

Macroeconomic Theory: Lecture 1

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Hello!

- ▶ Welcome and thanks for taking this module
- ▶ Macro is important, it is the 'big picture' stuff we hear about on the news, but it also shapes policy in a way we don't fully understand
- ▶ Big Issues of today: Inequality; Secular Stagnation; Austerity and debt crises; The rise(?) of China, and more. Never been more exciting to study macro.
- ▶ In a very real sense, measures like GDP *are* the economy as Mitra Kahn (2012) and Coyle (2013) have shown.
- ▶ The idea in this module is to show you the main models used in macroeconomics, and show you how to bring these models to the data.

Outline and Expectations (See handout)

- ▶ We'll follow Foley and Michl, 1999, as the basic text, with additional notes and readings where necessary. Buying Foley and Michl will be a good investment. Get it online cheaply secondhand.
- ▶ The labs start in week 2, and we're going to require you to do the readings we assign before class.
- ▶ You are not undergraduates anymore, we will expect a level of work and a degree of engagement commensurate with your new status.
- ▶ This module will mix theory and empirics pretty freely. Let's have a look at the handout for specifics.

Overview: nothing but a 'g' thing.

- ▶ Economic growth in historical context, our recent disaster as a blip.
- ▶ Quality and quantity in economic growth: is $g = (GDP_t - GDP_{t-1})/GDP_{t-1} > 0$ all we need?
- ▶ Clearly not. We experience growth *qualitatively* rather than in simple volumes of goods and services produced. But all our theories are quantitative. That is, we care about g .
- ▶ Macroeconomics and the reproduction of social structure.
- ▶ Growth in g really comes from the reinvestment of firms & households in a given period, to effect increases in *scale*.

Features of the economy to explain:

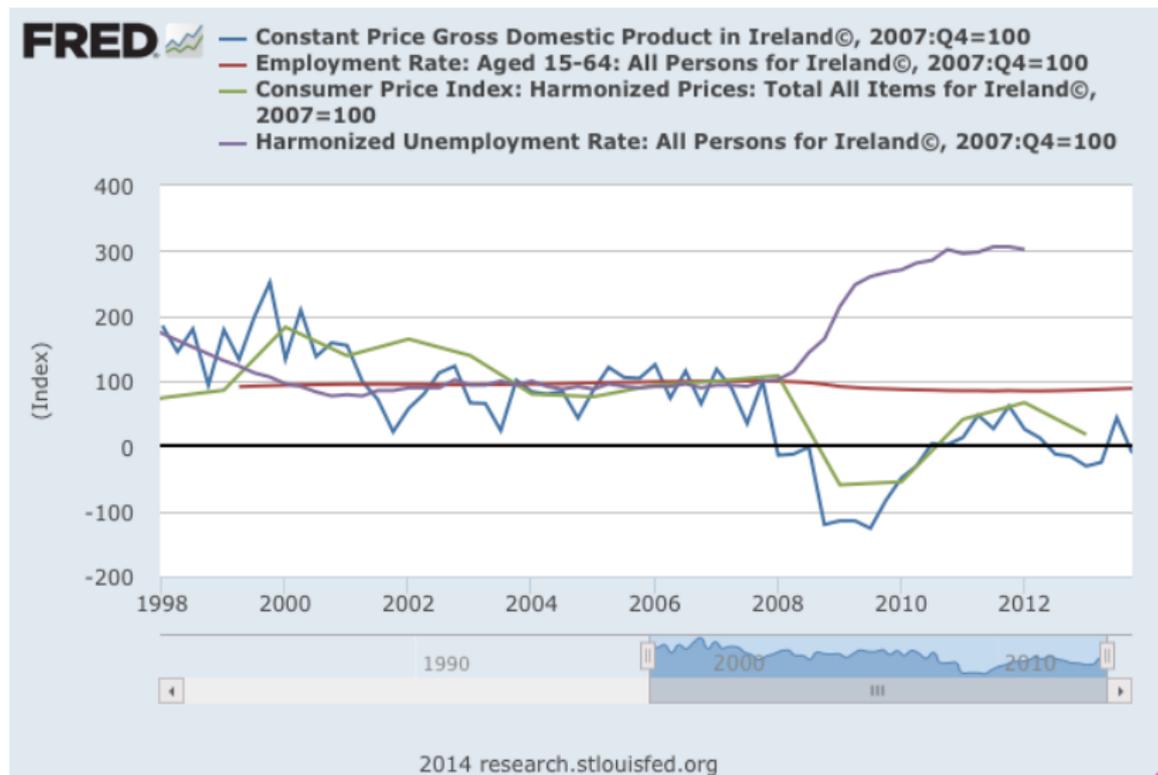


Figure 1: Macro data for Ireland, 1998 to present

Next few slides: a primer on macroeconomic development and then we'll think about measurement.

- ▶ In growth space it is true that: Value added = wages + profits/interests + rents
- ▶ This is an accounting identity. It is true at all times, like $Y = C + I + G + X - M$.
- ▶ Human relationships not forgotten here: capitalism needs workers to choose where to work, it needs capitalists to choose investment projects with the highest rate of return. Fundamentally these groups want different things.

Petty

- ▶ Bit of a legend. Entrepreneur, Prof. of Anatomy at Oxford, catamaran inventor, Surveyor, Connaught Immiserator, Rentier, Macroeconomist. (See Murphy, 2009, Genesis of Macroeconomics).
- ▶ His *Verbum Sapienti* essentially encodes all of modern macro in 19 paragraphs.
- ▶ Begins from population, aggregation/extrapolation of statistical aggregates, evidence-based policy to guide economies.

Smith

- ▶ Diamonds, water, and that bloody pin factory.
- ▶ Adam Smith emphasized the division of labour (increased specialisation/mechanisation) and the displacement that causes in extending the market outward over time. This process required wage flexibility but increased productivity per worker (See Kelly, QJE, Smithian Growth) and then increased growth but in unstable cycles.

Malthus

- ▶ Grumpy vicar, genius.
- ▶ Focus on population growth ala Petty but thought capital accumulation, being a self reinforcing feedback system, would create increased surplus,
- ▶ which would increase population, this would crowd the labour market and depress wages and living standards, increase land use and land intensity, and cause famines, which would result in the population reaching a demographic equilibrium over time.
- ▶ Malthus cited Ireland heavily and inspired both Darwin and Marx. His writings are still very readable, unlike Marx.

Ricardo

- ▶ The George Soros of his day. A richer than Crassus financier who thought deeply about the system he had mastered.
- ▶ His basic idea was that rent comes from the extensible use of limited land supplies.
- ▶ First to theorise mathematically rather than logically, building little models, etc.

Marx

- ▶ Class drives expropriation of surplus value, but generates technological changes as capitalists plough surpluses into investments.
- ▶ Investment leads to technologies which raise individual labour productivity (shovels vs JCBs) with higher capital per worker, but over time generates a lower and lower rate of profit.
- ▶ Marx thought technological progress would end up in a technological socialist paradise after capitalism had imploded because of the internal contradictions of capital.
- ▶ He never bargained with facebook I guess.

Marginalists to Solow

- ▶ Wannabe Physicists (See Mirowski, More Heat than Light)
- ▶ Wanting to get as far away from the politics of the labour theory of value and the classical economists, the marginalists wanted to analyse systems where a static efficiency of economic allocation (supply/demand, say) would dominate.
- ▶ Wage growth followed $w = dMPL/dt$, profit growth followed $r = DMPW/dt$
- ▶ Harrod's actual vs *warranted* (not natural) growth models.
- ▶ Solow's seminal growth model.

Measurement in Economics

- ▶ The economy 'throws off' a lot of data, but we measure it in specific ways.
- ▶ Every country wants to grow. Economic growth is an increase in a country's output of goods and services.
- ▶ Output is equal to the number of workers employed in production, labour, times the output produced by each worker, labour productivity.
- ▶ Labour productivity depends on technology, which depends on intermediate inputs, capital, and land.
- ▶ The country's growth, in the end, depends on the growth of its productive population, its accumulation of capital goods, and on technical change.

How to measure outputs and inputs (remember units matter)

- ▶ Production, Income, and Output Measures.
- ▶ The total production of an economy in any year consists of its newly produced goods and services.
- ▶ Gross production is the difference between total production and the goods and services used up in production.
- ▶ The Gross product is the value of gross production at current market prices including consumption and gross investment.
- ▶ Net Product is gross product - depreciation, includes net investment.
- ▶ Domestic and National 'counting' issues.

Some notation

- ▶ X = real product.
- ▶ Normally we're interested in real changes in the economy, so we'll usually look for real, inflation-corrected output in constant currency values.
- ▶ Differences between GDP Deflator and CPI/HICP
Measurement matter in this space.
- ▶ Net product: $Y = X - D$, output X minus depreciation D .
- ▶ Labour input is measured as N employed workers
- ▶ Capital goods (eg: plant, inputs, equipment) we denote K .
Think about this as the sum of the real value of past gross investment less depreciation.
- ▶ Productivity is then how well we use the capital and labour we've got. Value of output per worker per year in euros per worker is $x = X/N$, Capital stock per worker (or capital intensity) is $k = K/N$.

Ratio land, population: you.

- ▶ The output capital ratio is $\rho = X/K = x/k$. Think of this as average capital productivity.
- ▶ Depreciation of the capital stock is $\delta = D/K$
- ▶ Call $y = Y/N$ net output per worker.
- ▶ Ratio of net output to the capital stock is $Y/K - (X - D)/K$ which equals $\rho - \delta$.
- ▶ Exercise: calculate ρ , δ , and y .

Time (to Produce)

- ▶ Assume discrete time.
- ▶ Growth rates matter, so $\Delta X = X_t - X_{t-1}$ and $g_X = \Delta X / X$
- ▶ Growth factor for any variable is the ratio of the next period's value to the initial period's value. So $X_{t+1} / X = 1 + g_X$.
- ▶ The average compound growth rate of a variable like X between time 0 and time T is $g_X = \ln X_T - \ln X_0 / T$.
- ▶ When changes are small relative to their levels, then the growth rate is approximated pretty well by the average compound rate of growth.

Units

- ▶ Units matter much more than you've been told up until now.
- ▶ Accounting systems require you to be careful about what you count, and how you count it.
- ▶ Eg $\rho = X/K$ is measured in *inverse* time units, like an interest rate.

Technology

- ▶ Don't think about iPhones or Facebook. Think about toilets and hygiene.
- ▶ No theory currently satisfactorily explains technological change and economic growth.
- ▶ Exercise. Using EPWT, plot (ρ, x) and (k, x) .
- ▶ What relationship do you see?

Investment and Consumption

- ▶ Recall that $X = C + I$.
- ▶ In per-worker terms say that $c = c + i$.
- ▶ Net output is $Y = X - D = X - \delta K$.
- ▶ In per worker terms say that $y = x - \delta k$

Welcome to Ricardia

- ▶ Ricardia is a corn economy where the capital ratio depreciates every year. Suppose 20 bushels of seed can be planted by one worker to yield 100 bushels of harvest at the end of the year. Find x, k, ρ, δ, y for Ricardia. How many workers and how much seed corn would be needed to grow 1000 bushels of corn?

Growth rates of consumption

- ▶ Every economy faces a trade off between consumption and investment. The trade off is the production possibilities frontier.
- ▶ Assume the PPF is a straight line with slope -1.
- ▶ There is a trade off between the consumption and growth of the economy.
- ▶ Call this $x = c + (g_K + \delta)k$.

The Growth/Consumption and Growth/Distribution Schedules

- ▶ Re-writing the social consumption growth rate is $c = x\left(\frac{g_K + \delta}{\rho}\right)$.
- ▶ Exercise: what happens to this if labour productivity rises.
- ▶ Example: Mathematica Manipulation.

The Distribution of Wages and Profits

- ▶ Nomenclature: W for nominal wages, Z for gross profits, R for net profits.
- ▶ Always true that $X = W + Z = W + R + D$ or
- ▶ Equivalently $Y = X - D = W + R$.
- ▶ In ratio-land, $v = Z/K$ is the profit rate and $r = R/K$ is the net profit rate.
- ▶ Always true that $v = r + \delta$.
- ▶ Real wage profit relationship is $x = w + vk$.
- ▶ It's one pie, so define profit shares as $\pi = \frac{x-w}{x}$ and $1 - \pi =$ the wage share.

Pause for Piketty.

- ▶ His two 'laws' of capitalism are an accounting identity (the share of capital in national income is the rate of return on capital times the ratio of capital to income, $\alpha = r\beta$, and
- ▶ a long-run equilibrium condition (the steady-state capital/income ratio is the savings rate divided by the economy-wide growth rate, $\beta = s/g$).
- ▶ The first can't help but be true, and the second tends to be of limited relevance if s varies a lot, which it does.
- ▶ (Much) more on Piketty later.

Wages and profits: data

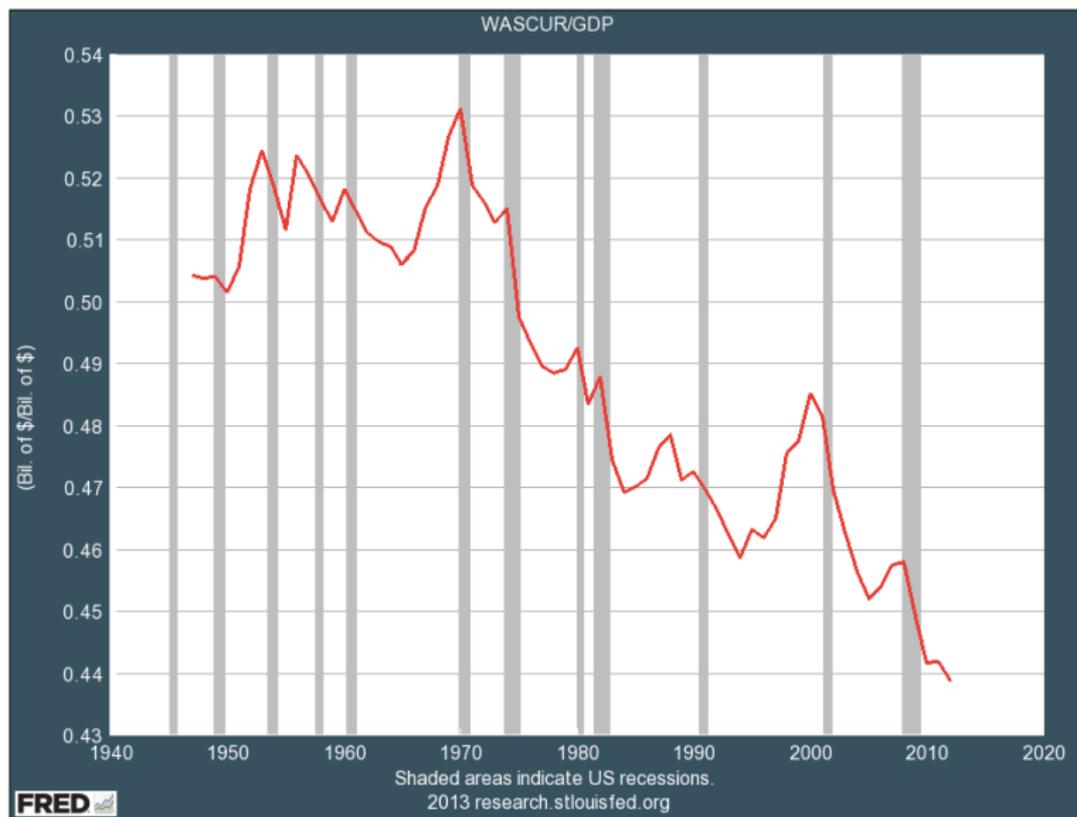


Figure 2: Wages

Wages and profits: data

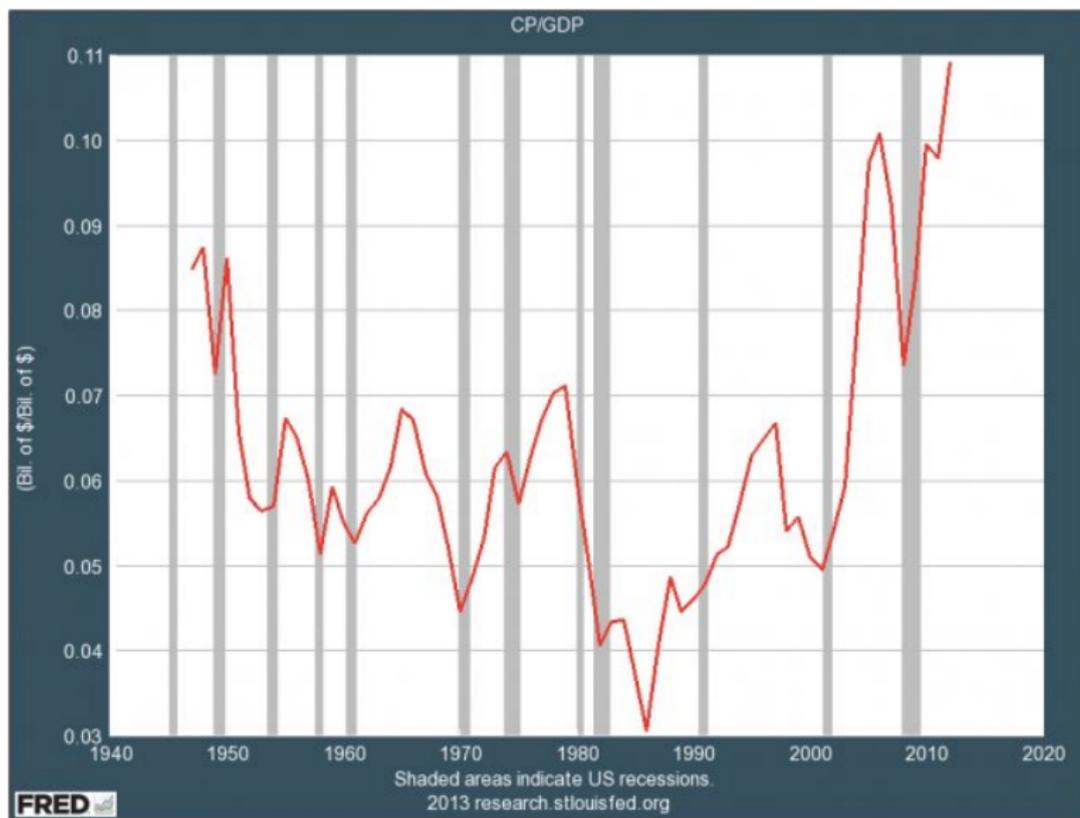


Figure 3: Profits

Over the long run:

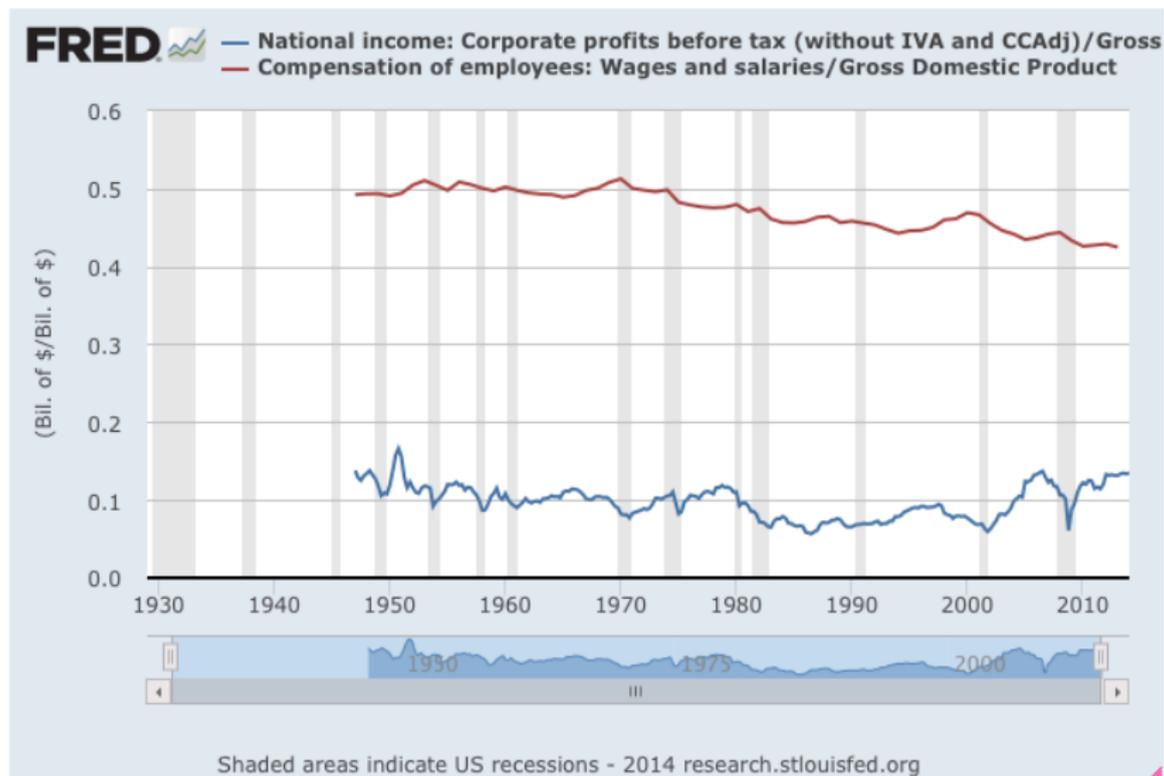


Figure 4: Longrunwp

The Real-Wage Profit Schedule

- ▶ Shows us that $v = \frac{x-w}{k} = (1 - \frac{w}{x})\rho$
- ▶ There is a fundamental division, in one period, of wages and profits.
- ▶ Mathematica demonstration.

Changing Labour Productivity

- ▶ Really important. When ρ or g_K change, they change the growth/distribution schedule.
- ▶ An upward shift in x corresponds to labour-saving technical progress. Empirically it is true that labour-saving technical progress has been positive over the broad stretch.
- ▶ An outward shift in ρ corresponds to capital-saving technical progress. Empirically this has not always moved positively.
- ▶ Of course both effects happen simultaneously, but often one effect dominates the other.
- ▶ It is really helpful to compare countries relative to their growth/distribution schedules.
- ▶ Exercise. Pick 2 countries from EPWT, compare them graphically.

Summary

- ▶ Consumption/Investment and Growth/Distribution schedules matter
- ▶ Pay attention to Units in macroeconomics
- ▶ As capitalist economies develop, labour productivity tends to increase, while capital productivity stagnates. The real wage then rises. The wage and profit shares used to move together. Now, not so much. Why?

Next Time

- ▶ Models of Production. Read GD, Chapters 3 and 4.