Comparative Cantillon Effects in the Canadian and Australian Art Markets

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ABSTRACT

As far back as 1755, Richard Cantillon analyzed how changes in the money supply affected relative prices in the economy. In times of monetary infusion, Cantillon asserted that the extent to which the prices of various goods and services could be expected to rise would depend upon the initial distribution of the money and therefore where it would be initially spent. Cantillon emphasized the case of a monetary infusion falling largely into the hands of already wealthy agents, arguing that it would drive up spending most prominently on luxury goods such as art works and financial assets, causing rapid price rises in such items. In this paper we present new evidence on "Cantillon effects" as a potential explanation for movements in the price of Canadian and Australian art since the mid-1970s. We conduct a time series analysis to investigate the relationship between the money supply and the price of art in the two countries. The choice of countries is significant insofar as both represent peripheral art markets in which domestic collectors and investors dominate making them vulnerable to domestic economic and monetary conditions while being relatively isolated from international monetary phenomena. Interestingly, we find somewhat different results for the two countries, possibly due to differences in the type and quality of art being traded. Prices for Canada's historically most important artists tend to closely follow the money supply over the long term, whereas in Australia, across a broader sample of artists, prices behave more like the consumer price index. However, when we focus on the art prices from the leading Australian auction houses, selling works by upper-tier artists, our results are similar to the Canadian ones. These results suggest that national art markets are not homogenous and that segmenting national markets for analytical purposes is justified. Specifically, we find evidence of Cantillon effects in the upper end of the market while for the majority of works that are not considered high-art and which are of limited historical importance, prices move more in line with domestic inflation.

Keywords: Canadian art; Australian art; art markets; money supply; market segmentation; Cantillon effects

1. Introduction

In his famous *Essai*, Cantillon (2015, but first published in 1755) makes much of the economic consequences of the introduction of new money. Cantillon particularly emphasizes the effects of increased spending on luxury goods (e.g. pp. 84, 89) by those economic agents whose wealth undergoes a positive exogenous shock as they find an increased quantity of gold or silver on their hands (e.g. Chapter 6). Among the redundant indulgences upon which the prodigal rich waste their newfound wealth are fine art works, including specifically paintings, mentioned several times in the *Essai.*

Within the literature (Bordo, 1983; Thornton, 2006), the result of an increase in the money supply on positively impacting asset prices has come to be known as "Cantillon effects". There is good reason to believe that Cantillon effects remain as relevant today as they were when Cantillon first wrote his *Essai*. In recent decades wealth inequality has increased (Atkinson, Piketty & Saez, 2011), while in the wake of the global financial crisis central banks (until recently) have engaged in (historically unprecedented) expansionary monetary policy and quantitative easing. It is perhaps then unsurprising that with these conditions in place, the very wealthy have sought to invest in fine artworks. Also for the newly very wealthy fine art has a special attraction associated with its conspicuous nature in that investors perceive it as a means legitimize their taste and signal their possession of cultural capital (Bourdieu, 1984; Veblen, 2007).

Goetzmann, Renneboog & Spaenjers (2011), evaluate the effect of equity markets and top incomes, including a measure of inequality, on the price of art in the London market between 1830 and 2007 and find that rising inequality contributes to the explanation of increasing art prices. In contrast, our research is concerned with evaluating changes in the quantity of money or Cantillon effects empirically, in order to test the effect this has on the price of art.

In an econometric time-series study that tests the relationship between money supply and art price indices for Australia and Canada, we find that the length and breadth of money supply expansion has implications for the fine art market, particularly its upper end. This is consistent with previous studies on the effects of monetary expansion, which find that the impacts on asset prices are greater and longer-lasting than effects on general prices in the consumer economy (Devadoss & Meyers, 1987;, Weber, 2011;, Bartscher et al., 2021). What makes our research unique is that we are interested in what we refer to as 'pure' Cantillon effects. Art works such as paintings, do not play a role in the capital structure of the economy, and thus we can evaluate money aggregate effects on the price of art absent debates and controversies around macroeconomic policy determinations concerning real output, employment and inflation.[1] It is therefore reasonable to hypothesise that money supply effects on art prices will

[1] Callahan and Garrison (2003) analyze money aggregate effects (Cantillon effects) surrounding the original dot-com boom and bust. From the period June 1995 to March 2000, they report the money supply (MZM) grew 52 percent, well ahead of real GDP growth of 22 percent. This means that a good

give rise to pure Cantillon effects whereby changes in the money supply result in monetary pass-through impacting art prices without any direct macroeconomic output effects, as assumed under conventional Keynesian assumptions that continue to influence central-banking practices and monetary policy.

Our objective is to evaluate statistically the degree and nature of possible Cantillon effects on art prices as reflected in time indices of prices in the respective auction markets for Australian and Canadian paintings. We construct price indices on the basis of large samples of auction sales in the two countries, collected by the authors, over a period of over 40 years for each country. We empirically gauge possible long- and short-term relationships between money and prices through time series statistical methods such as the presence or absence of cointegration, Granger-causality, and simple correlations. We also compare the art price indices with the consumer price index (CPI) in each country. A Cantillon effects interpretation of art works as representing luxury goods and/or financial assets would suggest that they should have a closer relationship to the money supply than to CPI, whereas the inverse would be expected to be observed if the paintings were more in the nature of regular consumption goods. Indeed, we find evidence that the paintings market can be segmented into an upper market belonging more to the former category, and thus more responsive to money supply changes, and a lower segment that follows more closely the CPI.

The paper is structured as follows. In the next section we provide context and background for our study including a discussion of key literature that has contributed towards understanding monetary effects not simply within the economy but on asset prices. After this we outline our central hypotheses and describe the method and data being used to test this. Next results are reported and discussed before the paper concludes.

2. Background

To the extent that new infusions of money into the economy find their way largely into the hands of the wealthy, one can reasonably expect that such infusions will have a particularly marked inflationary effect on the art market. If this is the case, then it follows that it should be possible to discern important statistical relationships between measures of the aggregate money supply and art price indices that track general movements in art prices over time. In analysing the results to understand the relationship between changes in the money supply and art prices, we might also expect how wealth is distributed to be relevant along with the type of art being traded to reflect differences in tastes and preferences for art that are socially stratified.

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portion of the money supply increase of the period was channeled through asset markets, including dot coms, and not GDP.

While a positive relationship between the money supply and art prices is to be expected, what the precise nature of this expected statistical relationship is remains ambiguous. This paper seeks to test this relationship using data (described in the next section) from the Canadian and Australian art markets. Certainly, a close reading of Cantillon (2015) alone yields no clear clues or rules to assist in quantifying this effect. While monetary habits and effects are a key theme in the *Essai,* there is nothing in Cantillon's original writings to suggest precisely what sort of relationships might exist between deterministic or stochastic trends, transitory variations, and time-series causality for different time series of money supply and prices within the economy. It has been over two hundred and fifty years since Cantillon first wrote his *Essai* and methodological advances in econometrics and time series analysis mean that we are now able to formally test for the presence and specific nature of any Cantillon effects on art prices (including measuring their strength and significance in different art markets and market segments).

Cantillon's understanding of monetary effects on the economy focuses on the role of disaggregated social distribution channels, although these are not mathematically expressed He makes the case that wealth is concentrated in the landlord class and that as a consequence, it is principally through the consumption habits of the wealthy that monetary injections inflate prices. In this manner money supply increases are first 'touched' by the wealthy, resulting in price increases on items mainly demanded by the wealthy. Most notably Cantillon predicts that asset prices will increase, whereas by the time money aggregate increases reach the less wealthy, they take the form of an increase in the prices of more typical consumption items (see the discussion in Cantillon (2015, chapters 3 and 4)). One empirical implication of this is that asset and luxury good prices should follow movements in the money supply more closely than they follow general consumption price indices.

Bartscher et al. (2021, p. 2) discuss the presence of inequality-creating asset market effects stemming from monetary policy. In their analysis centered around changes in the Federal Funds Rate in the United States they find that the effects of changes on asset prices due to policies which lower interest rates give rise to what they term "portfolio effects" which are larger in magnitude compared to changes in employment over multi-year time horizons. Evidence we find suggests that monetary policy effects on asset prices may be greater and longer lasting than has been previously thought which is consistent with Paul (2020) who argues that monetary policy today has larger effects on asset prices than in the past.

Expansionist monetary policy in the form of lower interest rates that increase monetary aggregates, creates inequality because people with more wealth and disposable income are better able to invest in appreciating asset market portfolios (including art) relative to those with less wealth and disposable income who spend more of their disposable income on consumption and have to pay more for subsistence goods and services. Drawing from United States data Weber (2023) reports that during the unprecedented increase in the quantity of money due to

Fed bond purchases in the first 18 months of the COVID-era, stock market indexes in the United States doubled while inflation continues to be greater than wage increases.

3. Data sets and econometric modeling

The data sets for Canada and Australia both include tens of thousands of observations for secondary market auction sales for hundreds of historically important artists extending over five decades. These data are used to estimate hedonic time series indexes for the two art markets, and it is these indexes which are the subject of interest in our empirical analysis that tests for the presence of Cantillon effects in the two markets. The Australian data set is more comprehensive than the Canadian, in that it extends farther into the lower reaches of the art market, with nearly 1,000 artists included, compared to the Canadian data which is based on the auction sales of close to 400 of Canada's most reputed artists. The differences in the scale of artists represented within each country's samples is important. As Rosen (1981) has demonstrated, in markets like the art market, which are subject to superstar effects, the sales by a relatively small numbers of artists fetch enormous prices and dominate the market. Given this characteristic within art markets as the pool of ranked artists included in any sample expands, the volume of sales occurs at a much higher rate compared to the value which is largely concentrated in the sales of a small number of key artists.

Within the Australian dataset many of the artists are considered to be of lesser historical importance and hence command lower prices, whereas the Canadian data set is concentrated on a "blue chip" sample of artists, including only artists of substantial historical interest and repute and by extension solid market value. The differences in how samples for the two markets are comprised is a central feature of the analysis as it allows us to compare not only between two peripheral art markets that share many similarities but to also consider how within a given market different market segments (between high and low art) distinguish the market. The wider market range covered by the Australian data set suggests that we might divide paintings at auction into a two-sector Bourdieu (1984)-like framework. The upscale high end of the market may be considered as reflecting "legitimate" or "highbrow" tastes with social distinction attached to this aesthetic whilst the works traded through less pedigreed auction houses might be considered "middle-brow" taste.[2]

In terms of choice of the two national art markets, Canada and Australia are similar countries in many respects that make then well suited to compare. Both countries are former British colonies with similar systems of government, they are also both large countries renowned for rugged natural beauty and wonders which is also a theme reflected in many artworks by their countrymen. Economically they are similar in terms of size (measured by GDP), standard of living (measured by GDP per capita), they have similar trade openness and also they have similar

[2] Bourdieu's (1984) third class-based aesthetic is the "popular" taste, or working-class taste, whom we consider may not be interested in art traded at auction.

inequality (measured by the Gini Index). One point of difference however, is that the Canadian dollar (CAD) is an international reserve currency, whereas the Australian dollar (AUD) is not. This might mean that some of the monetary aggregate effects for the Canadian economy are more likely to be diffused into the international economy compared to AUD monetary increases.

In this paper, we attempt to gauge empirically the relationship between the money supply and art prices for Canada and Australia using data for the period 1975-2017. We use semi-annual measures of M1. For Canada, these data are obtained from Statistics Canada's CANSIM data base while for Australia the data is sourced from the Australian Bureau of Statistics (ABS).[3] For comparative purposes, we will also consider general prices for the same period as measured by the Consumer Price Index, obtained from the same sources as M1. Our approach will be essentially exploratory, and we will attempt to discern what is the nature of the time series covariation, if any, between M1 and the art price indexes across the two countries. The length of our time series allows us to consider long-term covariation through the comparison of deterministic time trends, stochastic trends and cointegration, contemporaneous correlations in returns, and also test for the presence of Granger-causality.

To calculate our art price index, we estimated a hedonic regression using a sample of over 32,000 observations for Canada, on auction sales of over 400 Canadian artists covering the period 1968-2017. The Canadian dataset was constructed by the authors using Campbell (1970-75), Westbridge (1981-2018) and westbridge-fineart.com. With a larger pool of artists reflected in the Australian data, the sample size is bigger for the Australia market which includes over 103,000 works produced by about 1000 artists, starting in 1971. These data were obtained by the authors from the *Australian Art Sales Digest (AASD)*.

The econometric model used for both the Australian and Canadian versions of the hedonic regression is written:

$$p_i = \sum_{t=1}^{T} \gamma_t z_{it} + \sum_{j=1}^{J} \alpha_j w_{ij} + u_i \ , \ i = 1,\ldots,n,$$

where p_i is the logarithm of the price of sale *i*, z_{it} is the value of a period-t dummy variable, equal to 1 if painting *i* was sold in period *t* and zero otherwise, with the data being grouped semi-annually. Our estimates of the vector of associated parameters $\{\gamma_t\}$ will form our price index, to be used in the unit root and co-integration tests that we undertake in the following section. The regressors $\{w_{ij}\}$ represent the other hedonic characteristics of the painting associated with sale *I,* and for both samples this includes artist fixed effects as well as dummies for different types of medium/support used and auction house where works are traded. Other variables reflected in the model are artwork dimensions (including height, width and surface

[3] We are using M1 as it is the most representative of "money and near money" than other monetary aggregate measures.

area) and also in the Canadian sample, dummies are included for genre and for whether or not the work is dated.

As mentioned, for the estimation of the time period dummies, the data are grouped semi-annually, with all auctions occurring from January 1 to June 30 of a given year grouped together, and likewise for the period July 1-December 31. Although we calculate these dummies for the period 1968:2-2017:1, for Canada, and 1971:1-2017:1 for Australia, in this study we will only use the estimates for 1975:1-2017:1, since this is the period for which continuous data on M1 are available for both countries. The M1 data set we gathered consisted of monthly observations, and we used the observations for May and November of each year to correspond with the half-years in our art index. These months were chosen because they are the months of the year in which the majority of art auctions take place, and furthermore these are the months in which our auction price observations were most frequently realized across both countries.

4. Results

To commence our analysis, we first consider the semi-annual time series for log art price index, the log M1 and the log CPI for the period 1975:1 until 2017:1. One important difference between the country datasets previously mentioned is that the Canadian data pertains exclusively to the high end of the market while the Australian data covers a more heterogenous quality mix of works. As such for the Australian market we further break this down to consider both the representation of the entire market and then consider two sub-samples consisting of works sold at prestigious upscale auction houses (about 60,000 observations) and those sold at more "retail" or down-market houses (about 45,000 observations).

(i) Canada

The data for the Canadian log art price index, M1, and CPI, are plotted in Figure 1, with the first difference of art prices and M1 shown in Figure 2. A visual inspection of these figures shows that the art index, although being more volatile than M1, and having followed different paths for extended periods of time, does seem to stay very close to it over the very long run. This shows visually a Cantillon effect with art price increases coinciding with money supply increases over the longer term. It is less easy to see much of a relationship between the CPI and either M1 or art prices. This finding follows that of Bessler (1984) and Devadoss and Meyers (1987) who find that monetary effects on output goods (measured in the CPI) dissipate usually within 2 years. In the statistical analysis to follow, we concentrate on the long- and short-run statistical properties of M1, the art index, and of any bivariate relationships that may exist.

In analyzing the nature of the long- and short-term statistical relationships that may exist between the series, it is important to correctly characterize the time series properties of each

series individually concerning the presence (or absence) of deterministic and stochastic trends. It is clear from Figure 1 that the art index and M1 both have an upward deterministic trend, but it is not obvious that stochastic trend ,or unit roots are present in these series. We thus effectuate standard unit root tests for the series in levels and first differences (Phillips-Perron and ADF tests), which are reported in Table 1. For the levels test, we include an intercept and trend in the specification, and for the first differences only an intercept. In all cases, three lags are included in the ADF test specification. The evidence reported in Table 1 strongly suggests that both series are best modelled as integrated of order one (I(1)) around a deterministic trend. In other words, they possess a unit root or stochastic trend with drift. In all of the tests reported, the null hypothesis is the presence of a unit root versus the alternative of a root less than unity in the stochastic component of the time series.

Table 1: Unit root tests, Canada

Variable	Test	Statistic
Log art prices	ADF	-3.18*
	PP Zα	-13.19
	PP Zt	-2.89
Log M1	ADF	-2.12
	PP Zα	-7.78
	PP Zt	-2.06
Δ log art prices	ADF	-4.18***
	PP Zα	-80.6***
	PP Zt	-8.60***
Δ log M1	ADF	-3.45*
	PP Zα	-99.3***
	PP Zt	-10.2***

Statistic significant at level of 1% (***), 5% (**), 10% (*).

As both series possess unit roots, it is important to consider the possibility that they share a stochastic trend, or that they are cointegrated. In this case, the long-run stochastic behavior of the two series is very similar. We report in Table 2 the results of residual-based cointegration tests, using the two Phillips-Perron and ADF unit root tests applied to the residuals of the OLS regression of one series on the other, where a time trend and intercept are included in the regression, and 3 lags used for the ADF test. In all cases, the null hypothesis is the presence of a unit root in the residuals (in other words, no cointegration) against the absence of a unit root (and thus the presence of cointegration). We find no evidence that the two series are cointegrated.

Table 2: Residual-based cointegration tests between log M1 and log art prices, Canada

Test	Statistic
ADF	-3.21

PP Zα	-13.75
PP Zt	-2.87

Statistic significant at level of 1% (***), 5% (**), 10% (*).

As there is no long-term relationship between the stochastic components of these two series, it remains to characterize the nature of the relationship between their short-term dynamics. Since the variables are both I(1) and not cointegrated, this can be accomplished through an analysis of their first differences, whose primary statistics are reported in Table 3. As we can see, the first difference means are very similar, reflecting the presence of the same linear time trend in the two series. The correlation coefficient, at .206, shows that the first differences do have a moderate degree of positive correlation.

Table 3: First difference statistics, Canada

Variable	Statistic
Mean Δ log art prices	0.00376
Mean Δ log M1	0.00393
Correlation coefficient	0.206

In addition to the contemporaneous correlation between log M1 and log art prices, as reported in Table 3, it also of interest to enquire as to the dynamic nature of the correlations that may exist between these two series. It could be that shocks in one series "lead" movements in the other. The concept of Granger-causality exists to investigate this issue. The question here is whether lagged values of the first differences in one of these series can help predict the current values of the other. This question is evaluated through a linear regression for the second variable in which a certain number of lags of the other are included as explanatory variables and a test for the joint significance of the associated parameters is computed. We compute here a Granger-causality test, in each direction, for models with one, two, and three lags. The results are reported in Table 4, where we find no evidence of Granger-causality in either direction.

Table 4: Granger-causality statistics, Canada

Lags in VAR	M1 to Art	Art to M1
1	0.0053	0.0017
2	0.031	0.059
3	0.025	0.058

Statistic significant at level of 1% (***), 5% (**), 10% (*).

We conclude from these results that the stochastic relationship between the two series is limited to modest positive correlation in the first differences. However, deterministic trends in time series dominate either stochastic trends or short-term correlations or autocorrelations, and

the commonality of the linear trend indicates a very strong connection between the series. In particular, it is clear from looking at Figure 1 that the art prices are connected much more closely with M1 than with the CPI, which would be consistent with the Cantillon hypothesis that luxury/investment goods behave differently than regular consumer goods with respect to the supply of money.

(ii) Australia

The semi-annual time series for log M1, the log art index, and log CPI, for the period 1975:1-2017:1, are plotted in Figure 3, with the first differences of log M1 and log art plotted in Figure 4. A visual inspection of these figures shows that the art index behaves very differently from the Canadian case plotted in Figure 1, and more closely follows the CPI index rather than M1. As a large proportion (almost 40 per cent) of the observations in the sample from Australia represent sales at the Leonard Joel auction house, which specializes in more commercial art oriented to the middle-brow consumption market this is also separated from the sales recorded by the investor oriented and more upmarket houses such as Sotheby's, Christie's, and Deutscher-Menzies which specialize in blue-chip collectible art. It is in this latter market segment in which Cantillon effects would be more likely on *a priori* grounds to be present, hence we have also separately estimated two models with subsamples of the Australian data set, enabling us to separate the two groups referred to above. The resulting hedonic indexes are plotted in Figures 5 (Leonard Joel) and 6 ("upmarket" houses) where we observe that, indeed, the first index follows very closely CPI (as would be expected, under the Cantillon hypothesis, for non-investment consumer good), whereas the upmarket index trends upwards closer to the M1 index.

We find that for the larger Australian sample that includes works from both the high and lower ends of the market, the resultant art price index tends to more closely follow the CPI than the money supply suggesting that the larger volume of lower-priced works dominate to give art the characteristics of a consumer good, whereas in the Canadian case the art index follows more closely the money supply with art functioning more as an investment good.

When we use only the "upmarket" houses for the Australian art index, art prices follow the money supply more than in the general case for Australia. This supports the view that there may be market segmentation to justify distinguishing and separating analysis between art that is purely for consumption purposes and art that can function as an investment [4]. While this

[4] According to Grampp (1989) the majority of art traded at auction is low value and destined to become worthless. As such the value of such works reflects their current consumption value which corresponds to Bourdieu's (1984) middle-brow aesthetic. In contrast, artworks that are collectible and/or deemed to be of high aesthetic/historical and/or cultural value embody investment value that is expected to hold or increase in value over time, Such art that embodies investment value may be deemed to possess Bordieuan distinction and reflect the legitimate aesthetic of high art.

distinction may be justified it does still necessitate judgements when defining categories of boundaries to define the segments.

In the statistical analysis to follow, which identically replicates in methodology that for Canada, we concentrate on the long- and short-run statistical properties of M1, the general and upmarket art indexes, and of any bivariate relationships that may exist between M1 and each of the art indexes. We do not include the down-market index in the statistical analysis as it is clear from Figure 5 that Cantillon effects are not present here.

In analyzing the nature of the long- and short-term statistical relationships that may exist between the series, it is important to correctly characterize the time series properties of each series individually concerning the presence (or absence) of deterministic and stochastic trends. It is clear from Figures 3, 5, 6 that the art index and M1 both have an upward deterministic trend, but it is not obvious that stochastic trends, i.e. unit roots, are present in these series. We thus effectuate standard unit root tests for the series in levels and first differences (Phillips-Perron and ADF tests), which are reported in Table 5. For the levels test, we include an intercept and trend in the specification, and for the first differences only an intercept. In all cases, three lags are included in the ADF test specification. As in the case with Canada the evidence reported in Table 5 strongly suggests that all three series are best modelled as integrated of order one around a deterministic trend. In all of the tests reported, the null hypothesis is the presence of a unit root versus the alternative of a root less than unity in the stochastic component of the time series**.**

Table 5: Unit root tests, Australia

Variable	Test	Statistic
Log art prices	ADF	-2.42
	PP Zα	-8.39
	PP Zt	-2.19
Log art prices (upmarket)	ADF	-1.68
	PP Zα	-14.7
	pp Zt	-2.96
Log M1	ADF	-2.42
	PP Zα	-12.69
	PP Zt	-2.55
Δ log art prices	ADF	-4.18***
	PP Zα	-80.6***

	PP Zt	-8.60***
Δ log art prices (upmarket)	ADF	-4.59***
	PP Zα	-116.0***
	PP Zt	-15.5***
Δ log M1	ADF	-3.73***
	PP Zα	-94.50***
	PP Zt	-9.89***

Statistic significant at level of 1% (***), 5% (**), 10% (*).

As both series possess unit roots, it is important to consider the possibility that they share a stochastic trend, or that they are cointegrated. In this case, the long-run stochastic behavior of the two series is very similar. We report in Table 6 the results of residual-based cointegration tests, using the two Phillips-Perron and ADF unit root tests applied to the residuals of the OLS regression of one series on the other, where a time trend and intercept are included in the regression, and 3 lags used for the ADF test. As in the case with Canada, in all cases, the null hypothesis is the presence of a unit root in the residuals. We find no evidence that either of the two art indexes are cointegrated with M1. Thus, the long-term stochastic trend components of the two series evolve independently on one another in each of the two comparisons.

Table 6: Residual-based cointegration tests between log M1 and log art prices, Australia

(a) General art index

Test	Statistic
ADF	-2.43
PP Zα	-8.60
PP Zt	-2.22

(b) Upmarket art index

Test	Statistic
ADF	-1.67
PP Zα	-15.43
PP Zt	-3.01

Statistic significant at level of 1% (***), 5% (**), 10% (*).

As there is no long-term relationship between the stochastic components of these two series, it remains to characterize the nature of the relationship between their short-term dynamics. As in the case with Canada this can be accomplished through an analysis of their first differences, whose primary statistics are reported in Table 7. In both cases the correlation is very weak, with the mean increase in upmarket art exceeding that of the general art index but still less than for M1.

Table 7: First difference statistics, Australia

Variable	Statistic
Mean Δ log art prices	.0266
Mean Δ log art prices (upmarket)	.0339
Mean Δ log M1	.0541
Correlation coefficient (M1 and general art index)	0.100
Correlation coefficient (M1 and upmarket art index)	-.0101

In addition to the contemporaneous correlation between log M1 and log art prices, as reported in Table 7, it also of interest to enquire as to the dynamic nature of the correlations that may exist between these two series. It may be that shocks in one series may "lead" movements in the other. The concept of Granger-causality exists to investigate issues such as these. As in the case with Canada, the question here is whether or not lagged values of the first differences in one of these series can help predict current values of the other. To address 13his question we apply a linear regression for the second variable in which a certain number of lags of the other are included as explanatory variables and a test for the joint significance of the associated parameters. We compute here a Granger-causality test, in each direction, for models with one, two, and three lags. The results are reported in Table 8, where we find no evidence of Granger-causality in either direction, between M1 and either of the art indexes.

Table 8: Granger-causality statistics, Australia

(a) General art index

Lags in VAR	M1 to Art	Art to M1
1	0.00184	6.66×10^{-5}
2	0.00226	0.0150
3	0.0110	0.0165

(b) Upmarket art index

Lags in VAR	M1 to Art	Art to M1
1	0.000254	0.0173
2	0.0105	0.0471
3	0.0214	0.0562

Statistic significant at level of 1% (***), 5% (**), 10% (*).

5. Conclusions

The empirical analysis of the relation between M1 and an art price index in Canada and Australia produces some interesting similarities and differences. Both countries are in the small (or perhaps medium) open economy category, but with highly active art markets in which the great preponderance of purchasers are domestic, which allows us better to isolate the effects of domestic macroeconomic factors such as money supply than would be the case for countries like the United States, the United Kingdom, or France, whose auction markets are at the core of the global art market and frequented by a much more international clientele.

In both Canada and Australia, there is very little dynamic stochastic dependence between art prices and money supply, in either the long term (cointegration) or the short term (Granger-causality). However, the linear trends, which in formal statistical terms dominate these two categories of dependence, are virtually the same in the art index and M1 for Canada, which we interpret as reflecting a very strong Cantillon effect in Canada. However, it is worth noting that we are not aware of any literature that attempts to define different "levels" of Cantillon effect in terms of different levels of statistical relationships. In particular, these extreme long- term movements of art prices are very similar to those for M1, and not at all like those of the CPI,

strongly suggesting that an extreme long-term Cantillon effect likens art to luxury goods and/or financial assets, and not to regular consumption goods.

This extreme long-term relationship between art and M1 is, at first glance, entirely absent in the Australian data, where art prices behave much more like the CPI than like M1. However, the fact that the Australian data set we use to calculate the price index includes a much larger number of artists, combining major and minor ones, than does the Canadian data appears to be a key factor. From our further analysis of the Australian market that breaks the market down to compare the segmentcomposed only of major artists relative to the broader market, we find the evidence shifts to support the presence of Cantillon effects. In segmenting the Australian market into higher-end and lower-end segments that have the respective characteristics of luxury goods/financial assets and regular consumption goods respectively important differences emerge. To evaluate this, we partition the Australian data by auction house on the basis of the prestige and reputation of the auction house as a convenient means to distinguish the upper-end and lower-end of the market. The results obtained are highly suggestive with the lower market index closely following CPI, whereas the upper market index instead is closer to M1 in its long-term trend.

The partition criterion we use here is rather crude, and the result we obtain, if not highly precise, is nevertheless suggestive of the presence of Cantillon effects. We believe this presents an interesting line worthy of future research which could investigate more sophisticated schemes of market segmentation in which the effects of particular macroeconomic aggregates are allowed to have differential effects on different segments of the art market.

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Fig. 1: Canada: M1, Art, and CPI Log Indices

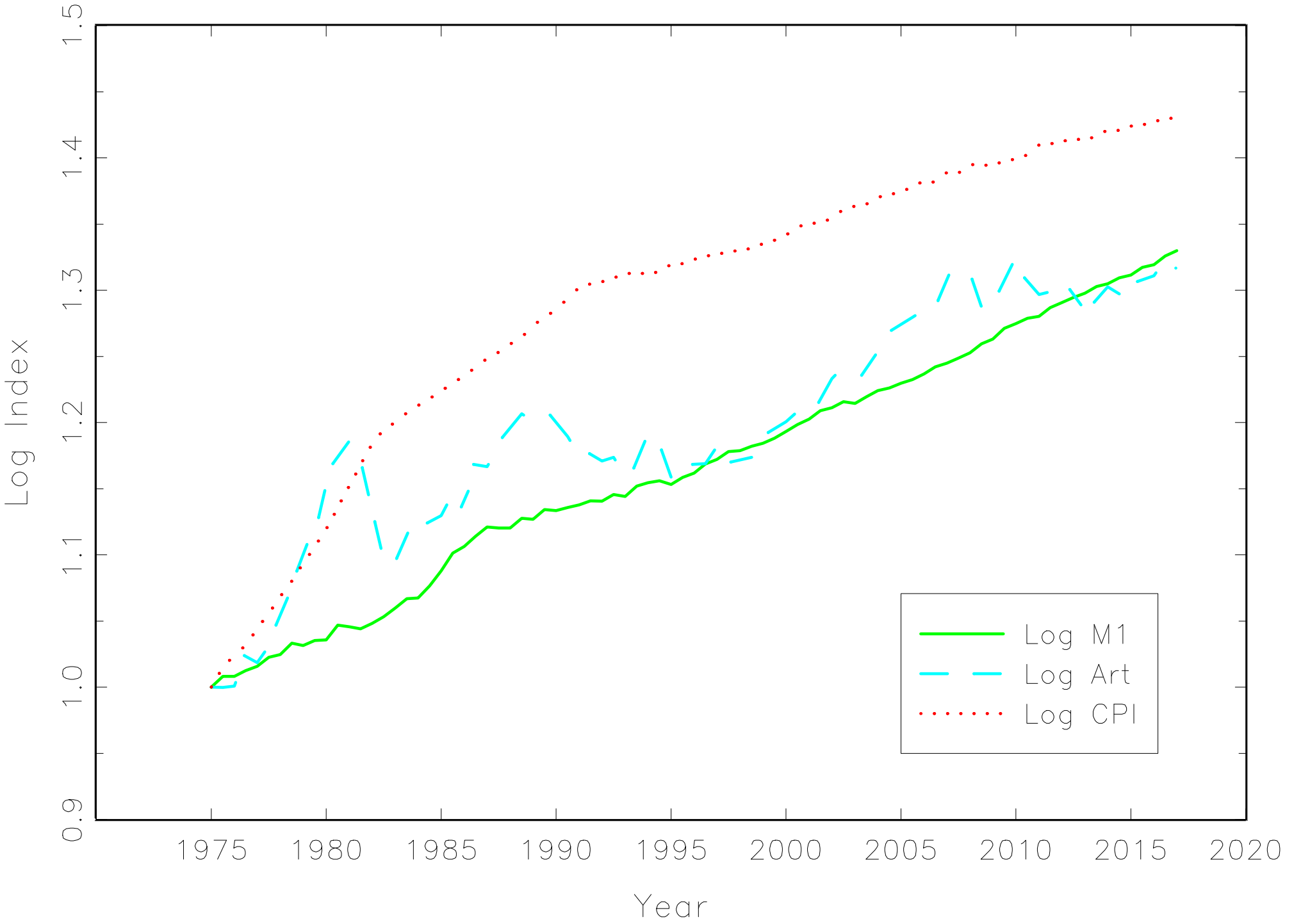

Fig. 2: Canada: M1 and Art Log Indices First Differences

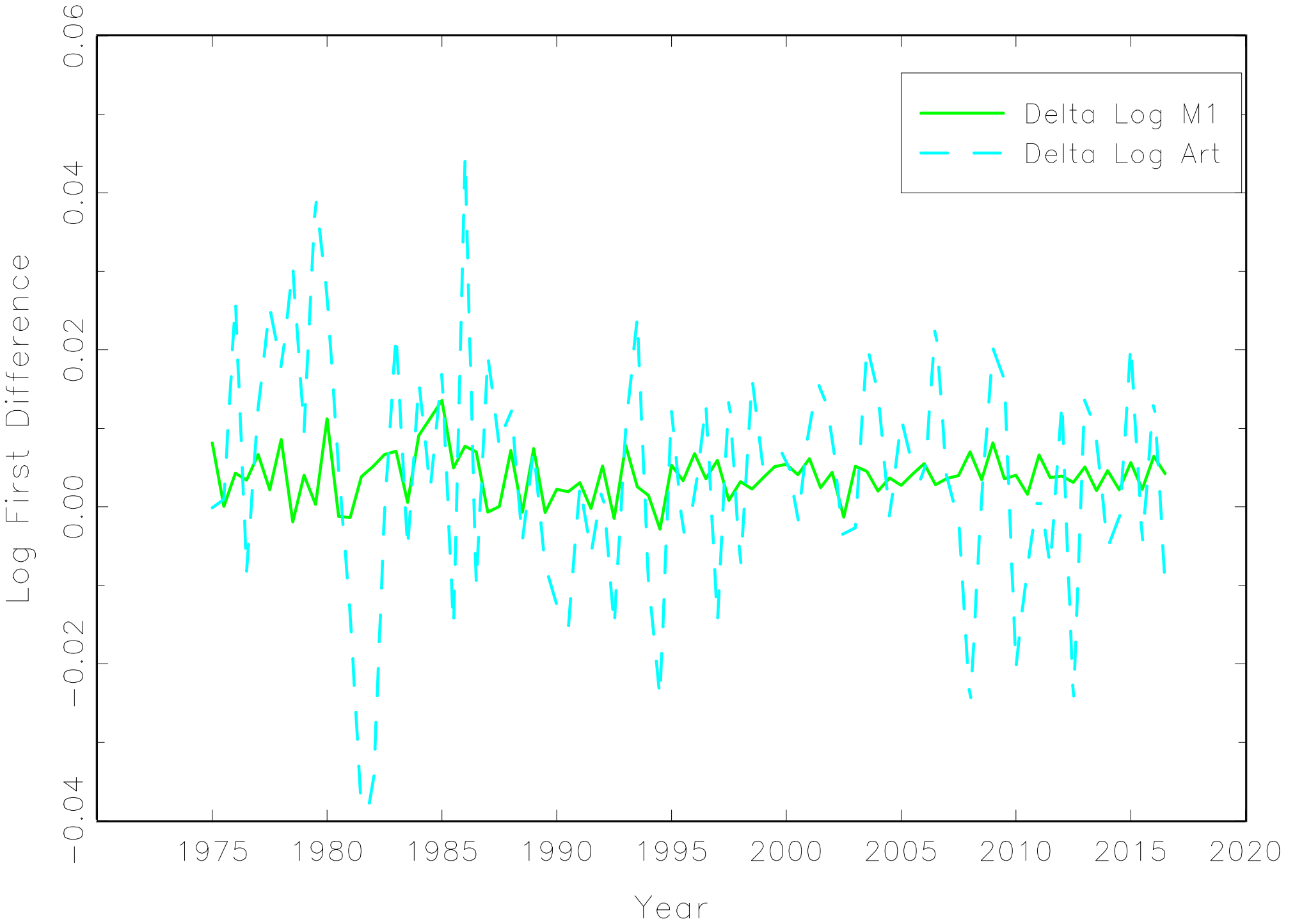

Fig. 3: Australia: M1, CPI and Art Log Indices

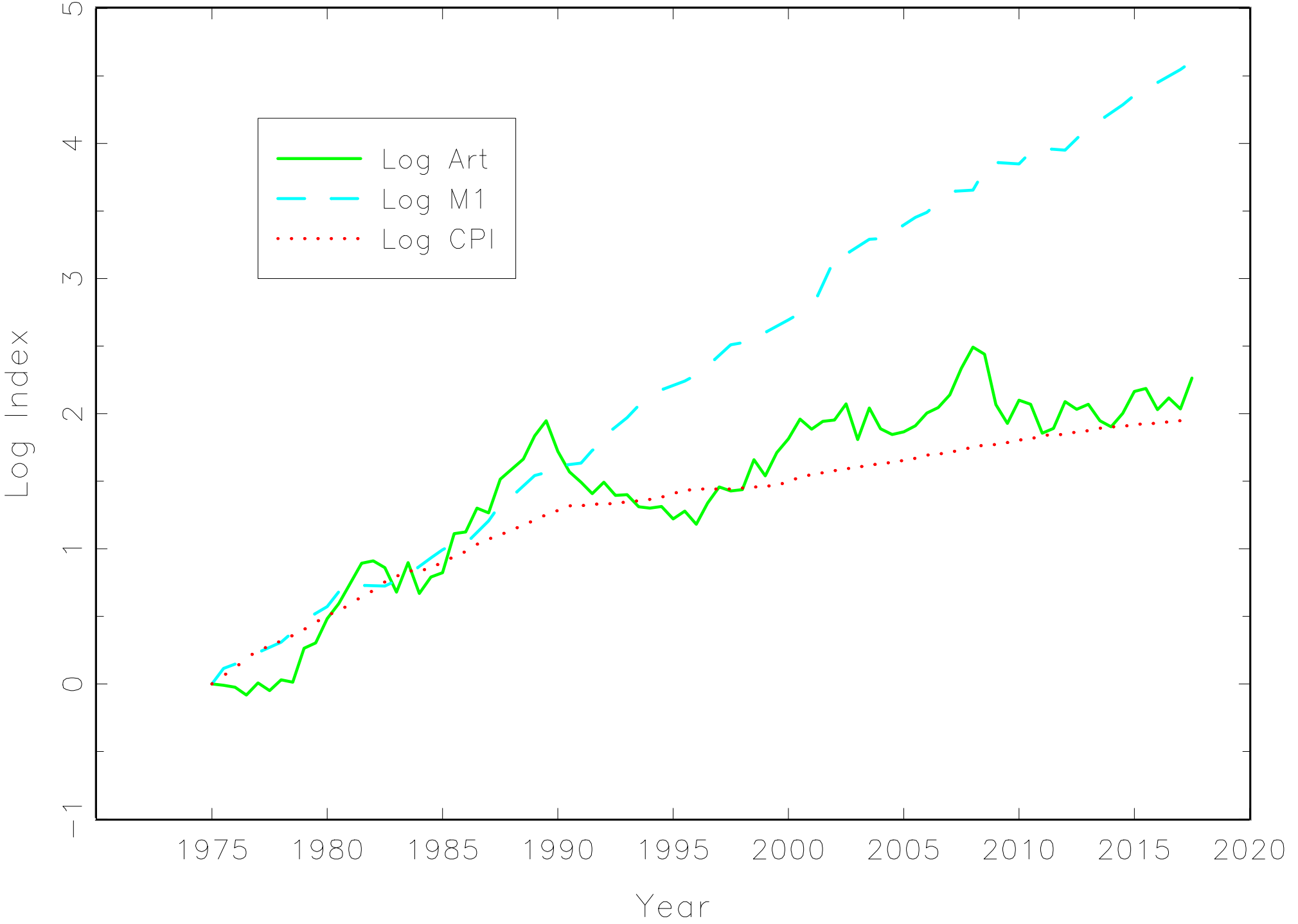

Fig. 4: Australia: M1 and Art Delta Log Indices

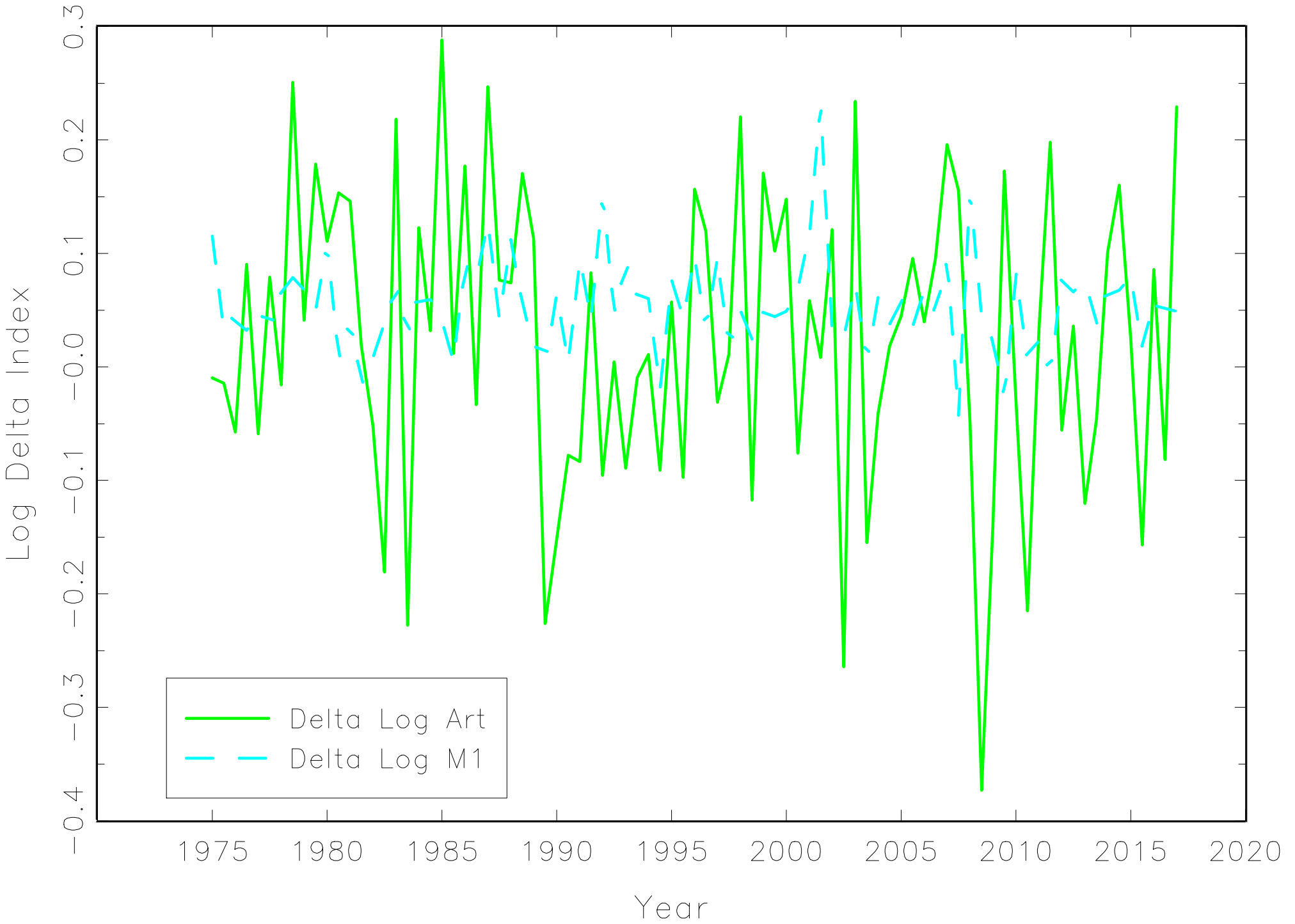

Fig. 5: Australia: M1, CPI and Art (L. Joel) Log Indices

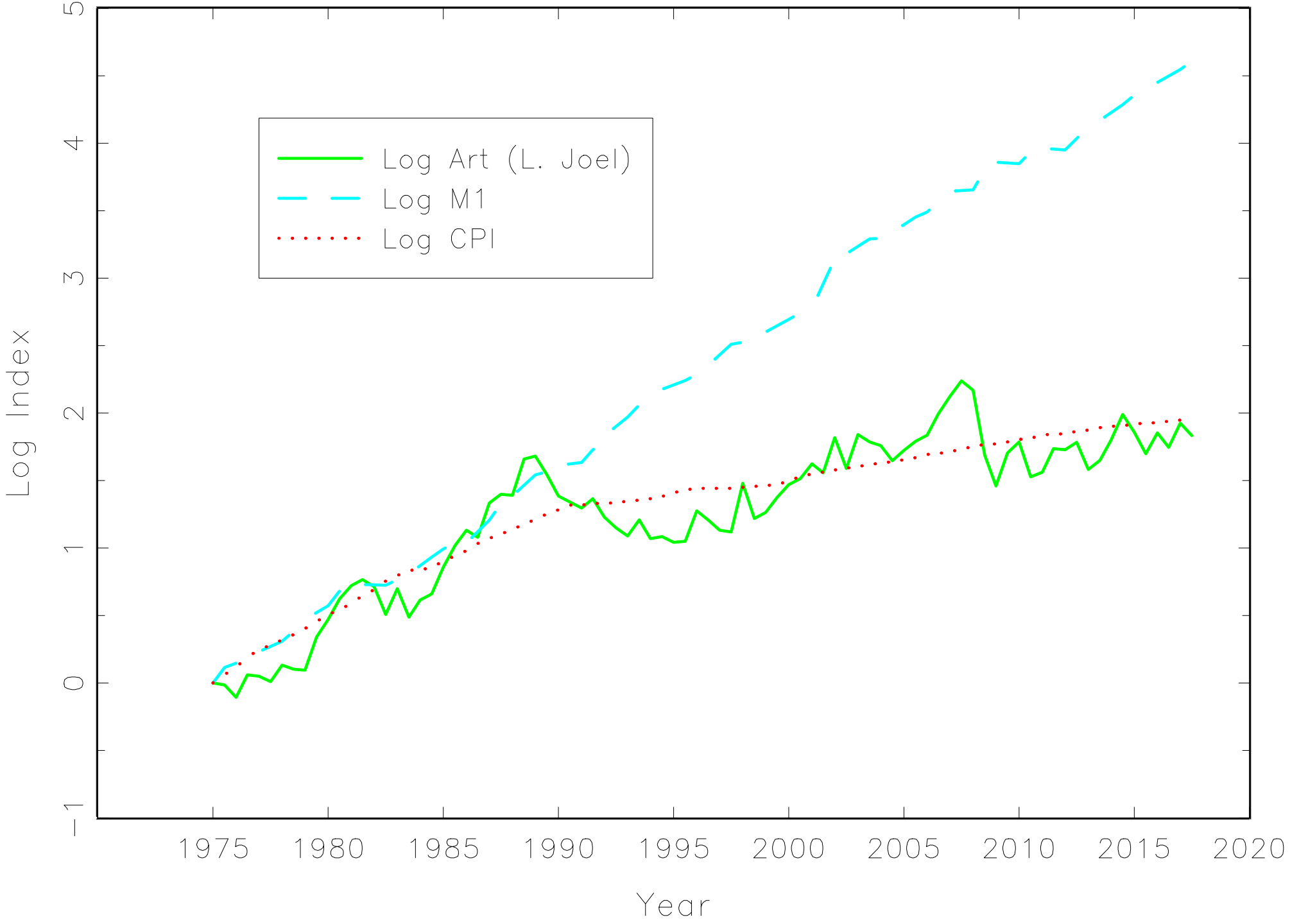

Fig. 6: Australia: M1, CPI and Upmarket Art Log Indices

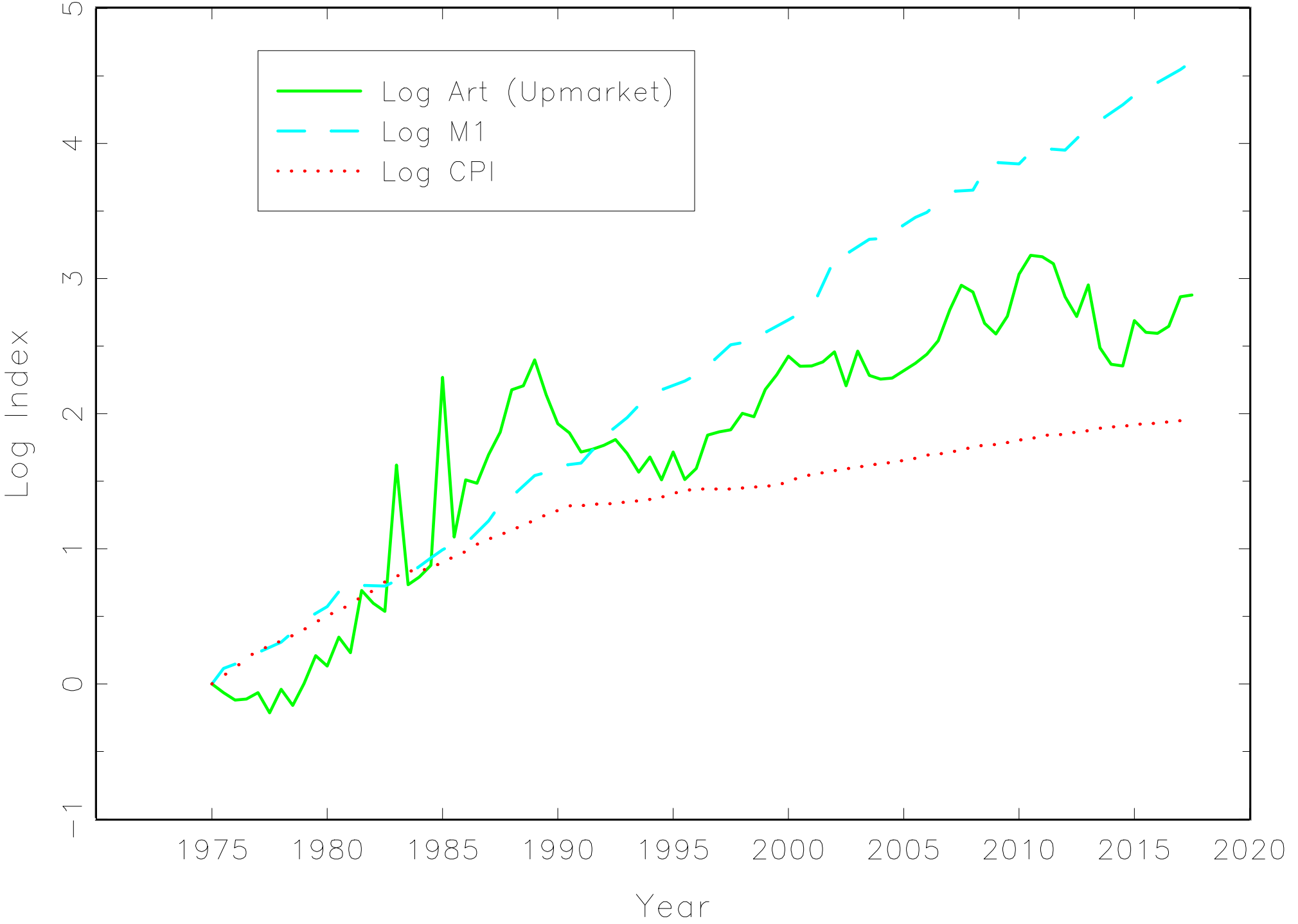

Fig. 7: Australia: M1 and Upmarket Art Log Delta Indices