

Culture Shocks and Consequences:

the connection between the arts and urban economic growth

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Williams College



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DOES CULTURE PRODUCTION AFFECT THE ECONOMY?

- The answer might seem obvious
 - Arts and culture production is a large and growing sector of the economy
 - Many studies demonstrate this:
 - Wassall (1997)
 - UNCTAD (2008)
 - Markusen *et al* (2008)
 - Lawton *et al* (2011)
- But ... size of the sector does not imply a causal connection between culture and prosperity
 - Is the creative economy a source, or a byproduct of a growing economy?
 - Do policies supporting the arts also promote economic growth, even if this is not the primary objective?
 - Perhaps this has already been demonstrated?

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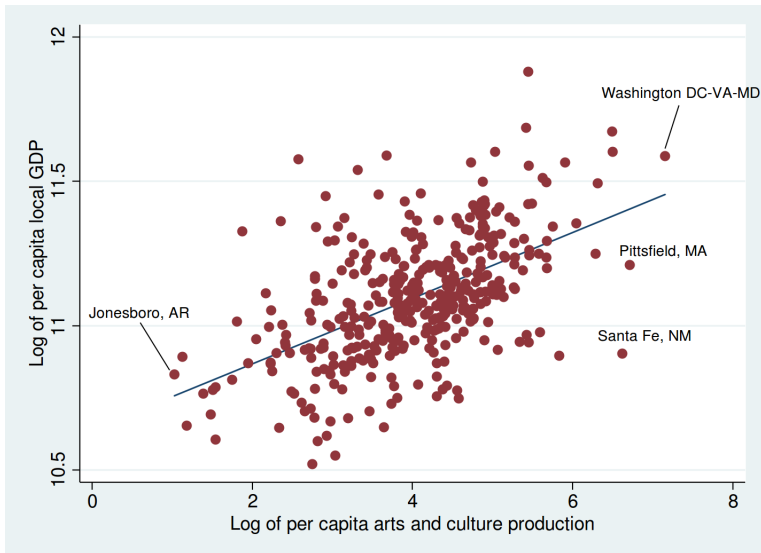
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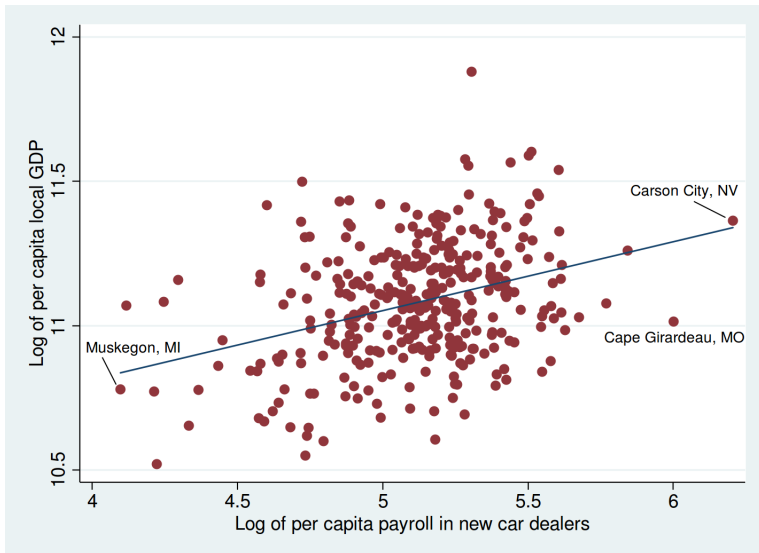
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THERE IS AN OBSERVABLE RELATIONSHIP ...



THIS RELATIONSHIP EXISTS FOR MANY SECTORS



THE PROBLEM

- Correlation does not imply causation
- Need a clear model supported by empirical validation
- Perhaps studies based on inter-industry models?
 - Input-output models and others
 - These provide 'multipliers' that are widely used
 - Skepticism – models **always** predict positive impact
 - Models may be appropriate for short or medium term
 - Models don't account for *opportunity cost* of resources
 - Models don't address the long run impact on prosperity
- The goal:
 - A model that accounts for opportunity costs
 - A model that allows for culture to **cause** growth
 - Allows for empirical testing of causality and long-run impact

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MODEL OF CULTURE AND GROWTH

- Aggregate income depends on capital, culture and labor

$$Y_t = A_t \cdot K_t^\alpha C_t^\beta L_t^{1-\alpha-\beta}$$

- Where:
 - Total factor productivity A_t evolves randomly over time with a possible trend
 - **Local culture production C_t claims a share τ_t of income not consumed and is subject to random shocks**
 - Capital K_t claims the remainder $(1 - \tau_t)$ of income not consumed
 - Labor L_t grows at a rate that is a constant plus random shocks
- Culture production subject to 'shocks' in philanthropy or public support
- Culture has an opportunity cost: could be used to provide capital K_t

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CULTURE SHOCKS

- The central question: do positive shocks to culture production generate changes to steady-state income?
- We express the model in *per capita* terms:

$$\left(\frac{Y}{L}\right)_{t+1} = A_{t+1} \cdot s^{\alpha+\beta} (1-\tau_t)^\alpha \tau_t^\beta \cdot \left(\frac{Y}{L}\right)_t^{\alpha+\beta} \cdot \left(\frac{L_t}{L_{t+1}}\right)^{\alpha+\beta}$$

- This implies that *per capita* income depends on:
 - Total factor productivity
 - Shares of income devoted to culture and capital
 - Lagged *per capita* income
 - Labor growth

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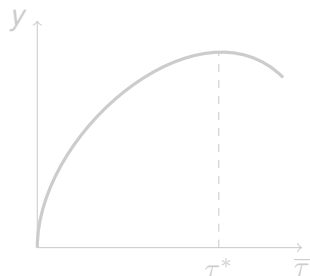
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CONSEQUENCES OF CULTURE SHOCKS

In this model if $\alpha + \beta < 1$ and if A_t is stable so that economic growth is endogenous, then:

- The log of *per capita* income and culture production will have a stability property known as having a *unit root*
- The log of *per capita* income and culture production will be closely linked via a property known as *cointegration*
- There will be a share of GDP for culture production $s \cdot \tau^*$ that will maximize growth

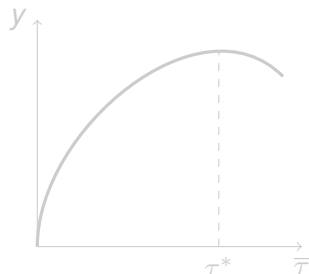


- For cities with $\bar{\tau} < \tau^*$, shocks to culture production will cause increases in steady-state GDP

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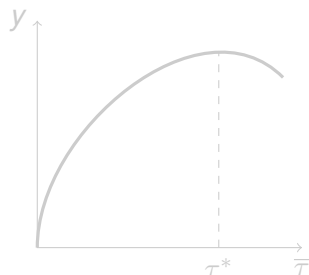


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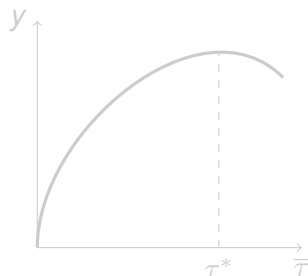


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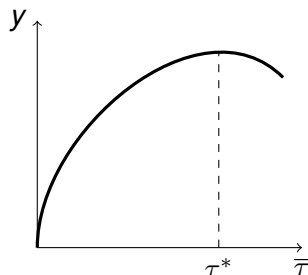


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ARE THE DATA CONSISTENT WITH THE MODEL?

- Our model assumes random processes that generate data on *per capita* income y_t and culture production c_t
- We must determine if observed data on y_t and c_t are consistent with the assumptions made in our model
- Test hypothesis that y_t and c_t have a unit root
 - Must hold in every city
 - Implies that first differences Δy_t and Δc_t are stationary
- Test hypothesis that y_t and c_t are cointegrated
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- We estimate the cointegrating relationship:

$$c_t = a + \beta_t \cdot y_t + e_t$$

- Requires only data on culture production and local GDP
- Estimated for each city, permits heterogeneity
- Estimate a vector error correction model:

$$\Delta c_t = b_1 + \lambda_1 \cdot \hat{e}_t + \sum_{j=1}^K R_{11} \Delta c_{t-j} + \sum_{j=1}^K R_{12} \Delta y_{t-j} + \epsilon_1$$

$$\Delta y_t = b_2 + \lambda_2 \cdot \hat{e}_t + \sum_{j=1}^K R_{21} \Delta c_{t-j} + \sum_{j=1}^K R_{22} \Delta y_{t-j} + \epsilon_2$$

- Use estimates of λ_1 , λ_2 and the ratio $\frac{-\lambda_2}{\lambda_1}$ to test causality and long-run impact

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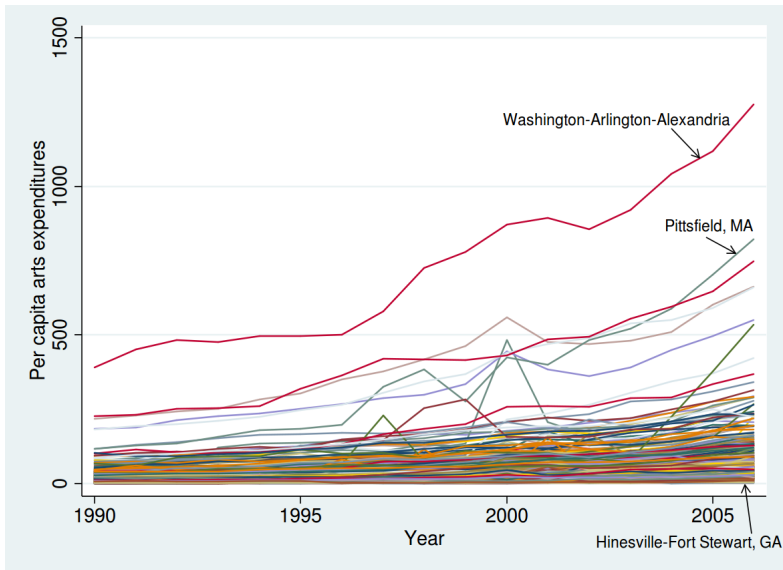
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AGGREGATE DATA FROM CULTURAL NON-PROFITS



TEST FOR COINTEGRATION

Test	Value
<i>Panel tests</i>	
ν	14.94***
ρ	-7.49***
Phillips-Perron	-9.63***
<i>ADF</i>	-10.05***
<i>Group tests</i>	
ρ	-1.41*
Phillips-Perron	-10.01***
<i>ADF</i>	-12.65***
*** - 1%, * - 10%	

- **These tests are all consistent with the predictions of our model**
- This implies a substantial connection between culture production and prosperity

TEST FOR CAUSALITY

	$\bar{\lambda}_2$	Test $c_t \rightarrow y_t$	$\bar{\lambda}_1$	Test $y_t \rightarrow c_t$
Group Mean	0.1	0.49	-1.11	-1.8**
Lambda-Pearson		1499.72***		2869.24***

*** - significant at 1%, ** - significant at 5%

	Median $\left(\frac{-\lambda_2}{\lambda_1}\right)$	Bootstrap σ
Sign Test	0.0384	0.0212

- The tests imply a **pervasive causal connection** between c_t and y_t
- We cannot reject the hypothesis that $c_t \rightarrow y_t$ is zero on average
- The sign test indicates that positive shocks to c_t generate increases in steady-state income

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CONCLUSIONS

- There is a short-run relationship between culture production and economic output
- Neither this relationship nor the size of the sector imply that increases in arts support will cause economic growth
- Evaluation of the ability of culture to cause growth requires a new type of model and data analysis
- We provide a growth model in which shocks to culture may generate economic growth
- Using data from cultural non-profits in US MSAs, we find the data to be consistent with our model
- Arts and culture production has a pervasive causal impact on steady-state income
- A positive shock to culture production causes economic growth
- In this sense we can say

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- A positive shock to culture production causes economic growth
- In this sense we can say

CONCLUSIONS

- There is a short-run relationship between culture production and economic output
- Neither this relationship nor the size of the sector imply that increases in arts support will cause economic growth
- Evaluation of the ability of culture to cause growth requires a new type of model and data analysis
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