Understanding State-Level Correlates to Economic Wellbeing

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Research Question

Growing inflation rates following the U.S. Government's robust fiscal policy response to COVID-19 have bolstered public skepticism over the net economic impact of progressive fiscal policies. To help mitigate speculation in the current discourse, I generate two multilinear regression models to determine how prices, government consumption, and other related market conditions correlate to overall economic prosperity between businesses (*Model 1*) and consumers (*Model 2*).

Data Sources

Considering the objective of providing a comprehensive assessment of economic welfare, I compile requisite data from two extensive sources. Information for individual consumption and cost of living is derived from the U.S. Department of Commerce's official Bureau of Economic Analysis website. The remaining data come from sources in the Correlates of State Policy Project – a compilation of over 3,000 policy, government, and demographic variables with observations from all 50 U.S. states and Washington, D.C. each coded by year for years spanning 1900 to 2019 (Grossmann et al., 2021). In recognizing the breadth of unique observations in the dataset, as well as the constraints imposed by variables with data for varying time periods, the data sample used in this analysis represents just a snapshot of observations from all states (excluding D.C.) for the year 2014 (the most recent year with information for all relevant variables).

Statistical Models

Although economic welfare may encompass a range of socioeconomic conditions, I evaluate economic wellbeing in the more traditional sense by estimating correlates to overall producer and consumer welfare in the following two models. The first model predicts changes in per capita Gross State Product (GSP), the state-level equivalent to per capita Gross Domestic Product (GDP) which measures the total annual economic output of all public and private industries within a state divided by the midyear population. The second model estimates changes in Real Per Capita Personal Consumption Expenditures (PCE)[1], the sum of individuals' consumption expenditures for one year divided by the population and adjusted for regional inflation.

***Model 1*:** Gross State Product per capita (natural log); $Y_1 = lgspt$

$$lgspt = \hat{\beta}_0 + \hat{\beta}_1 gcomp + \hat{\beta}_2 ppar + \hat{\beta}_3 unemp + \hat{\beta}_4 unemp^2 + \hat{\beta}_5 abovefed + \hat{\beta}_6 pov + \hat{\beta}_7 urb + \hat{\beta}_8 lgov + \hat{\beta}_9 ltax + \hat{\beta}_{10} inct + \hat{\beta}_{11} corpt + u$$

***Model 2*:** Personal Consumption per capita (natural log); $Y_2 = lpcon$

$$lpcon = \hat{\beta}_0 + \hat{\beta}_1 gcomp + \hat{\beta}_2 ppar + \hat{\beta}_3 unemp + \hat{\beta}_4 unemp^2 + \hat{\beta}_5 abovefed + \hat{\beta}_6 pov + \hat{\beta}_7 urb + \hat{\beta}_8 lgov + \hat{\beta}_9 ltax + \hat{\beta}_{10} inct + \hat{\beta}_{11} corpt + u$$

Variables

The independent variables described in the following table include several factors related to government economic welfare policy, including taxes, wages, and government consumption. All coefficients represent the estimated percent change in *Y* given a one percentage point increase in *X* unless otherwise specified.

[1] Regional inflation-adjusted values (rather than nominal values) are used so that *rpp* in *Model 2* captures indirect or reverberating effects of inflation on Personal Consumption Expenditures.

Table 1. **List of Variables**

Dependent Variables	
lgspt	Per capita Gross State Product (GSP) (natural log)
lrpcon	Real Per Capita Personal Consumption Expenditures (PCE) (natural log)

Independent Variables		**Coefficient Description**
jcomp	Avg. compensation paid per job in thousands of USD x (1/*rpp*)100	Coef. estimates % Δ in *Y* given a 1000 dollar increase in wages
rpp	Regional price parity (PCE inflation index); state equivalent to 100 USD	
unemp	Unemployment rate	Estimated marginal effect of 1 ppt increase in unemp = $\hat{\beta}_1 + 2\hat{\beta}_2(unemp)$
$unemp^2$	Unemployment rate squared	
abovefed	Indicator of states with minimum wages above the federal minimum 1 = states with min > \$7.25 0 = state with min ≤ \$7.25	Coef. estimates % Δ in *Y* for a change in value of *X* from 0 to 1
pov	Poverty rate	
urb	Percent of the population living in urban and suburban areas	
hhs	Average household size	Coef. estimates % Δ in *Y* given one additional household member
lgov	Government consumption and investment per capita (natural log)	Coef. estimates % Δ in *Y* given a 1 pct change in per capita gov consumption
ltax	Total government tax revenues per capita (natural log)	Coef. estimates % Δ in *Y* given a 1 pct change in per capita tax revenues
inct	Top marginal individual income tax rate	
corpt	Top marginal corporate income tax rate	

Tabular Results

Table 2 depicts the results of *Model 1* and *Model 2* before and after controlling for outliers.[2]

Table 2. **Results for Model 1 and Model 2**

VARIABLES[3]	(*1a*) GSP	(*1b*) GSP	(*2a*) PCE	(*2b*) PCE
jcomp	0.0205***	0.0201***	0.00614***	0.00529***
	(0.00250)	(0.00249)	(0.00169)	(0.00155)
rpp	-0.00331	-0.00543**	0.00657***	0.00712***
	(0.00311)	(0.00228)	(0.00190)	(0.00199)
unemp	-0.135**	-0.111**	-0.126***	-0.159***
	(0.0508)	(0.0439)	(0.0289)	(0.0266)
unemp2	0.00672*	0.00533*	0.00761***	0.0102***
	(0.00357)	(0.00311)	(0.00204)	(0.00193)
i.abovefedmin	0.0174	0.0311	0.0535***	0.0484***
	(0.0223)	(0.0205)	(0.0136)	(0.0137)
urb	0.00199**	0.00148*	-0.00184**	-0.000910
	(0.000955)	(0.000791)	(0.000684)	(0.000764)
pov	-0.00533	-0.0104***	-0.00417***	-0.00386***
	(0.00375)	(0.00325)	(0.00151)	(0.00131)
lgov	0.305***	0.263***	-0.0740*	-0.103**
	(0.0675)	(0.0688)	(0.0425)	(0.0453)
ltax	0.0781**	0.0997***	0.0439**	0.0486**
	(0.0374)	(0.0345)	(0.0202)	(0.0186)
inct	-0.00778**	-0.00817***	-0.00524**	-0.00347*
	(0.00308)	(0.00282)	(0.00196)	(0.00201)
corpt[4]	0.00627	0.00656	0.00516*	0.00646**
	(0.00458)	(0.00413)	(0.00264)	(0.00293)
hhs	0.00861	0.112	-0.186***	-0.290***
	(0.0769)	(0.0750)	(0.0371)	(0.0528)
Constant	10.84***	10.83***	10.49***	10.49***
	(0.0133)	(0.0111)	(0.0102)	(0.0106)
Observations	50	45	50	44
R-squared	0.930	0.954	0.903	0.923

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[2] Observations with a Cook's distance ≥ 4/*n*, or 0.08.

[3] All independent variables are scaled so that $x_n = 0$ represents the average value of x_n.

[4] Three out of five states coded as having a 0% corporate income tax rate levy corporate taxes through means not captured in the data set. As such, 0 values for Nevada, Ohio, and Texas have been recoded to reflect the average corporate tax rate of states with an official corporate income tax rate above 0%.

Findings

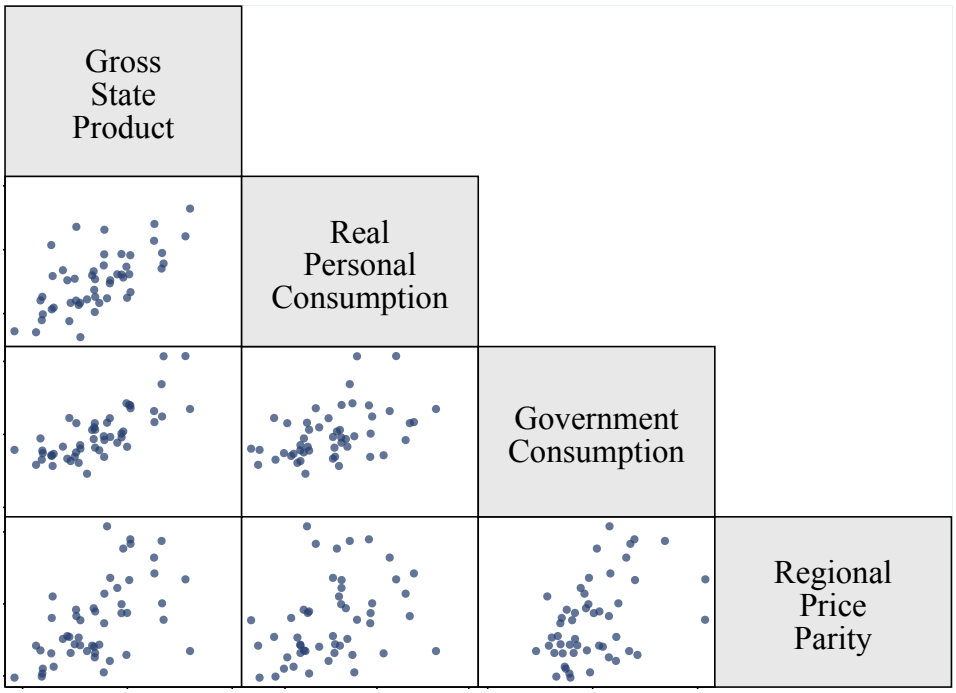
When comparing the original models (*a*) and the models controlled for outliers (*b*), aside from coefficients for urban living and the income tax rate, the significance of all estimated coefficients in the constrained models either increased or remained about the same. Still, accounting for outliers produced noteworthy differences. Average compensation was the largest predictor of Gross State Product and maintained a positive relationship all else constant ($p = 0.000$; *std.* $\hat{\beta} = 0.578$). Conversely, average household size, which was not significantly related to Gross State Product (std. $\hat{\beta} = 0.010$; $p = 0.911$), was nonetheless the largest predictor of Real Personal Consumption to which it was inversely related all else constant ($p = 0.000$; *std.* $\hat{\beta} = -0.440$).

Gross State Product was significantly related to a number of government policies, including a positive relationship with government consumption and total tax revenue, and a negative relationship with the individual income tax rate. The opposite trend appeared among correlates to Real Personal Consumption, which was better predicted by socioeconomic conditions including poverty, unemployment[5], regional price parity, and average and minimum wages. Unlike indicators for prices and wages, poverty and unemployment rate were negatively related to personal consumption. More curiously, increases in urban living, relative prices, and government consumption demonstrated a positive, negative, and positive relationship with Gross State Product, but contrary relationships with Real Personal Consumption. However, unlike urban living, relative prices and government consumption's opposing relationships with GSP and PCE

[5] For *Model 2b*, $\hat{\beta}_1 + 2\hat{\beta}_2 unemp$ = -0.025 (*std. beta equivalent* = -0.374); $p = 0.000$.

were not representative of these variables' uncontrolled positive associations with both measures of economic welfare (as seen in *Figure 1*).

Figure 1. **Correlation Matrix**



Adjusting Model Parameters

To account for potential omitted variable bias in the estimated coefficients for regional price parity, I segmented regional inflation into three variables – the relative price of goods (*gcost*), housing (*hcost*), and other services (*ocost*) not including utilities. As demonstrated in Table 3, all subcategories of regional inflation excluding relative housing costs in *Model 1c* were statistically significant. More notably, the direction of their correlations to GSP and PCE were consistent. Variables for urban living and government consumption nonetheless retained their diverging relationships with GSP and PCE, while a similar pattern regarding average household size became statistically significant. Unlike in *Model (a)*

and *Model (b)*, variables for corporate tax rate and urban living were only significant in *Model 1c* and *Model 2c*, respectively.

Table 3. **Results with Adjusted Parameters**

VARIABLES	(*1c*) GSP	(*2c*) PCE
jcomp	0.0210***	0.00749***
	(0.00276)	(0.00141)
gcost	-0.0110**	-0.00771***
	(0.00530)	(0.00250)
hcost	0.000967	0.00274***
	(0.000656)	(0.000384)
ocost	-0.0130***	-0.00857***
	(0.00413)	(0.00273)
unemp[6]	-0.0423***	-0.0214***
	(0.00782)	(0.00395)
abovefed	0.0318	0.0506***
	(0.0210)	(0.0101)
urb	0.000983	-0.00244***
	(0.000807)	(0.000472)
pov	-0.00665**	-0.00373***
	(0.00290)	(0.000999)
lgov	0.247***	-0.0902**
	(0.0663)	(0.0437)
ltax	0.0925***	0.0445**
	(0.0288)	(0.0189)
inct	-0.00710**	-0.00449***
	(0.00297)	(0.00155)
corpt	0.00266	0.00389
	(0.00422)	(0.00315)
hhs	0.140*	-0.180***
	(0.0719)	(0.0203)
Constant	12.67***	12.42***
	(0.599)	(0.333)
Observations	43	43
R-squared	0.966	0.952

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[6] Unemployment is depicted in linear rather than quadratic form to mitigate multicollinearity.

Limitations

This study had a number of limitations that are worth noting. Because data represented a one-year snapshot of state economic conditions, results did not account for lagged effects and thus cannot be used to make casual inferences. Furthermore, the limited time horizon and small sample size increased risks of bias due to overfitting and omitted variables. High levels of multicollinearity between model parameters also undermined the statistical significance of variables such as urban living, corporate tax rates, and housing costs.

Conclusion and Recommendations

Results suggest that rising prices have a nuanced relationship with economic health. A one percentage point increase in the relative cost of goods and other services predicterd an approximate 0.01% lower GSP per capita, and a 0.008 – 0.009% lower real per capita PCE. Conversely, higher housing costs were significantly correlated to higher consumer expenditure. Given that government consumption was positively related to Gross State Product and negatively associated with Personal Consumption Expenditure, I find that results demonstrating how government consumption relates to overall economic health inconclusive. Further research should be done to estimate the aggregate net impact of the "crowding-out" of private consumption potentially driving this discrepancy.

Data Resources

US Department of Commerce Bureau of Economic Analysis. (2021). Regional Data. https://apps.bea.gov/iTable/iTable.cfm?reqid=70.

Grossmann, M., Jordan, M. P. and McCrain, J. (2021) "The Correlates of State Policy and the Structure of State Panel Data," State Politics & Policy Quarterly. Cambridge University Press, pp. 1–21. doi: 10.1017/spq.2021.17.