

# Using Dallas Fed Publications in the Classroom

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Disclaimer: The views expressed are those of the presenter  
and do not necessarily reflect those of the Federal Reserve  
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## **The Big Mac: A Global-to-Local Look at Pricing** by Anthony Landry

Economic Letter  
September 2008

## Simulation

- You are a wheat buyer from one of two countries – Bluestan and Redlandia
- You can import wheat or buy it domestically
- If you import wheat, you must buy foreign currency in a competitive auction



## How far will you travel?

- Imagine that you are in the market for a particular car.
- How far will you travel in search of the best deal?
- Do you expect that it will sell for the same price in different markets?
  - Two different parts of San Antonio
  - San Antonio and Austin
  - Texas and California
  - U.S. and Mexico

## Law of One Price

- According to the law of one price:  
***Identical items should sell for the same price.***
- Law of one price holds if:
  - Goods are tradable
  - Transportation and distribution costs are negligible
  - Markets are competitive
- The law holds reasonably well for globally traded commodities (oil, chemicals, metals and some crops)

## Law of One Price

- Remember the car...two U.S. dealers are easy to compare
- International comparisons require the use of an exchange rate  
 **$Price_{U.S.} \times \text{exchange rate} = Price_{Mexico}$**
- Assume Mex\$10.2 / US\$1  
 **$US\$20,000 \times 10.2 \text{ (Peso/USD)} = Mex\$204,000$**

## Exchange Rates

- **Nominal exchange rate** – the rate at which the currency of one country can be exchanged for the currency of another country
- **Real exchange rate** – the rate at which the goods and services of one country can be exchanged for the goods and services of another country

## Purchasing Power Parity

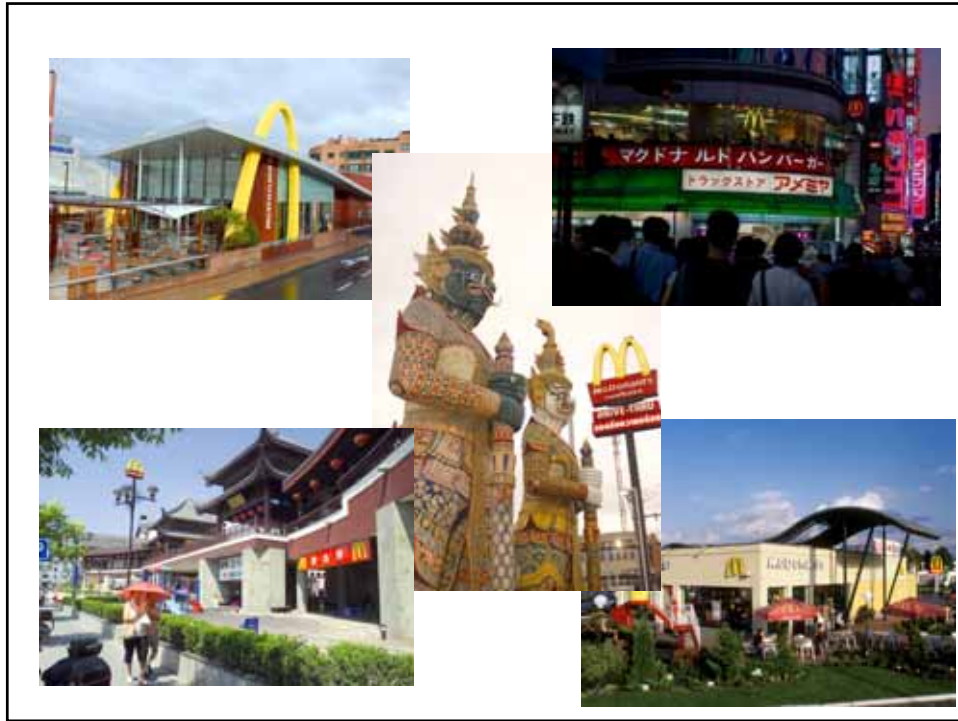
- Purchasing power parity (PPP) looks at groups of items called consumption baskets
- PPP holds when *one unit of domestic currency will buy the same basket of goods anywhere in the world*
- If PPP holds, the real exchange rate is 1

## A Basket to Consider

- Selected items from the United Nations' Standard International Trade Classifications (SITC), Revision 3
  - 011.12 Meat of bovine animals, fresh or chilled, boneless
  - 098.49 Other sauces and preparations; mixed condiments and mixed seasonings
  - 054.54 Lettuce and chicory (including endive), fresh or chilled
  - 024.20 Processed cheese, not grated or powdered
  - 056.71 Vegetables, fruit, nuts, and other edible parts of plants, prepared or preserved by vinegar or acetic acid
  - 054.51 Onions and shallots, fresh or chilled
  - 222.50 Sesame (Sesamum) seeds
  - 046.10 Flour of wheat or of meslin

Remember?





## The Big Mac Index

- Published in *The Economist* since 1986
- Even though the Big Mac is not traded, the ingredients can be traded
- Goal is to measure how far the nominal exchange rate deviates from the one that would create PPP
- Think of the Big Mac as a “basket of goods”
  - Frozen beef patties
  - Cooking oil
  - Special sauce
  - Sesame-seed buns





## In Mexico...

- Prices
  - Big Mac in Mexico = Mex\$32
  - Big Mac in U.S. = US\$2.99
- Exchange rates
  - Real exchange rate = Mex\$32 / US\$2.99 = 10.7
  - Observed (nominal exchange rate) = 10.2
- Conclusions
  - U.S. dollar is undervalued against the peso
    - US\$2.99 × 10.2 = Mex\$30.50
  - Peso is overvalued against U.S. dollar
    - Mex\$32 × (1/10.2) = US\$3.14

## In China...

- Prices
  - Big Mac in China = ¥12.50
  - Big Mac in U.S. = US\$2.99
- Exchange rates
  - Real exchange rate =  $¥12.50 / US\$2.99 = 4.18$
  - Observed (nominal exchange rate) = 6.83
- Conclusions
  - Renminbi is undervalued against U.S. dollar
    - $¥12.50 \times (1/6.83) = US\$1.83$
  - U.S. dollar is overvalued against the renminbi
    - $US\$2.99 \times 6.83 = ¥20.42$

## What causes Big Mac prices to vary?

- Transportation costs – it is not free to ship frozen beef patties around the world
- Trade barriers – agricultural products are some of the most protected items
- Nontraded inputs – rents and wages vary widely between countries

# What causes Big Mac prices to vary?

- Balassa and Samulson (1964) link productivity and prices:
  - Income broadly reflects productivity
  - High income implies high productivity, especially in traded sectors
  - Since domestic labor markets are competitive, high wages in traded sectors drive up wages in nontraded sectors
  - Higher wages create higher prices
- Thus, rich countries pay more for Big Macs



**Table 2**  
Big Mac Prices Vary Across the U.S.

Northwest	Price	Midwest	Price
Columbia, MD	\$2.79	Edinburgh, IN	\$2.45
Revere Airport, RI	2.88	Bloomington, IN	2.49
Albany, NY	2.91	Alton, OH	2.60
Zions, DE	2.95	Edison, MI	2.68
Baltimore, MD	2.98	Confield, OH	2.78
Burton, MI	2.99	Champaign, IL	2.95
Concord, TN	3.18	Detroit, MI	2.99
Washington, DC	3.28	Duluth, MN	2.99
Boston, MA	3.48	Carry, OH	3.00
Bronx, NY	3.48	North Branch, MN	3.10
Bronckson, NY	3.78	Min. St. Paul Airport, MN	3.29
Philadelphia, PA	3.84	Chicago, IL	3.40
<b>Average</b>	<b>\$3.22</b>	<b>Average</b>	<b>\$2.98</b>
South	Price	West	Price
Atlanta, GA	\$2.24	Alameda, CA	\$2.60
Alto, DC	2.48	Rock Spring, WY	2.79
Atlanta, GA	2.48	Boise, ID	2.80
Wayne, NC	2.58	Las Vegas, NV	2.89
Goldboro, NC	2.60	Los Angeles, CA	2.99
Ashland, KY	2.68	Albuquerque, NM	3.08
Houston, TX	2.78	Colorado Springs, CO	3.08
Alexandria, VA	2.80	Fargo, ND	3.10
Winchester, TN	2.80	Anaheim, CA	3.11
Lawrence, KS	2.99	Fresno, CA	3.22
Alexandria, VA	3.18	Acworth, GA	3.48
Arlington, VA	3.39	Auburn, WA	3.40
<b>Average</b>	<b>\$2.77</b>	<b>Average</b>	<b>\$3.87</b>

SOURCE: Federal Reserve Bank of Dallas (data collected week of April 30, 2008).

Do prices vary across the U.S.?

Yes!

Do prices vary across Texas?

Yes!

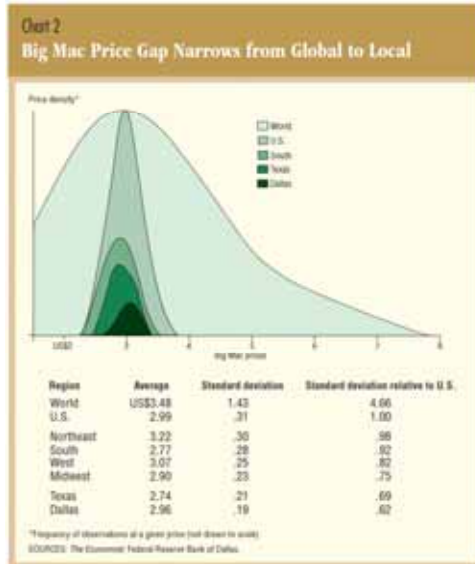
**Why?**

**Table 3**  
Big Mac Prices Vary Across Texas

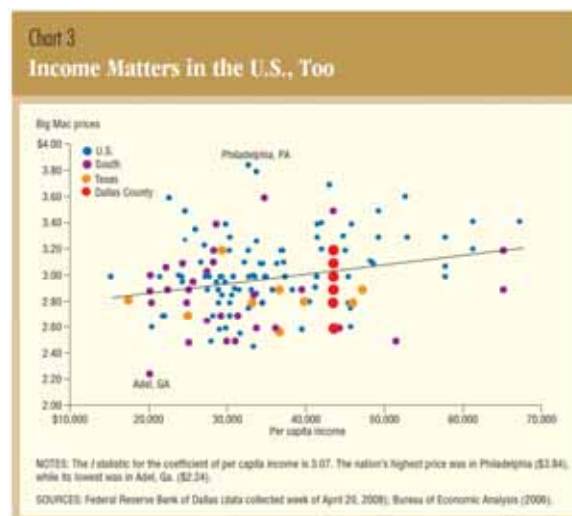
Texas	Price	Dallas area	Price
Fort Worth	\$2.35	Grapevine	\$2.56
El Paso	2.69	Mesquite	2.59
Lubbock	2.69	Richardson	2.79
Waco	2.69	Galleria	2.89
Amarillo	2.70	North Dallas	2.89
Houston	2.79	Allen	2.99
San Antonio	2.79	DeSoto	2.99
Tyler	2.79	Downtown	3.09
Austin	2.80	Greenville Avenue	3.09
Corpus Christi	2.80	DFW Airport	3.19
Alamo	2.81	Ennis	3.19
Dallas	2.96	Love Field Airport	3.19
<b>Average</b>	<b>\$2.74</b>	<b>Average</b>	<b>\$2.96</b>

NOTE: The Dallas price is an average of the locations sampled for this article.  
SOURCE: Federal Reserve Bank of Dallas (data collected week of April 30, 2008).

# Price Gap Narrows



# Why Do Domestic Prices Vary?



## Using PPP

- Nominal exchange rate is observed in foreign exchange markets
- Real exchange rate =  $\frac{\text{Dollar price of foreign goods}}{\text{Dollar price of domestic goods}}$
- If PPP holds, the real exchange rate is 1
- But what basket of goods is used to compute the measure?

## CIA World Factbook



- Information about all countries recognized by the U.S.
- GDP info is computed in two ways
- <https://www.cia.gov/library/publications/the-world-factbook/geos/ch.html#Econ>

China	
GDP (purchasing power parity):	\$7.8 trillion (2008 est.) \$7,104 trillion (2007) \$6,475 trillion (2006)
GDP (official exchange rate):	\$4,222 trillion (2008 est.)
GDP - real growth rate:	9.8% (2008 est.) 13% (2007 est.) 11.6% (2006 est.)
GDP - per capita (PPP):	\$6,000 (2008 est.) \$5,500 (2007 est.) \$4,900 (2006 est.)

## CIA World Factbook

### *GDP (official exchange rate)*

- Uses the nominal (observed) exchange rate for conversion
- Can be useful when comparing the purchasing power a nation enjoys in the international marketplace
- Drawbacks
  - Exchange rates can be artificially fixed and/or subject to manipulation
  - Market exchange rates are frequently established by a relatively small set of goods and services (the ones the country trades) and may not capture the value of the larger set of goods the country produces
  - Difficult to compare GDP over time, since appreciation or depreciation will make the OER GDP value rise or fall regardless of whether home-currency-denominated GDP changed

## CIA World Factbook

### *GDP (purchasing power parity)*

- Values goods and services produced at prices prevailing in the U.S.
- Can be useful when comparing per-capita welfare, living conditions or use of resources
- Drawbacks
  - U.S. dollar value has to be assigned to all goods and services in the country regardless of whether the items have a direct equivalent in the U.S.
  - PPP estimates for some countries are based on a small and sometimes different set of goods and services
  - Many countries do not formally participate in the World Bank's PPP project that calculates these measures

## Outcomes

- For many developing countries – wide variation in PPP-based GDP measure and official exchange rate (OER) measure
- Industrialized countries find a much smaller difference

## World Bank

REGIONAL FACT SHEET FROM THE WORLD DEVELOPMENT INDICATORS 2009

### East Asia and Pacific

East Asia & Pacific: regional data from the WDI database

	Population		GNI per capita		Life expectancy at birth years	Primary completion rate % of relevant age 2007 <sup>c</sup>	Access to improved water source %	Carbon dioxide emissions per capita metric tonnes 2005	Total debt service % of exports 2007	Internet users per 100 people 2007
	millions	Atlas <sup>a</sup>		PPP <sup>b</sup>						
		2007	2007							
<b>East Asia &amp; Pacific</b>	1,912	2,182	4,969	72	88	87	3.6	4.0	14.6	
Europe & Central Asia	446	6,052	11,262	70	98	95	7.0	18.7	21.4	
Latin America & Caribbean	561	5,801	9,678	73	100	91	2.5	16.0	26.9	
Middle East & North Africa	313	2,820	7,402	70	90	89	3.7	5.8	17.1	
South Asia	1,522	880	2,532	64	80	87	1.1	12.9	6.6	
Sub-Saharan Africa	800	951	1,869	51	60	58	0.8	5.0	4.4	
<b>Selected economies:</b>										
Cambodia	14	550	1,720	60	85	65	0.0	0.5	0.5	
China	1,318	2,370	5,420	73	...	88	4.3	2.2	16.1	
Indonesia	225	1,650	3,570	71	99	80	1.9	10.5	5.9	
Lao PDR	6	630	2,080	64	77	60	0.3	18.9	1.7	
Malaysia	27	6,420	13,230	74	98	99	9.3	4.6	55.7	
Mongolia	3	1,290	3,170	67	110	72	3.4	2.1	12.3	
Myanmar	49	...	d	62	...	80	0.2	1.7	0.1	
Papua New Guinea	6	850	1,870	57	...	40	0.7	11.2	7.8	
Philippines	88	1,620	3,710	72	94	93	0.9	13.7	6.0	
Thailand	64	3,400	7,880	71	101	98	4.3	8.1	21.0	
Vietnam	85	770	2,530	74	...	92	1.2	2.3	21.0	

Note: Figures in *italics* are for years or periods other than those specified.  
a. Atlas method; see WDI Statistical methods. b. Data are for the most recent year available. c. Provisional data. d. Estimated to be low income (\$935 or less).  
Source: 2009 World Development Indicators database, World Bank, April 20, 2009.

[http://siteresources.worldbank.org/DATASTATISTICS/Resources/eap\\_wdi.pdf](http://siteresources.worldbank.org/DATASTATISTICS/Resources/eap_wdi.pdf)

## Questions?

## Sources

- Cecchetti, Stephen G. (2008), *Money, Banking, and Financial Markets*, 2<sup>nd</sup> Ed. (Boston: McGraw–Hill Irwin).
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- Yarbrough, Beth V. and Robert M. Yarbrough (2003), *The World Economy: Trade and Finance*, 6<sup>th</sup> ed. (Mason, Ohio: South-Western).