothing short of spectacular. The electronic transactions on the information superhighway can be classified into different categories (B2B, B2C and G2B) as shown in the matrix (Table 2).

Australia occupied a top rank in the first quartile, in the OECD league of 27 countries, in terms of e-commerce indicators such as secure servers and Internet hosts (See Table 3). In the OECD

² Tobin's q

Tobin's q = [Stock market value of IT investment] / [Replacement cost of installed IT investment]

league it ranked third both in terms of IT expenditure as a ratio of GDP and in terms of Internet access costs. It ranked eighth in Internet hosts per thousand inhabitants, sixth in terms of PC penetration.

Table 2 Matrix of e-commerce transactions

e-commerce	Business(B)	Consumer (C)	Government(G)
Business (B)	B2B	B2C	B2G
Consumer (C)	C2B	C2C	C2G
Government(G)	G2B	G2C	G2G

Table 3 Number of Internet Secure servers and Hosts

Country/ Internet	Secure servers ^a /mn Pop (Rank)	Internet hosts/th Pop (Rank)
Australia	119 (3)	55 (8)
USA	170 (2)	160 (1)
OECD Average	60	54
OECD Total	66810	60502

Notes: Secure servers allow users to engage in e-commerce using encrypted credit cards for financial transactions. Internet hosts refers to a computer system with an Internet Protocol (IP) linked to the network. Source: OECD www.oecd.org/dsti/itcm/ Coppel (2000).

Despite Australia's adoption of IT on a grand scale which ranked Australia next to the US top-seed as a NE, there were some noteworthy difference between Australia and the USA. Australia lacked an IT production sector. It neither produced semiconductors or other high-tech gear nor could it boast of a high-tech hub like the Silicon Valley Australia also was not an assembler of labour intensive electronic products generating IT jobs as in South Korea or Czechoslovakia. This was reflected in the low shares of IT related employment and value added by this sector to total business activity. IT related employment and value added in Australia was 10 and 14 times lower than in USA (Table 4).

Table 4 Share of IT Production (1998)

Manufacturing	Employment	Value-added
Australia	0.13	0.14
US	1.31	1.90
Ratio AUS/US	10	14
UK	1.37	2.56
Ratio AUS/UK	10	18

Source: OECD (2000) Measuring the ICT Sector, OECD Paris.

OECD studies (OECD 2000) indicate Australia outperformed USA the leading NE, in the productivity stakes, despite the lack of IT producing sector (Gust and Marquez 2000).

III. A NEW PARADIGM

The relevance of rival macroeconomic paradigms or the conventional wisdom in the form of the New Classical, New Keynesian and Real Business Cycle theories have been tested using Australian stylised facts (Karunaratne 1999). Rather than retread ground already covered, here we focus on the two-pronged attack mounted by the NE enthusiasts on the conventional paradigm. The first prong of the NE enthusiasts attack is trained on the short-run cyclical transmission mechanisms of the conventional paradigm as exemplified by the Phillips curve tradeoff. The second prong of the attack is trained on the long-run speed limits to growth or the production potential of the economy as predicted by the neoclassical growth model.

First, it is alleged that the emergence of the NE has caused the breakdown of the short-run tradeoff between inflation and unemployment as postulated by the original Phillips curve (Phillips 1958). It needs to be noted that the expectations augmented Phillips curve (EAPC) positing no long-run tradeoff between inflation and unemployment evolved later in the deft hands of Phelps (1968) and Friedman (1968). The EAPC a core component of the conventional paradigm took a battering, during the stagflation of the 1970s, when inflation and unemployment rose simultaneously in the face of supply shocks. Then EAPC was banished into oblivion from the policy arena. It was chastised as “an empirical failure on a grand scale’ (Lucas and Sargent 1978) and “a professional embarrassment” (Galbraith 1998). The Phillips curve was not sighted during the episodes of monetary targeting (1975-85) and during the era of the check-list approach when discretion guided policy prescriptions in the late 1980s (Johnston, 1985). However, with the adoption of inflation targeting in 1993, the Phillips curve has made a comeback both as an important intellectual framework for policy analysis and as an empirical tool for testing the robustness of policy prescriptions (Gruen et al. 1999). The Phillips curve also figures prominently in contemporary macroeconomic texts as an important analytical tool in the context of the conventional paradigm (Mankiw 2001, Dornbusch et al. 2001). A skeletal history of the evolution of the Phillips curve in Australia is recounted in Table 5.

The emergence of the NE allegedly caused a breakdown of the short-run Phillips curve tradeoff because in the NE unemployment can be reduced with igniting inflation. Therefore, the NE rhetoric proclaims the death of inflation and the business cycle (Boole 1996). The NE has stood stagflation on its head and at the same time knocked the wheels off the short-run Phillips curve. The policy prescriptions grounded out from the old paradigm according to the NE enthusiasts are flawed as they stifle expansionary policies that could deliver higher employment and output without kindling inflation. Therefore, the NE hype calls for a new paradigm to meet the policy challenges posed by the NE.

Table 5 History of the evolution Phillips Curve in Australia

Period	Type	Policy	Source
1960	Inflation -Unemployment tradeoff	Wage arbitration	Phillips (1958)
1975-86	No tradeoff (stagflation)	Monetary targeting	Friedman (1968)
1989-90	No tradeoff	Check-list	Jonston (1985)
1993-01	Tradeoff	Inflation targeting	Gruen et al (1999)

The labour market version of the EPAC has been presented in terms of symbolic logic³. Here the conventional tradeoff in the Phillips curve postulates, cet. par., when unemployment exceeds the non-accelerating rate of inflation (NAIRU) inflation could be reduced below expected inflation. But the NE hype claims that in the NE both unemployment and inflation can be reduced simultaneously as the hypothesised inflation unemployment tradeoff in the conventional paradigm has been rendered obsolete. Further insights on the break-down of the Phillips curve are revealed through the supply side version of the Phillips curve. The supply-side Phillips curve can be obtained by substituting in the Okun's Law⁴ relationship that links the output gap to the deviation of unemployment rate from NAIRU, which states that $\beta\%$ reduction in unemployment

³ Expectations Augmented Phillips Curve (EAPC)

$$\pi = \pi^e - \beta(u - u^*) + \varepsilon \quad (1) \text{ Labour market version.}$$

where π : inflation, π^e : expected inflation, u : unemployment rate, u^* : natural rate or NAIRU (non-accelerating inflation rate of unemployment), ε : a supply shock, β : is the response of inflation to the cyclical demand-push on inflation, measured by deviation of unemployment for the natural rate.

Cet. par assumption assumes away supply shocks (ε).

According to the conventional paradigm if $u < u^*$ then $\pi > \pi^e$. That is, reduction of unemployment triggers inflation.

In the NE it is claimed that cet. par. $u < u^*$ and $\pi < \pi^e$ can occur simultaneously.

This leads to a breakdown of the tradeoff and death of inflation and the business cycle.

⁴ Expectations Augmented Phillips Curve (EPAC).

Substitute from Okun's Law $-\beta(u - u^*) = 1/\alpha(y - y^*)$ in labour market version of EPAC and obtain:

$$\pi = \pi^e + 1/\alpha(y - y^*) + \varepsilon \quad \text{Supply version of EPAC}$$

According to the conventional paradigm if $y > y^*$ then $\pi > \pi^e$.

In the NE it is argued that $y > y^*$ can occur with $\pi < \pi^e$ because the NE has raised the speed limit y^*

below NAIRU can deliver $1/\alpha$ % increase in output above potential. Thus, according to the conventional paradigm rapid growth of output can spark off inflationary pressures. The NE hype contends that the speed limits of growth or potential output has been raised by the NE. Therefore, output can be increased without overheating the economy. This leads to the conjecture that the old paradigm is passé in the NE and ground out flawed policy prescriptions making the economy perform below its capacity output or productive potential.

The second prong of the NE attack on the conventional paradigm is trained on the trend growth rate or the speed limits of growth. In the conventional paradigm the trend growth rate or the speed limits to growth were grounded out from the neoclassical paradigm or the Solow-Swan growth model (Solow 1956, Swan 1956). The case for a new paradigm for the NE is presented in the form of two variants related to low run growth both alleging that the speed limits to growth have been raised by the NE. The first variant contends that raising of the speed limits to growth in the neoclassical or Solow-Swan model enables the expansion of output by increased IT investment without running into diminishing returns to IT capital and igniting the fires of inflation as enunciated in the conventional paradigm. The second variant is based on new growth theory or the endogenous growth model (Romer 1986, Aghion 1994). The Romer endogenous growth model conceptualises capital more broadly than just physical capital in the neoclassical model. In the NE, capital incorporates IT capital which like human capital can generate positive externalities and increasing returns. The complementary innovations associated with IT, x-efficiency from reorganisation and positive network externalities contribute to the manifestation of increasing returns. Therefore, the endogenous growth model, in the NE has constant marginal productivity of capital⁵ rather than diminishing marginal productivity capital as in the Solow-Swan model. Therefore the NE can enjoy persistent growth without crashing into any speed limits to growth. Furthermore, it is conjectured that once the NE reached a critical mass it could hop on to a nonlinear trajectory and takeoff on a virtuous circle of self-sustained growth (Kelly 1997) and it is argued that the dynamics of the NE could be better understood through the insights from evolutionary complexity theory rather than from the conventional paradigm (Mandeville, 2000).

⁵ Endogenous growth model

Let Y: output, K: Capital including IT, A: constant

$Y = AK$

$\Delta K = sY - \delta K$ (Capital accumulation = investment - depreciation)

$\Delta Y/Y = \Delta K/Y = sA - \delta K$ (persistent growth if $sA > \delta$)

The NE enthusiasts also press the case for a new paradigm on empirical grounds. It is alleged the official statistics mis-measure the productivity resurgence delivered by the IT revolution. The mis-measurement claims of the NE hype can be illuminated using the ball-park figures in Table 6. Okun's Law⁶ under the assumption that unemployment rate is at the natural rate (NAIRU) predicts that percentage growth rate of potential output or the speed limits to growth is equal to the sum of the growth rate of labour productivity and growth rate of the labour force (i.e. Symbolically; given Y: output, N: labour, Δ : change. The speed limits are estimated as: $\Delta Y/Y = \Delta(Y/N) + \Delta N = 4\% + 1\% = 5\%$). The NE proponents contend that this 5% growth rate which is coterminous with the growth rate in the published official statistics is a gross underestimate due to the mis-measurement of labour productivity growth. Some of the reasons for mis-measurement have been recounted earlier. This underestimation of productivity obscures the true prowess of the economy and also gives flawed policy guidelines on the basis of the old paradigm. If the labour productivity statistics were 6% rather than 4% per annum then the growth rate or speed limits would be 7% growth rate per annum. According to the NE enthusiasts the speed limits prescribed by the conventional paradigm forces policymakers to apply the policy breaks prematurely pulling the economy short of its full production potential (Table 6).

Table 6 Ball park figures for measuring the speed limit of growth

Macro growth rate (%) p.a.	1995	2000	Proximate source
Labour productivity $\Delta(Y/N)$	2	4	Gruen, Simon, PC
Labour force $\Delta(N)$	1	1	ABS
Old speed limit: $\Delta(Y/N) + \Delta(N)$	3	5	
NAIRU (u^*)	6	6	Gruen et al. (1999)
Labour productivity in NE	3	6	Guesstimate
NE speed limit: $\Delta(Y/N) + \Delta(N)$	3	7	Guesstimate
Underling Inflation (π)	8	2	ABS

Notes.

According to Okun's Law, when $u=u^*$ or $Y=Y^*$, then potential growth rate of output or the speed limit is given by the sum of the growth rate of labour productivity and the growth rate of the labour force.

⁶ Okun's Law, speed limits to growth = potential growth

Okun's Law predicts to maintain a constant unemployment rate

potential growth rate = Labour productivity growth x labour force growth rate

$\Delta Y/Y = \Delta(Y/N) + \Delta N$

where Y: output, N: labour force

IV. POPPYCOCK

The emergence of a NE in Australia appears incontrovertible on the basis of the stylised facts presented in relation to the productivity pick-up and the use of the information superhighway as a consequence of the IT investment in the mid-1990s. However, the claim that the NE has rendered the conventional paradigm obsolete paving the way for a new paradigm for policy making in the NE remains a questionable proposition. Mainstream economists after a cool look at the NE hype for a new paradigm for the NE dismiss it as poppycock, first by rejecting that mis-measurement in the official statistics fail to knock the wheels off the conventional paradigm (Blinder 1997) and second, IT is not a general purpose technology (GPT) and therefore fails to live up to the stature of past inventions (Gordon 2000). Overall the case for new paradigm for the NE is rejected on the grounds that “technology changes but economic laws do not” (Shapiro and Varian 1999).

The existence of mis-measurement of productivity in the official statistics during a period of rapid technological change is readily acknowledged by the defenders of the conventional paradigm.

However, since the mis-measurement affects all the variables in the Phillips curve and the Solow-Swan growth model equally neither the tradeoffs nor the speed limits in the conventional paradigm are invalidated as claimed by the proponents of the NE. However, it is conceded measurement errors are rife in the productivity statistics and there at least six ways in which they create measurement bias as discussed below.

First, the consumer price index (CPI) overestimates inflation because of an upward bias and therefore underestimates real output which is nominal output divided by the CPI. Second, the use of chain-weighted measures of GDP gives less value to IT compared to the base-weight index because the latter gives higher values to IT by ignoring the price reductions due to the operation of Moore’s law and Metcalfe’s laws. Third, downsizing whilst increasing labour productivity at firm level depresses productivity at an economy-wide level. Fourth, the wealth-based estimation of capital stock using the current market value of assets, as used in growth accounting methodology, leads to serious underestimation of the income producing capacity of the existing

capital stock. Fifth, the imputations for the large unmeasured part of the economy based on the measurement of productivity for a small segment of the economy - the durable manufacturing sector, can be misleading. Sixth, the ‘tyranny of the missing anecdote’ or the bias to measure productivity success stories whilst sweeping under the carpet productivity debacles. Sixth, the Solow productivity paradox may not have been reversed as asserted by the NE enthusiasts.

The mis-measurement of the productivity contribution of IT due to rapid changes in quality can be rectified by calculating constant quality adjusted prices using hedonic regression methods. Hedonic⁷ measures regress price of an IT good on price of quality attributes over time (Triplet 1989). For example, the latest Pentium IV computer with superior attributes such as higher speed, more memory, better modems, may cost the same as a superseded Pentium II model. The improvement in quality of the computer translates into a price reduction and this is captured by the hedonic pricing methods.

The dismissal of NE case for a new paradigm as poppycock gets much support from the strident critique the techno-sceptics lead by Gordon (2000). First, the productivity surge that has propped up the NE is shown to be a mere cyclical phenomenon and not an upward shift in the trend growth rate. Second, it can be argued that IT is subject to a rapid law of diminishing returns, since the exponential growth of IT technology runs into the fixed “cost of thinking” or the failure of the human brain to keep pace with Moore and Metcalfe laws. Third, the IT revolution and the associated globalisation forces affect only about one-fifth of the tradable sectors of the economy whilst bypassing the large nontradeables sector old economy that dominates the whole economy. Fourth, the IT and globalisation results in a zero-sum game which creates no net gains when adverse Stolper-Samuelson effects of freer trade and ‘Marx striking again’ effects of technological change are netted out (Karunaratne, 1999). Fifth, the massive price reduction in IT due to Moore’s and Metcalfe’s law leads to the substitution of the more costly IT by cheaper alternatives. Such substitution effects are old hat and therefore make no case for a new paradigm (Jorgenson and Stiroh 2000). Sixth, IT may create serious problems of information overload

⁷ Hedonic price measures

$$\ln P_{i,t} = \sum_j \beta_j A_{j,i,t} + \sum_t \delta_t D_{i,t} + \varepsilon_t$$

where $P_{i,t}$: price of good i at time t , $A_{j,i,t}$: attribute j of good i at time t , $D_{i,t}$: time dummy.

The hedonic approach uses the implicit prices (β_j) of the attributes $A_{j,i,t}$ demanded by users. The constant quality price index can be estimated from the antilog of δ_t .

because of the phenomenon summed up in: ‘What Intel giveth Microsoft taketh away’. Also it could result in much directly unproductive activity (DUP) activity due to mindless net surfing and sheer idle capacity because of Herbert Simon phenomenon: “A wealth of information creates a poverty of attention”. Seventh, IT does not fall into the same league as the great inventions of the past as a general-purpose technology (GPT) like the steam engine or the electric motor. Therefore, contrary to the NE hype, the IT revolution will not usher the big bang ‘ Third Industrial Revolution’ as trumpeted, but rather it will peter out as a whimper. Furthermore, no cohesive case for a new paradigm has been established by the proponents of the NE, rather it is all economic snake oil (Buiter, 2000).

Although the case for a new paradigm for the NE has not been persuasively presented, a fundamental change has occurred in the Australian economic landscape due to IT investment. But, it is too early to tell whether this change is transitory or permanent phenomenon. The benefits of IT may be yet to come since inventions such as electricity delivered after a lag of 50 years according to the “delay hypothesis” (David, 1990) - a hypothesis that is bitterly contested by Gordon (2000). Therefore, rather than dismissing the NE case for a new paradigm as sheer poppycock, it would be more prudent to adopt a more cautious approach. The statistics for testing the claims for a new paradigm for the NE are still in the pipeline and therefore the jury is still out deliberating the verdict.

V. THE DOLLAR PUZZLE

Despite strong macroeconomic fundamentals and Australia’s emergent NE, the exchange rate, the most important price of an open economy virtually nose-dived during the first half of 2001. Both when measured in terms of the bilateral USD/AUD or as trade weighted basket of currencies, the trade weighted index (TWI) the dollar plummeted in value and crashed through the psychological barrier of 0.50US cents and reached an all time low of nearly 0.48USD during the end of the first quarter of 2001. This was a huge fall of about 60% from the dizzy heights of 0.80USD recorded in 1996. The plummeting dollar triggered a heated debate on the proximate causes for the downward slide. Some concerned observers urged the Reserve Bank to “lean against the wind” or intervene to prop -up the dollar.

In this section we review some of the conventional exchange rate theoretic explanations based on macroeconomic fundamentals proffered to explain the dollar puzzle. We also review the new fangled explanation for the plummeting dollar based on the perception that Australia was an ‘old economy’ rather than a NE. Equity investors, both portfolio and foreign direct investment (FDI), were not attracted to Australia because it did not have the NE high -tech equities as in the USA. Therefore Australia was type cast as an ‘old economy’. The fact that investors continued to invest in the USA even after the ‘tech-wreck’ in March 2000 suggests that the past momentum played a role in keeping the dollar on a downward slide despite its strengthening against the USD.

During most of the 1990s the Australian economy exhibited strong fundamentals and it weathered the Asian currency crisis (mid-1997) with a resilience that was unrivalled by other members in the OECD league. Australia’s strong fundamentals were manifest in the unprecedented spell of GDP growth that lasted for more than a decade without driving the economy into a technical recession. Core inflation, which had hovered around the double-digit mark at the beginning of the decade, had been pegged to just over 2% at the end of the decade. The unemployment rate had stabilised around a natural rate or NAIRU of 6%. The external position of the economy was relatively sound as indicated by fundamentals such as the current account deficit as the ratio of GDP which cycled around 4.5% and the debt to GDP ratio of 40%. Both indicators and the debt servicing to exports ratio were heading in a downward direction (Table 7). Based on such a track-record of strong fundamentals, the conventional exchange rate theories would have predicted a strong dollar appreciation rather than massive depreciation that eventuated in 2001. The nose dive of the dollar by about 33% in terms of the USD and by 13%

Table 7 Macroeconomic fundamentals in the NE

Decade 1990s	Average
Y: Growth GDP	4.2 %
π : CPI inflation	2.3%
u: Unemp. Rate	6.0%
CAD/GDP	4.5%
Debt/GDP	40%
BD/GDP	- 0.0

Notes:

CPI: Consumer Price Index. CAD: Current Account Deficit. BD: Budget deficit

Source: Treasury Round-Up Winter 2001, RBA Bulletin Dec. 2000

in terms of the TWI was one mighty puzzle. It provoked a heated debate about the proximate causes behind the plummeting dollar.

Among the conventional explanations of the dollar puzzle we review theories based on macroeconomic fundamentals. Modern exchange rate theories regard the exchange rate as an asset price. Its current value is determined by expected future value of fundamentals. First, the prediction of the dollar value, the exchange rate, is based on purchasing power parity (PPP) theory and its corollary, the law of one price (LOOP). Second, the prediction of the dollar value based on risk neutral uncovered interest parity (UIP) condition is examined. Here domestic and foreign bonds are assumed to be perfect substitutes. Third, the empirics of a typical error correction model (ECM) of exchange rate behaviour based on fundamentals that are important for a commodity exporting nation is reviewed. Fourth, the role of chartists who predict the exchange rate based on past trends is reviewed on the basis of a typical technical trading rule. Fifth, the exchange rate observed at any point of time is the upshot of fundamentalist and chartists activity and this can be stylised in terms of a Markov Regime Switching (MRS) model. Empirics from the MRS model cautions against the use of activist policies to prop- up the falling dollar on the grounds that it could be destabilising and counterproductive.

First, based on LOOP, a corollary of PPP theory, the price of a homogenous good like a Big Mac should cost the same in Australia and USA. However, the Australian dollar (AUD) was during the latter half of 2001, about 50% undervalued compared to the US dollar (USD)⁸. The weak AUD was the flip side of the strong USD. However, it is widely recognised that the exchange rate, an asset price in the short- run can overshoot its long-run equilibrium value as predicted by the PPP theory, in response to an exogenous shock or “news” or new information about fundamentals. According to the ‘sticky price’ model the overshooting occurs in the short-run due to asymmetric speeds of adjustments in the goods and asset markets. But in the long-run the exchange rate reverts to the PPP determined equilibrium value (Dornbusch 1976).

⁸ Purchasing power parity / law of one price (Economist, 5th September, 2001).

The price of a hamburger during 2001Q2 was 1.50 USD in USA, 3.00AUD in Australia, the exchange rate was $S=AUD/USD=2.00$. Therefore according to the law one price the value of a hamburger when converted to AUD should cost the same. The ratio of the foreign to domestic price according to the law of one price should give $Q=SP*/P = 1$. But for the above prices $Q = SP*/P = 2.00 \times 1.50 / 2 = 1.50$

The US burger was 50% over valued or Australian burger was 50% under valued according to PPP theory.

Second, the uncovered interest parity (UIP) condition predicts that expected depreciation of the dollar, under the assumption of risk neutrality, is equal to the differential between domestic and foreign interest rates. The interest differential for long-term bonds between Australia and USA had narrowed from 3% in mid-1990s to a mere 0.05% during 2000Q4 (Table 8). Therefore, according to the UIP condition ⁹ the dollar should have depreciated only by just 0.05% and not by the massive 50% as predicted by LOOP and PPP. The UIP notoriously mis-predicts exchange movements because it has failed to take account of risk aversion of investors (Froot and Thaler 1990). The fact that there was massive reversal of capital inflows during the latter part of 1990s, indicate that the risk premium on Australian bonds had risen rapidly.

Table 8 Exchange rates and Macroeconomic Fundamentals

Quarter	2000Q1	2000Q2	2000Q3	2000Q4	2001Q1	2000Q2
USD/AUD	0.62	0.59	0.57	0.53	0.50	0.51
TWI	54.5	52.4	51.6	49.7	47.4	49.7
π : Inflation (CPI)	2.8	3.2	6.1	5.8	6.0	6.0
π^* : Infl. US	4.0	0.8	0.9	0.2	1.4	1.2
i =Aus 10bond	6.72	6.27	6.24	5.80	5.59	6.24
i^* = US 1 bond	6.41	6.28	6.03	5.75		

Sources: OECD and The Reserve Bank Australia. <http://www.rba.gov.au>

Capital inflows which had averaged AUD 4.3 billion per year, during the five years 1992Q2 - 1997Q2 reversed into a massive outflow of AUD 5.0 billion per year during the subsequent two years. The lure of the robust NE of the USA and the increasing risk of investing in Australia may have inflicted a double whammy triggering a capital flow reversal in the late 1990s. This, in turn, contributed to the massive weakening of the dollar.

Third, the behaviour of the exchange rate could be explained parsimoniously in terms of fundamentals such as the interest differential and the commodity terms of trade using an error

⁹ Uncovered interest parity (UIP) condition

The expected depreciation of the spot exchange rate $S=AUD/USD$ is given by the differential of the domestic interest rate (i) and the foreign interest rate (i^*) and the risk factor $\rho=0$ if investors are risk neutral and positive if investors are risk averse.

$$\Delta S^e = (i^* - i) + \rho$$

correction model (ECM) model¹⁰

Fourth, further light could be shed on the dollar puzzle based on the activities of chartists who use past trends to predict exchange rate movements. A typical technical rule based on past trends is the moving average cross (MAC)¹¹. This emits a foreign exchange buy signal when the short-term moving average crosses the long-term moving average from below (a golden cross). The chartist activities based on technical rules can impart a momentum and cause the exchange rate to overshoot the long-run equilibrium predicted by the PPP theory in the short-run. The dollar plummet during 2001 could be regarded as an overshoot due to the momentum created by technical trading activities of the chartists.

The Markov Regime Switching (MRS) model combines the forecasts of chartists and fundamentalists' equations to estimate the transition probabilities that determine the exchange rate regime shifts. The MRS model empirics indicate for post-float period chartists dominated the foreign exchange activities during tranquil period and the fundamentalists dominated the foreign exchange market during turbulent periods. Moreover, the massive depreciation observed 2001 be a chartist generated overshoot and left to free market forces under the floating regime, would be reversed by activities of fundamentalists. Therefore, interventionist policies to prop-up the plummeting dollar are not supported by the empirics of the MRS model (Djoudad et al. 2000).

Nevertheless, the case for intervention to halt the slide of the dollar was mounted on the basis of the new fangled argument that classified Australia as an 'old economy' compared to the USA. Whilst conceding that there was such misperception, the Governor of the RBA observed that it was out of kilter with the stylised facts for (Macfarlane 2000) as recounted in section II of the paper. Nonetheless, Australia is not a producer of semi-conductors nor does Australia have a

¹⁰ Fundamentalist model & Chartist technical rule

A typical error-correction model fitted to fundamentals in a commodity exporting nation such as Australia would assume the following form:

$$\Delta q_t = \alpha_1 + \alpha_2(i - i^*) + \alpha_3 \text{tot}_{t-1}^{\text{non-energy}} + \alpha_4 \text{tot}_{t-1}^{\text{energy}} + \alpha_5 \text{ECM}_{t-1} + \varepsilon_t$$

where, real exchange rate (q_t) = $e_t P_t^*/P_t$; tot_t : terms of trade (energy or non-energy commodities), ε_t : error

$$\Delta q_t = \beta_1 + \beta_2(i - i^*) + \alpha_3 \text{MA}_{t-1}^{\text{short-term}} - \alpha_4 \text{MA}_{t-1}^{\text{long-term}} + \alpha_5 \text{tot}_{t-1}^{\text{long-term}} + \varepsilon_t$$

¹¹ Modified Taylor's Rule

$$i_t = r_0 + \pi_{t-1} + \gamma_1 (\pi_{t-1} - \pi^T_t) + \gamma_2 (y_{t-1} - y^*_{t-1}) + \gamma_3 (\varepsilon_{t-1} - \varepsilon^*_{t-1})$$

i_t : nominal interest rate, i_0 : real interest rate, π_{t-1} : inflation rate over past year, T: superscript refers to target. y : real output, y^* : potential output ; ε_{t-1} : real exchange rate, ε^*_{t-1} : equilibrium real exchange rate, γ : reaction parameter.

Silicon Valley. It is only a small producer of telecommunications ware. Australia also does not have labour intensive electronic assembly industries which provide high employment to export-oriented labour abundant economies such as South Korea or Malaysia. Therefore, Australia lacks the portfolio of high tech equities to lure investors and risk-seeking speculators. However, Australia may have a comparative advantage IT intensive service industries that require high skills and capital and promotion of such industries could overcome Australia's deficiency as a low producer of IT goods. In the concluding section we dwell on some policy perspectives that are relevant for implementing monetary policy in the emerging NE given the commitment to inflation targeting.

VI. POLICY

Australia is a small open economy, a price-taker in the world market. Currently monetary policy is implemented to achieve a pre-announced core inflation target in the range of 2-3% over the business cycle. The nominal interest rate (the overnight cash rate) is the operational instrument of monetary policy. There is widespread agreement, that given the commitment to an inflation-targeting framework, the Taylor rule is an appropriate policy reaction function (Taylor 1993). In the context of the focus on the exchange rate a modified Taylor rule incorporating the rate channel for a small open economy as suggested by (de Bouwer and O'Regan 1997) is considered relevant. The interest rate smoothing to achieve the inflation target would, given the real interest rate, respond to deviation of inflation from the target, output from potential and the exchange rate from its equilibrium rate.

However, the empirics from macroeconomic fundamentals and the MRS model caution against the pursuit of interventionist policies to halt the dollar plummet. Also it has been emphasised that the focus of monetary policy in a small open economy should not attempt to offset transitory exchange rate fluctuations, however large they may be, as this would result in inefficiency in the sense of more variability in other macro variables such as output (Svensson 1998). Nonetheless, during the big nose-dive of the dollar during the first half 2001, the RBA appears to have engaged in covert sterilised intervention, departing from its usual practice of leaning with the

wind rather than against it. The recent analytics and empirics on inflation targeting in a small open economy appear to lend support to such activist policies (Ryan and Thompson 2000).

Next, some brief comments are offered on the ‘pass-through’ perspective and the productivity consequences of a prolonged dollar tumble. First, the ‘pass through’ perspective which maps out that depreciation by increasing import price would unleash inflation would also implicitly support activist monetary policy to counter the dollar plummet. However, contrary to the predictions of the pass-through perspective inflation did not rear its ugly head during the downward slide of the dollar. This is because the ‘pass-through’ perspective may be flawed as it fails to function when NE type supply- side shocks or real demand shocks hit the economy (Karunaratne 2001). Second, the apprehension that depreciation would widen the productivity gap between Australia and USA as has been observed in the case of Canada has not emerged in the Australia-USA context. The comparative data shows Australia raced ahead of USA both in labour productivity and total factor productivity in the latter half of the 1990s (Table 1). But in terms of productive capital stocks in information technology Australia bereft of robust IT producing sector lags far behind USA the NE *par excellence*. The plummeting value of the dollar could have three types of adverse effects exacerbating the divergence of the inter-country productivity gap between USA and Australia. Three ‘smoking guns’ have been blamed the occurrence of these divergent trends: 1. The factor cost effect due to rise in the price of imports reducing investment in IT and thereby slowing down the growth of the NE. 2. The escalation of the innovation gap due to retardation of innovation and R&D because of high costs of imported IT hardware and goods. 3. The slowdown of the process of ‘creative destruction’ of the low productivity firms by prolonging their life due to protection offered by a low value of the dollar (Harris, 2000). These ‘smoking guns’ warn that the plummeting value of the Australian dollar could only slowdown any prospects of emerging as robust ‘new economy’ in a world overshadowed by the super ‘new economy’ of the USA.

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