GDP, PERSONAL INCOME AND GROWTH

PART 2: IMPACT OF PERSONAL INCOME CHANGES ON NEVADA GROWTH

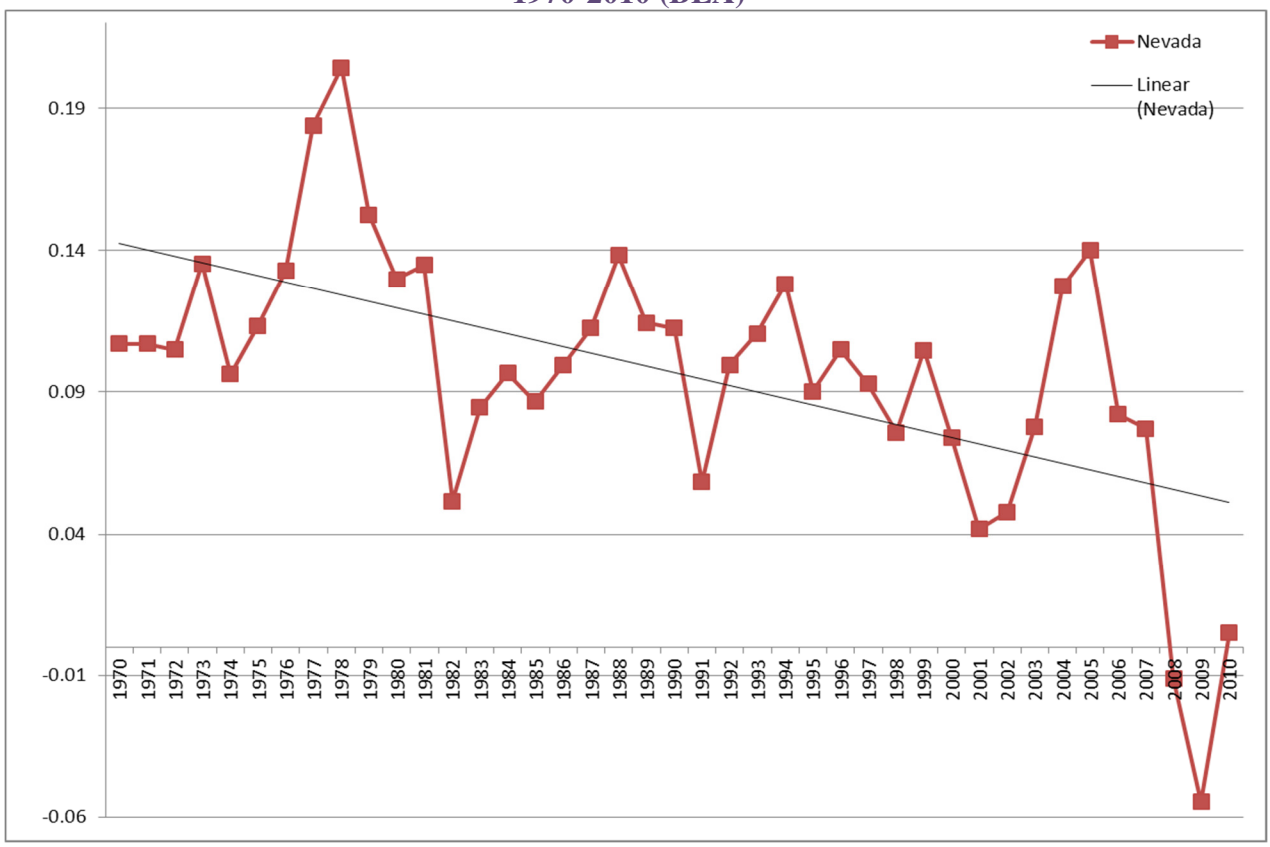
INTRODUCTION

Nevada has been heavily hit by the recession, with unemployment rates of 13.4% as of October 2011, lost sales tax revenue and gaming revenue, declining population, and reductions in visitors (DETR 2011). While other states have also been impacted by the recession, Nevada leads the way in unemployment and foreclosure rates (Bloomberg 2011).

Assuming GDP[1], which measures output of the economy, is a good indicator of the health of the economy, we would expect an increasing GDP growth to indicate a growing and healthy economy, and a declining GDP growth to indicate potential problems. Figure 1 below shows GDP growth for the State of Nevada between 1970 and 2010. The overall trend of growth for Nevada GDP has been one of decline, slowly decreasing in its rate of growth over the 40 year period.

[1] GDP-Gross Domestic Product. Unless otherwise indicated, the analysis uses real GDP, data adjusted for inflation, which allows for easier comparison between years by eliminating changes in data due to inflation.

Figure 1
Annual Growth Percentage Real GDP- Nevada
1970-2010 (BEA)



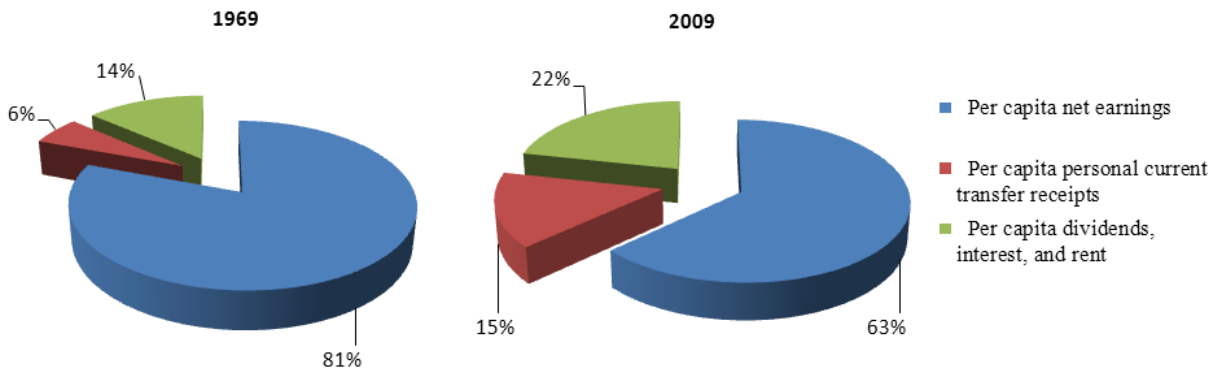
There are many reasons for this decline; some of it may be related to national and neighboring state economies and their impact on Nevada's growth. These impacts are discussed in Part 1 of this analysis. Another reason may be the changes in the State's composition, including significant changes in the make-up of the State's personal income. This paper explores the impact of the changes in this personal income composition on State growth.

In 1969, 81% of Nevada's per capita personal income was made up of net earnings,[2] 14% was current transfer receipts,[3] and 6% from dividends, interest and rent.[4] By 2009, per capita net

[2] Net earnings is earnings by place of work (the sum of wage and salary disbursements (payrolls), supplements to wages and salaries, and proprietors" income) less contributions for government social insurance, plus an adjustment to convert earnings by place of work to a place-of- residence basis.
[3] Current transfer receipts consist of income payments to persons for which no current services are performed and net insurance settlements. It is the sum of government social benefits and net current transfer receipts from business.

earnings made up 63% of total per capital personal income, 22% in per capital personal current transfer receipts and 15% in per capita dividends, interest and rent. This is a considerable shift from earnings from employment to those received from passive activities, such as investments and governmental payments.

Figure 2
Per Capita Personal Income Components
Nevada-1969 and 2009 (BEA)



In 2009, there were eight counties in Nevada with over 40% of per capita personal income from passive sources, such as transfers, dividends, rents and interest. Table 1 below shows the per capital personal income breakdown in 1969 and 2009. Douglas and Nye counties have the highest percentage of this passive income at 49% of total per capita personal income, followed by Lincoln County at 47%, and Carson City at 43%.

[4] Dividend income is dividend income received by persons. Interest income is interest income received by persons from all sources; includes both monetary and imputed interest. Rental income is earnings from the rental of real property by persons who are not primarily engaged in the real estate business. It also includes the imputed net rental income of owner-occupants and the royalties received by persons from patents, copyrights, and rights to natural resources.

Table 1
Per Capita Personal Income Components
Nevada Counties-1969 and 2009 (BEA)

County	Year	Per capita net earnings	Per capita personal current transfer receipts	Per capita dividends, interest, & rent
Carson City	1969	78%	6%	16%
	2009	57%	19%	24%
Churchill	1969	76%	10%	14%
	2009	66%	19%	15%
Clark	1969	84%	5%	11%
	2009	65%	15%	20%
Douglas	1969	70%	5%	25%
	2009	51%	12%	37%
Elko	1969	76%	6%	18%
	2009	75%	11%	13%
Esmeralda	1969	78%	6%	17%
	2009	61%	20%	18%
Eureka	1969	86%	4%	10%
	2009	73%	13%	14%
Humboldt	1969	78%	7%	15%
	2009	71%	14%	15%
Lander	1969	83%	6%	11%
	2009	76%	13%	11%
Lincoln	1969	74%	11%	15%
	2009	53%	29%	18%
Lyon	1969	76%	6%	18%
	2009	58%	24%	19%
Mineral	1969	86%	6%	8%
	2009	54%	30%	16%
Nye	1969	88%	5%	7%
	2009	51%	29%	20%
Pershing	1969	81%	8%	11%
	2009	62%	23%	15%
Storey	1969	75%	7%	18%
	2009	60%	16%	24%
Washoe	1969	76%	6%	18%
	2009	59%	14%	27%
White Pine	1969	83%	8%	9%
	2009	68%	18%	14%

This increase in passive income my also impact the State's ability to weather national and worldwide recessionary swings.

METHODOLOGY

The purpose of this project is to determine State of Nevada's ability to withstand economic cycles, to determine whether increases in personal income components (net earnings, interest, rents, dividends and transfers) have an impact on Nevada GDP.

Real GDP data is used as it allows comparison of actual GDP growth without the impact of inflation. This data is collected from the Bureau of Economic Analysis, which provides GDP data at the national and state levels.[5] Data is shown in percent annual change format, which is used as a proxy for economic growth on the assumption that the economy's output (GDP) growth represents overall growth of the economy. The model will take the form of:

$$\%\Delta NVGDP=\alpha+\beta_1\%\Delta PCNE+\beta_2\%\Delta PCCT+\beta_3\%\Delta PCDIR$$

NVGDP-Nevada GDP
PCNE-per capita net earnings
PCCT-per capita personal current transfer receipts
PCDIR-per capita dividends, interest, and rent income

Per capita personal income is used to eliminate any changes in personal income due to population. This data was obtained from the Bureau of Economic Analysis for the period between 1969 and 2009. As discussed above, percentage change in each income component is used to signify growth, so the analysis includes the forty-year period between 1970 and 2009.

[5] Real GDP data is available from the Bureau of Economic Analysis for the period between 1963 through 2010. However, personal income data also used in this report is available for the period between 1969 and 2009, so this period is used to be consistent. Because the analysis utilizes annual percent increase data calculated from this data, we cannot use 1969 data, so the analysis begins in 1970.

FINDINGS

As discussed above, Nevada has experienced an interesting change in personal income in many of its counties, a shift from employment earnings to passive income. The analysis looks at whether this shift has impacted the State's economy (as represented by its GDP). This is done by creating a regression model where Nevada GDP is regressed against personal income components such as net earnings, current transfers and dividend, interest and rent income.

$$\%\Delta NVGDP=\alpha+\beta_1\%\Delta PCNE+\beta_2\%\Delta PCCT+\beta_3\%\Delta PCDIR$$

Since the model in the regression equation is based on time series data, variables within this study must be tested for stationarity, and if non-stationary, they should be cointegrated. Below are the tests for both. The results of the Dickey-Fuller test for stationarity are summarized below.

			Critical Value (tc)				
	t	**p**	**1%**	**5%**	**10%**	**Result**	**Conclusion**
NVGDP	-1.295	0.6313	-3.655	-2.961	-2.613	|t|<|tc|, p>5%	Do not reject Ho
PCNE	-1.549	0.5093	-3.655	-2.961	-2.613	|t|<|tc|, p>5%	Do not reject Ho
PCCT	-3.320	0.0140	-3.655	-2.961	-2.613	|t|>|tc| at 5% and 10%, p<5%	Reject Ho at 5% and 10%
PCDIR	-2.627	0.0875	-3.655	-2.961	-2.613	|t|>|tc| at 10%, p>5%	Do not reject Ho at 1% and 5%, Reject at 10%

The test assumes that data is non-stationary (null hypothesis H_0), because we do not reject the null hypothesis, NVGDP, PCNE and PCDIR are non-stationary. Because these variables are non-stationary, they must be cointegrated in order to proceed with the analysis, otherwise they are unrelated variables and the result of the regression will not be accurate. Variable PCCT is stationary. To test whether these variables are cointegrated, the analysis estimates residuals of the regression model and then conducts the Dickey-Fuller test on the residuals. The results of this test are shown below:

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	**-4.725**	**-3.655**	**-2.961**	**-2.613**

MacKinnon approximate p-value for Z(t) = **0.0001**

|t|>|tc| for the 1%, 5% and 10% critical values, reject H_0 that variables are not cointegrated at these levels, p=0.00<0.05, reject H_0 that residuals are not cointegrated.

This means that even though the variables are non-stationary, they are cointegrated and therefore can be used in this model. Another problem that faces a time series regression equation is serial correlation. The Breusch-Godfrey test can test for this as follows:

Breusch-Godfrey LM test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
1	**1.663**	**1**	**0.1972**

H0: no serial correlation

P=0.1972>0.05, do not reject null that no serial correlation exists. This test shows that serial correlation does not exist and the basic Ordinary Least Squares (OLS) methodology can be used to estimate the model, as follows: [6]

$$\%\Delta NVGDP = 0.0265098 + 0.7041257\%\Delta PCNE - 0.1430566\%\Delta PCCT - 0.0232625\%\Delta PCDIR$$
$$(0.00567)^{***}\ (0.086337)^{***}\qquad (0.411193)^{***}\qquad (0.0579031)$$
$$r^2 = 0.7780$$

This model predicts approximately 77.8% of the annual change in Nevada GDP. It shows that given a 1% increase in per capita net earnings will increase NV GDP by 0.70%. A 1% increase in per capita current transfers decreases Nevada GDP by .14% and a 1% increase in per capita dividend, income and rental income decreases Nevada GDP by 0.02%. All of the coefficients,

[6] Values in parenthesis are standard errors associated with above coefficients. Asterisks following each standard deviation number represent the significance of the coefficient at the level of significance of 10%-*, 5%-**, and 1%-***.

with the exception of PCDIR are highly significant even at 1%. PCDIR is not significant even at 10%.

There, however, may be another problem with this data, this one dealing with causality. It is unclear if changes in personal income components cause changes in Nevada GDP, or whether personal income components change due to changes in Nevada GDP. We can use the Granger Causality test to help resolve this issue. The test will not tell us whether one variable causes the change in the other, rather it will tell us which variable came first, which is as good of an answer as we can get in this case.

Using this test, we would reject the null that NVGDP causes PCNE and PCCT, which means it may precede both of these variables. Similarly PCNE precedes PCCT, and PCDIR precedes PCNE and PCCT. There seems to be a lot of relationships between these variables, which may impact the findings of the analysis.

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
nvgdp	pcne	10.405	4	0.034
nvgdp	pcct	13.758	4	0.008
nvgdp	pcdir	7.2902	4	0.121
nvgdp	ALL	37.883	12	0.000
pcne	nvgdp	4.6809	4	0.322
pcne	pcct	14.621	4	0.006
pcne	pcdir	7.446	4	0.114
pcne	ALL	26.32	12	0.010
pcct	nvgdp	5.2592	4	0.262
pcct	pcne	4.1887	4	0.381
pcct	pcdir	2.5632	4	0.633
pcct	ALL	22.064	12	0.037
pcdir	nvgdp	8.7452	4	0.068
pcdir	pcne	28.598	4	0.000
pcdir	pcct	12.935	4	0.012
pcdir	ALL	79.554	12	0.000

CONCLUSION

The findings of the personal income model are somewhat surprising. It makes sense that the growth in per capita net earnings can contribute to the growth in State GDP. Higher salaries and increased productivity are both components of economic growth. However, what is surprising is

that an increase in capital transfer income and dividend, rent and interest revenue actually decreases State output.

In thinking about this issue, it makes sense in that as more people receive passive income, such as retirees receiving retirement payments or investors receiving rents, nothing is being produced in the economy and as the number of these people grows, they lower the impact of workers producing State output. This would show that a rapidly growing passive personal income base is not beneficial to the health of the State and should not be encouraged to grow at the expense net earnings income.

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