1. (You may find the material on price indexes on pages 99–101 of Pindyck and Rubinfeld helpful on this problem.) Suppose that consumers in the hypothetical economy of Reedia buy three goods: cell phones, abalone dinners, and "other stuff." The consumption by the average consumer in Reedia bought the indicated quantities of each good at the prices shown in 1975 and 2005.

Good	1975			2005		
	Price	Quantity	Expenditures	Price	Quantity	Expenditures
Cell phones	$2000	0.001	$2	$50	1	$50
Abalone dinners	$10	12	$120	$200	0.01	$2
Other stuff	$100	10	$1,000	$200	12	$2,400
Total			$1,122			$2,452

a. The Consumer Price Index uses a Laspeyres price index based on the "base-year" market basket. Suppose that the base year is 1975. How much would the 1975 market basket have cost at 2005 prices? How much did it cost in 1975? What would be the 2005 value of the CPI based on this market basket with 1975 = 100?

The 1975 market basket cost $1,122 in 1975 and would have cost 0.001 × $50 + 12 × $200 + 10 × $200 = $0.05 + $2,400 + $2,000 = $4,400.05 in 2005. Thus, the 2005 value of the CPI (with 1975 base) would be 100 × $4,400.05/$1,122 = **392.2**. According to the Laspeyres index, prices were almost 4 times as high in 2005 as in 1975.

b. The GDP consumption deflator uses a Paasche price index based on the "given-year" market basket. How much did the 2005 market basket cost at 2005 prices? How much would it have cost at 1975 prices? What would be the 2005 value of the GDP consumption deflator with 1975 = 100?

The 2005 basket cost $2,452 in 2005 but would have cost 1 × $2,000 + 0.01 × $10 + 12 × $100 = $2,000 + $0.10 + $1,200 = $3,200.10 in 1975. The 2005 value of the GDP consumption deflator (with 1975 base) would be 100 × $2,452/$3,200.10 = **76.6**. According to the Paasche index, prices were almost 25% lower in 2005 than in 1975.

c. Which of the price indexes overstates and which understates inflation and why? How, in principle, does the chain-weighted price index discussed on page 101 of Pindyck and Rubinfeld improve on the simpler Laspeyres and Paasche indexes?

If we throw out the two commodities whose prices changed radically, prices of everything else doubled, so an appropriate price index should be somewhere near 200. Obviously, the Laspeyres index (CPI) overstates inflation and the Paasche index (deflator) understates inflation—ridiculously so in this case. This is because of substitution. The Laspeyres index gives heavy weight to abalone, which was cheap in the base year and thus consumed heavily, and almost no

weight to cell phones, which were expensive and hardly consumed at all. Thus if weighs heavily the good whose price increased (even though it's hardly consumed at all anymore) and almost ignores the good whose price decreased (even though it's now ubiquitous). The Paasche index does exactly the opposite. This can happen in cases like this because the given year and the base year are 30 years apart, so prices and consumption patterns can change a lot. The chain-weighted index uses weights from adjacent years to measure price change year by year, so it is less susceptible to this kind of bias.

2. (From Mankiw) What components of GDP (consumption, investment, government spending, net exports), if any, would each of the following affect and how? Explain. (Be careful to include all aspects of each transaction.)

    a.   A family buys a new refrigerator.

Although it is durable, refrigerators are part of personal consumption expenditures. GDP would go up by the amount of the purchase, including taxes and any delivery charges.

    b.   Chase Chevy sells a car from its inventory.

If the car was already in its inventory at the beginning of the period, then the only production that occurred during this period was the sale. Thus, GDP would increase by the difference between the retail and wholesale price of the car. In terms of components, personal consumption expenditures rise by the retail price of the car, but inventory investment falls by the wholesale price—it is negative inventory investment when the firm sells something out of its existing stock.

    c.   You buy a pizza.

The cost of the pizza (including tax, delivery, and tip) adds to GDP through consumption.

    d.   Multnomah County replaces the Sellwood Bridge.

Because it is undertaken by a government agency, this is considered government expenditure even though it is clearly durable capital.

    e.   Your professor buys a bottle of South African pinotage at a local shop.

This would increase both consumption and imports. Consumption would go up by the full amount of the purchase; imports would rise by the amount paid by the importer to the South African winery. Because imports are deducted from GDP when adding up expenditures, there would only be a small net positive effect on GDP: the "value added" by the Americans who handled the wine (the importer, distributor, and shop).

    f.   Honda builds onto its factory in Ohio.

Because it happens in the U.S., this would be an increase in investment spending and would increase GDP. It would be also reasonable to consider the purchase of U.S. construction by a Japanese firm as exports. The effect on GDP would be the same.

3. (From Mankiw) International data show a positive correlation between income per person and health outcomes. Can we be confident which way the causality runs (or that there is any causality at all)? Why might it be important for policymakers to know which way the causality runs?

Better health should increase productivity, leading to higher incomes. Higher incomes allow more to be spent on health, leading to better health outcomes. Causality undoubtedly flows both directions. Knowing which is more prominent might help policymakers decided where is the best place to jump onto this positive, self-reinforcing merri-go-round.

4. (From Mankiw) From 1950 to 2002, manufacturing employment as a percentage of total employment in the United States fell from 28 percent to 13 percent. At the same time, manufacturing output experienced slightly more rapid growth than the overall economy.

    a.   What do these facts say about growth in labor productivity in manufacturing?

Labor productivity must have more than doubled in manufacturing relative to the rest of the economy. Per dollar of GDP, we are getting more output from less than half as much input. Mathematically, we are given that

$$L^m_{2002} = 0.28 L_{2002}, \quad L^m_{1950} = 0.13 L_{1950}, \quad \frac{Y^m_{2002}}{Y^m_{1950}} > \frac{Y_{2002}}{Y_{1950}}.$$

Thus,

$$\frac{Y^m_{2002} / L^m_{2002}}{Y^m_{1950} / L^m_{1950}} = \frac{Y^m_{2002}}{Y^m_{1950}} \times \frac{L^m_{1950}}{L^m_{2002}} = \frac{Y^m_{2002}}{Y^m_{1950}} \times \frac{0.13 L_{1950}}{0.28 L_{2002}},$$

$$\frac{Y_{2002} / L_{2002}}{Y_{1950} / L_{1950}} = \frac{Y_{2002}}{Y_{1950}} \times \frac{L^m_{1950}}{L^m_{2002}},$$

$$\frac{Y^m_{2002} / L^m_{2002}}{Y^m_{1950} / L^m_{1950}} > \frac{0.28}{0.13} \frac{Y_{2002} / L_{2002}}{Y_{1950} / L^m_{1950}}.$$

    b.   In your opinion, should policymakers be concerned about the decline in the share of manufacturing employment? Explain.

To the extent that the decrease in employment simply reflects increasing productivity it is a good thing. We are still getting as much manufactured stuff, but we have freed up lots of labor resources to produce other things.

5. Suppose that in January 2010 Joan Jones buys an existing house from Alton Dalton for $400,000. Closing costs include a $20,000 commission to UN Realty, a $2,000 title research and transfer fee to SUB Title, and a $4,000 loan origination fee to River Bank. During 2010, Joan pays $1,500 in principal on her mortgage and $15,000 in interest. How (if at all) do the above transactions enter into 2010 GDP?

The house itself is not part of GDP because it is not new. The closing costs, title fee, and loan origination fee would be GDP as consumption of financial services. The $15,000 of interest would be income for the mortgage lender and would be in GDP. Thus, the only part of the transactions that enter GDP are the financial services that were "produced" to enable the (economically beneficial) transfer of the house from one person to the other.

6. "Growth regressions" often take the form of

$$g_i = \alpha + \beta \ln y_{0,i} + \gamma X_i + u_i,$$

where g_i is country i's growth rate over a period, $\ln y_{0,i}$ is the natural log of the initial level of per-capita income in country i, X_i is a set of other variables that might help determine growth in i (we show only one for simplicity, but there may be many), u_i is a disturbance term to capture factors that are omitted or not measurable, and α, β, and γ are coefficients to be estimated.

   a. If the convergence property of the neoclassical growth model is correct, should β be positive or negative? Why?

β should be negative because countries with higher initial incomes should grow more slowly than those with lower incomes, other things held equal. The absolute value of β is the share of the gap that is eliminated per year.

   b. In order to have a valid test of the convergence hypothesis, what kinds of variables should be included as X?

The Solow model requires that technology and its rate of change, the saving rate, and the population growth rate be the same. Anything that influences these variables should be held constant in the regression, and so should be included in X.

   c. In a paper from which I presented results in class, Xavier Sala-i-Martin tested the "robustness" of the effects of dozens of potential variables X variables.[1] Read the results section of this paper and examine his Table 1. For each of the variables that he finds significant, assess the economic (or other) argument (if any) that might explain its effect on growth.

You will have lengthy explanations. Trade and lack of market distortions make an economy more efficient. Higher investment = higher saving rate. Rule of law and other political variables allow for more secure property rights and enhance efficiency. Wars, revolutions, and coups are bad. The various regional, religious, colonial, and industry dummies are open to interpretation. They are almost certainly proxying for other things that are not measured.

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[1] Sala-i-Martin, Xavier, "I Just Ran Two Million Regressions," *American Economic Review* 87(2): 178-183. URL: http://www.jstor.org/stable/2950909.