# 25 Papers for Macroeconomics 101: From Hayek to Krugman

## Contents

## 1. The Price System: A Review of Supply and Demand

### 1.1. The Use of Knowledge in Society (Hayek 1945).

(1) The economic problem is simple enough if we possess all the relevant information. It is simply a question on how to allocate resources such that the marginal rates of substitution between any two factors or commodities are the same. However, the knowledge of the circumstances that is required to solve the problem is dispersed across separate individuals. As such, it is not just a problem of allocation but one the utilisation of knowledge that is not given to anyone in its totality.

(2) This raises two questions 1. what is the best way of utilising knowledge that is initially disaggregated? 2. who does the planning? The question of what the most efficient system looks like depends on which of them being able to use that knowledge to its fullest. That is, whether a single central authority should collect knowledge from different individuals or whether we should convey additional knowledge to individuals as they need.

(3) It depends on the type of knowledge. Some knowledge is more likely to be located with particular people, while other knowledge might be possessed by experts. Although scientific knowledge fits better in the latter category, there is a scope of knowledge where individuals have an advantage - the knowledge of the particular circumstances of time and place.

(4) In the competitive world, there is constant change and creative destruction. That means the knowledge of individual conditions cannot be by its nature conveyed to a central authority in statistical form.

(5) Since the economic problem of society is one of rapid adaptation, it seems decisions should be left to people familiar with the circumstances and are proximate to both the changes and the resources required. Therefore decentralisation is necessary, although there is a problem of the person's knowledge being limited. Luckily, they do not need to know the exact causes of events, simply a comparative sense of affairs.

(6) Prices can act to coordinate the separate actions of different people. This is not because any particular person can survey the whole field, but rather because their limited individual fields of vision sufficiently overlap, such that through intermediaries, the relevant information is communicated to all.

(7) Undoubtedly the signals from prices are imperfect in the way in which equilibrium analysis might be. However, they push people in the right direction, and that is all that is necessary.

### 1.2. The Economic Organisation of a POW Camp (Radford 1945).

(1) In a POW camp, one aspect of social organisation that exists is economic activity. Everyone got rations from the Germans and were given an equal share of food and cigarettes in Red Cross parcels. Trade allowed the expression and satisfaction of individual preferences. Crucially, the markets within POW camps arose spontaneously, resulting from immediate needs rather than conscious imitation.

(2) There was no gift economy, since everyone started with the same. However, trading became a way to maximise individual satisfaction e.g. Sikhs sold their beef rations. Cigarettes became a currency, and were used in exchange. Prices stabilised as this became established (especially with a noticeboard of exchange offers), although prices were more chaotic in temporary transit camps and allowed arbitrage. In this way, a market came into existence without labour or production. However, there were middlemen, who could translate languages or offer futures, that came into existence.

(3) Cigarettes fulfilled all the functions of traditional currency - as a unit of account, measure of value and store of value. They were homogenous, durable and conveniently sized. However,

Gresham's Law that 'bad money drives out good' prevailed, as cigarettes that were 'sweated' (rolled to shake out some tobacco) became the dominant currency.

(4) Initially, the weekly issue of cigarettes and food parcels occurred on a Monday, with no private stocks and with the non-monetary demand for cigarettes being less elastic than the demand for food. That caused prices to fall towards Sunday night and rise on Monday mornings, although as people starting holding reserves and using credit, this effect subsided.

(5) However, there were other factors. For example, the non-monetary use of cigarettes meant that a lack of injection from Red Cross parcels led to deflationary episodes. The influx of new prisoners and air raids, as well as the general sentiments of optimism or pessimism also altered prices. Finally, the composition of parcels and the season changed what people wanted to buy.

(6) During D-Day, a restaurant was created and a shop was made to organised paper currency, backed by food. However, the halving of parcels led to the paper currency becoming less valuable, causing a flight back to cigarettes. Price fixing similarly failed due to price level changes and shifts in price structure.

(7) Ultimately, the economic organisation, which was originally smooth-working, began to struggle. The fluctuations in parcels and cigarettes, coupled with the changing demands for various goods and the non-monetary uses of cigarettes, led to instability with the fixed price system.

## 2. The Long Run

### 2.1. Measuring the Economy: A Primer on GDP (BEA 2015).

(1) Consider a simple economy of solely businesses and individuals. Individuals provide the labour for businesses to produce goods and services. Alternatively, businesses provide individuals with income which is spent on the goods and services produced. The interdependence of these flows demonstrates how the income earned from production is equal to the value of goods and services produced. The real economy involved governments and international trade, as well as investment in capital and flows of financial capital.

(2) The National Income and Product Accounts provides a framework for understanding these flows. It primarily measures GDP, which is the market value of the goods, services and structures produced by the USA's economy in a particular period. It includes market production and some non-market production e.g. government defense or education provision as well as emergency housing from non-profit institutions. However, it doesn't include activities such as taking care of your children, volunteer work for charities and illegal activities.

(3) GDP is valued at market prices, although for non-market goods and services, the value is imputed from similar market transactions or the costs of inputs. GDP is a measure of current production rather than sales, with unsold products being measured as inventory investment. GDP measures the value of final goods and services, with intermediate products being excluded. GDP captures output within the USA, excluding domestic corporations operating outside the USA. GDP is a gross measure that doesn't take into account the depreciation of capital.

(4) GDP can be measured in three ways. It can be measured as the sum of expenditures by final users i.e. consumption + investment + government spending + net exports. As the market price of goods and services reflects all the incomes earned and costs incurred, GDP can be measured by the income approach. It is also the sum of the value added at each stage of production. NIPA uses the expenditure approach.

(5) NIPA also measures gross domestic income, which is GDP via the income approach. It also includes gross national income and personal income. GNI is GDI plus net income from overseas, calculating the income from production that accrues to the USA's production.

(6) From NIPA, it is possible to examine three types of producers. Businesses engages in the production and sale of goods and services for profit. Households and institutions engage in the production of household services. General governments receive revenues from taxes and other sources to provide public goods and services, as well as transfer payments.

(7) The T-account matches sources of funds/credit to uses/debit on the left. Total expenditures and savings = consumption + tax payments + saving. Total income = compensation + interest received + dividends received.

(8) NIPA summarises the economy in seven T-accounts. Account 1 is the domestic income and product account, displaying the expenditure and income approaches to GDP. Account 2 presents the sources and uses of income for private enterprises. Account 3 presents personal income and outlays. Account 4 presents government receipts and expenditures. Account 5 presents the current transactions in production, income and outlays between the USA and the rest of the world. Account 6 and 7 are capital accounts, with 6 being a saving-investment account for domestic sectors and 7 presenting the capital transactions between the USA and the rest of the world.

## 2.2. The Sixteen-Page Economic History of the World (Clark 2007).

(1) The basic outline of economic history can be summarised by a Malthusian Trap persisting till 1800 - income per person varied across societies and epochs without an upward trend. Short-term gains in income from technological advances were lost to population growth. Indeed, the life expectancy in 1800 of 30 to 35 years was no higher than for hunter-gatherers. Hunter-gatherer societies were also more egalitarian. That is, material living standards on average declined from the Stone Age to the 1800s.
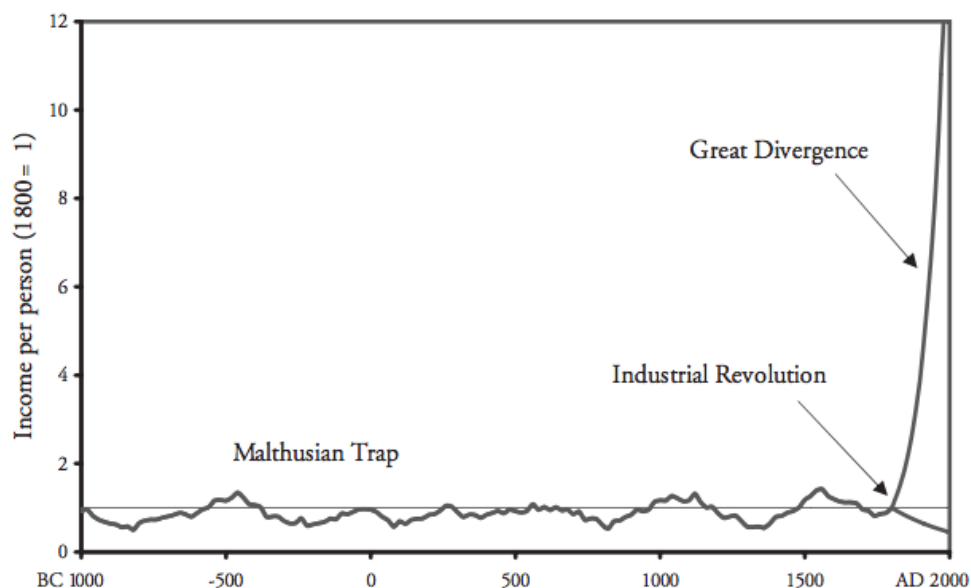


(2) The Industrial Revolution changed the possibilities for material consumption. Incomes per person faced sustained growth in a select group of countries, with the richest modern economies being ten to twenty times wealthier than in 1800. This particularly benefited the unskilled.

(3) However, prosperity has not arrived to all societies, with material consumption being well below pre-industrial norms. This is most pronounced in sub-Saharan Africa. The Industrial Revolution, although it reduced inequalities within societies, increased them between societies. This Great Divergence is such that the gap in incomes between countries is on the order of 50:1.

(4) There are three questions of economic history 1. why did the Malthusian Trap persist so long? 2. why did the initial escape into the Industrial Revolution occur in 1800s England? 3. why was there the consequent Great Divergence?

(5) To begin with, it is worth considering the Malthusian Trap. Before 1800, the rate of technological advance was below 0.05% a year, around a thirtieth of the modern rate. The vices of modern economic policy were virtues, with violence, collapsed infrastructure and bad sanitation helping to keep population down. Fertility controls and poor hygiene meant mortality was abundant.

(6) The consequence of this was that the economic laws governing human society were the same that governed animal societies - mankind was subject to natural selection, with the richest men having twice as many surviving children at death as the poorest in England. The death rate for the poor was so high that it was a world of constant downward mobility. In England, the creation of an institutionally stable, capital-intensive economic system rewarding middle class values with reproductive success.

(7) The stasis of the pre-industrial world was shattered by the Industrial Revolution and the demographic transition of declining fertility. There are three explanations for the way in which this change occurred 1. the Industrial Revolution was caused by exogenous changes in political institutions 2. pre-industrial society was caught in a stable but stagnant equilibrium, with a shock moving society to a dynamic equilibrium 3. the Industrial Revolution was an endogenous product of the gradual evolution of social conditions.

(8) The classic description of the Industrial Revolution suggests an abrupt transition, making the first and second explanations most compelling. However, looking for a change in institutional and economic conditions in England in the years just before 1800 has been fairly unsuccessful. Instead, the productivity growth rate varied irregularly over time from since 1200, with the specific conditions of trade, demand and resources in 1760-1860 being superimposed upon the long-run upward sweep in the rate of knowledge accumulation, driving the Industrial Revolution.

(9) Indeed, the institutions necessary existed by the 1200s in England, and the Neolithic Revolution established the settled agrarian society with massive stocks of capital necessary. However, it was the cultural changes that led to the Industrial Revolution occurring in the 1800s. Similarly, the reason it occurred in England is because of the accidents of institutional stability and demography - the stability of England since the 1200, the slow growth of its population from 1300 to 1760, and the fecundity of the successful (arising from social customs).

(10) The accelerated growth rate in industrial societies benefited unskilled workers. The proportion of national income going to the owners of land and capital halved.

(11) The Industrial Revolution led to the Great Divergence, with ever-widening gaps in hourly labour costs across countries. The technological, organisational and political changes that caused the Industrial Revolution seemed to appear around the world in the 1900s, with transport costs, capital markets and institutional structures being fairly comparable. However, the popular explanations of bad institutions, bad equilibria and bad development paths seem insufficient.

(12) Jared Diamond's *Guns, Germs and Steel* suggested that geography, botany and zoology were destiny. However, the lacuna in this argument is that in a world where industrialisation is the path to riches, this gap ought to have been narrowed by replication. What cannot be replicated worldwide is the social environment. Crucially, these variations existed throughout time, but were dampened by the economic system in the Malthusian era. By contrast, the world after the Industrial Revolution accentuated these disparities, in part because modern production technologies are dependent upon disciplined, conscientious and engaged labour forces.

(13) Ultimately, material affluence has not made us any happier than our hunter-gatherer forebearers. As observed by Richard Easterlin in 1974, rising incomes for everyone in successful economies since 1950 have not produced greater happiness. Despite the enormous income gap between rich and poor societies, reported happiness is only modestly different. The pressures of the Malthusian era may have driven out the contended, leaving the envious to inherit the earth.

### 2.3. **A Contribution to the Theory of Economic Growth (Solow 1956).**

(1) The Harrod-Domar model suggests that in the long run, the economic system is balanced on the knife-edge of equilibrium growth, and that there is no natural reason for an economy to have balanced growth. It emphasises the comparison between the natural rate of growth (for full employment) and the warranted rate of growth (where all savings go into investment). However, this ignores the possibility of changes in the capital-to-output ratio and in labour productivity. Instead, we shall accept all Harrod-Domar assumptions except these fixed proportions, and analyse what happens with exogenous changes in the labour force and price-wage-interest reactions.

(2) Suppose only one commodity produced by labour and capital designated $Y(t)$. Part of each instant's output is consumed and the rest is saved and invested, with the rate of saving as $sY(t)$, with the community's stock of capital $K(t)$ as an accumulation of the composite commodity. Net investment is the rate of capital stock increase $\frac{dK}{dt}$, producing the identity

$$K' = sY$$

(3) Output is produced via capital and labour $L(t)$. Thus, the technological possibilities are represented by the production function (assuming constant returns to scale)

$$Y = F(K, L)$$
$$K' = sF(K, L)$$

(4) We have an equation in two unknowns. We could add a demand-for-labour equation (where marginal productivity of labour equals the real wage rate) or make labour supply a function of the real wage. Instead, we will operate in the spirit of the Harrod-Domar model, where exogenous population growth leads the labour force to increase at constant relative rate $n$, producing

$$L(t) = L_0 e^{nt}$$
$$K' = sF(K, L_0 e^{nt})$$

(5) We have produced the basic equation determining the time path of capital accumulation necessary to employ all available labour, with the real wage being determined by the marginal productivity equation of

$$\frac{\delta F(K, L)}{\delta L}$$

(6) It is possible to examine if there is always a capital accumulation path consistent with any rate of growth of the labour force. We have $r = \frac{K}{L}$ and hence $K = rL = rL_0 e^{nt}$. Differentiating with respect to time, we see that

$$K' = r'L_0 e^{nt} + nrL_0 e^{nt}$$
$$(r' + nr)L_0 e^{nt} = sF(K, L_0 e^{nt})$$

and due to the constant returns to scale, we can divide both variables by $L_0 e^{nt}$

$$(r' + nr)L_0 e^{nt} = sL_0 e^{nt} F(\frac{K}{L_0 e^{nt}}, 1)$$
$$r' = sF(r, 1) - nr$$

(7) This is the differential equation involving the capital-labour ratio alone. $F(r,1)$ is the total product curve as varying amounts $r$ of capital is employed with one unit of labour. When $r' = 0$, the capital stock is expanding at the same rate as the labour force i.e. at $n$. One possible $F(r,1)$ is seen below as passing through the origin and being concave i.e. no output unless both inputs positive and diminishing marginal productivity of capital. It intersects with $nr$ where $r' = 0$, at which point output per head will stay constant.
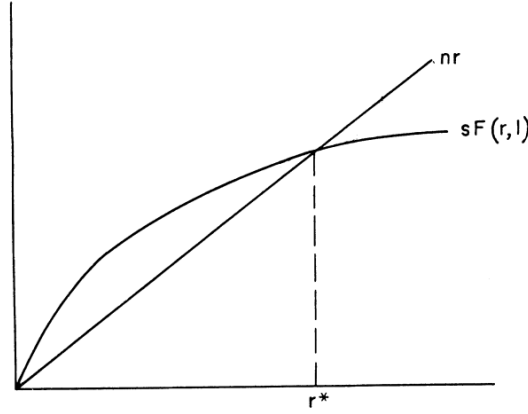


(8) If $r \neq r^*$, it is clear based on $r' = sF(r,1) - nr$ that on either side it will converge, making the equilibrium value of $r^*$ stable. However, there are other curves $F(r,1)$ are a priori possible. For example, in the first function below, only $r_1$ and $r_3$ are stable. In the second, the two curves might be $nr + \sqrt{r}$ and $\frac{nr}{r+1}$. The former is so productive and saves so much that perpetual full employment will increase the capital-labour ratio beyond all limits, with capital and income increasing faster than labour supply. The latter is so unproductive that full employment leads only to forever diminishing income per capita. As such, production under the usual conditions will not cause any opposition between the natural and warranted rates of growth, and the system can adjust to any given rate of growth of the labour force.
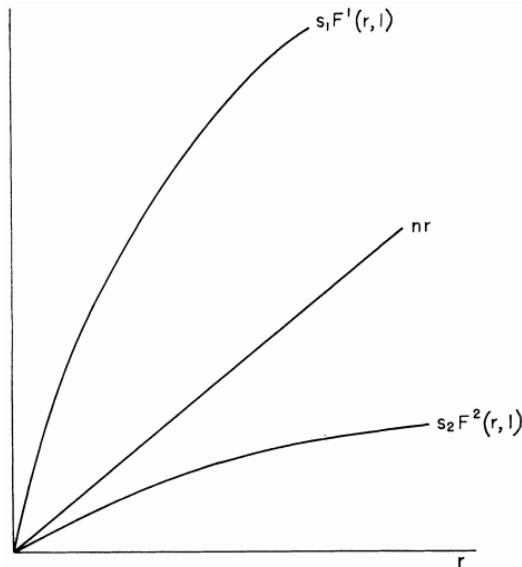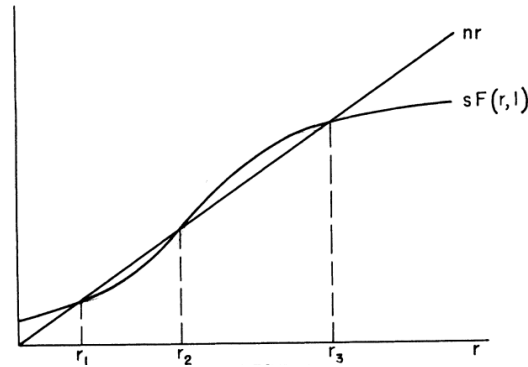
(9) The first example is the Harrod-Domar model where it takes $a$ units of capital and $b$ units of labour to produce a unit of output. This can be expressed as

$$Y = F(K, L) = \min(\frac{K}{a}, \frac{L}{b})$$

$$r' = s \min(\frac{r}{a}, \frac{1}{b}) - nr$$

(10) For small $r$ where $\frac{r}{a} < \frac{1}{b}$, $r' = \frac{sr}{a} - nr$, while when $\frac{r}{a} \geq \frac{1}{b}$, the equation becomes $r' = \frac{s}{b} - nr$.
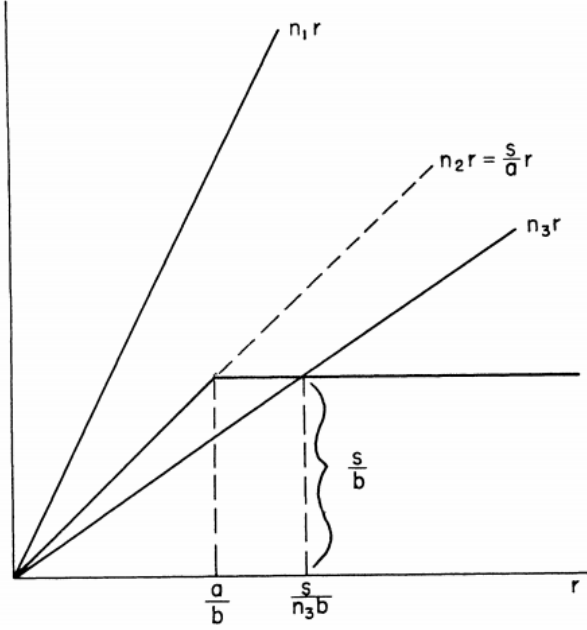


(11) There are three possibilities. The first is where $n_1 > \frac{s}{a}$ i.e. the natural rate exceeds the warranted rate. This means $n_1 r > s \min(\frac{K}{a}, \frac{L}{b})$, meaning $r$ always decreases. Suppose we begin with $r_0 > \frac{a}{b}$ where $r' = \frac{s}{b} - n_1 r$. The solution is $r = (r_0 - \frac{s}{n_1 b})e^{-n_1 t} + \frac{s}{n_1 b}$, which converges to $\frac{s}{n_1 b}$. Since that is less than $\frac{a}{b}$, at some point $r$ will reach $\frac{a}{b}$.

(12) That is where $r' = \frac{sr}{a} - n_1 r$, which has the solution $r = \frac{a}{b}e^{(\frac{s}{a} - n_1)(t - t_1)}$. Since $\frac{s}{a} < n_1$, $r$ will decrease toward zero. That means, past the point where labour supply and capital stock are in balance, the capital-labour ratio decreases and labour becomes redundant.

(13) The second case is where $n_2 = \frac{s}{a}$, with the warranted and natural rates being equal. Either $r > \frac{a}{b}$ initially such that labour is the bottleneck and $r$ decreases to $\frac{a}{b}$, or $r < \frac{a}{b}$ and $r$ remains constant over time.

(14) The third case is of $n_3 > \frac{s}{a}$ where the warranted rate exceeds the natural rate. There is a stable equilibrium capital output ratio at $r = \frac{s}{n_3 b}$, but since the marginal productivity of capital falls to zero, causing increasing excess capacity.

(15) As such, it is clear that there is a range of $n$ for which there is an equilibrium like in the first diagram, but for values of $n$ above and below that range, there will be redundant labour and capital respectively.

(16) The second example is the Cobb-Douglas function where $Y = K^a L^{1-a}$. This looks like the first Solow diagram. As the capital-labour ratio decreases, the marginal productivity of labour rises indefinitely such that $sF(r, 1)$ rises above the ray $nr$. Since $a < 1$, eventually it'll cross the ray from above and stay below it. With differential equation $r' = sr^a - nr$, the untransformed equation is

$$K' = sK^a(L_0 e^{nt})^{1-a}$$

with the solution of

$$K(t) = (K_0^b - \frac{s}{n}L_0^b + \frac{s}{n}L_0^b e^{nbt})^{\frac{1}{b}}$$

where $b = 1 - a$ and intial capital stock $K_0$.

(17) As $t$ becomes large, $K(t)$ becomes the rate of growth of the labour force. The equilibrium value of the capital-labour ratio is $r^* = (\frac{s}{n})^{\frac{1}{b}}$, which is larger when the savings ratio is larger and the rate of increase of the labour supply is lower.

(18) $Y$ behaves like $K$ and $L$ and grows at relative rate $n$, with real income per head $\frac{Y}{L}$ tending to $(\frac{s}{n})^{\frac{a}{b}}$. It is also true with the Cobb-Douglas that $\frac{Y}{L} = (\frac{K}{L})^a = r^a$. As such, the equilibrium value of $\frac{K}{Y}$ is $\frac{s}{n}$. This is the capital coefficient, and from that we can see that the natural rate equals the warranted rate.

(19) The rest is omitted to be examined at a later date.

## 2.4. The Worldwide Standard of Living Since 1800 (Easterlin 2000).

(1) By many measures, there has been a revolution in the human condition sweeping the world. People are healthier, live longer and are better educated. It is worth defining what the standard of living means before observing the various components that have contributed to its advancement.

(2) The concept of the standard of living was conceived in material terms in the early post-war period. That is, the goods and services at one's disposal, leading to the adoption of real GDP per capita. The flaws it has led to a more balance social indicator in the form of the Human Development Index, combining GDP per capita, life expectancy at birth and a composite measure of education (literacy and school enrollment) into an overall index number. Studies of what people thought were important sources of wellbeing found that material circumstances, family concerns and health ranked highly.

(3) The level of living i.e. the quantity of goods consumed by the average person has growth quickly. Between 1950 and 1995, average living levels have grown two to three-fold or more, with the notable exception of sub-Saharan Africa.

(4) Life expectancy at birth has also faced rapid improvement. The upturn in life expectancy starting from the late 1800s was due to a technological breakthrough - in the control of communicable diseases via preventative and therapeutic methods. Vaccinations, personal hygiene knowledge, mosquito control and supervision of food and water safety all helped, followed by effective methods of cure via antibiotics. These increases in health status improved life expectancy.

**Life Expectancy Improvement in the Half Century Before and After Its Turning Point in Six Countries**

| Country | Approximate Turning Point | Life Expectancy at Turning Point (Years) | Change in Half Century | |
|---|---|---|---|---|
| | | | Before Turning Point | After Turning Point |
| England and Wales | 1871 | 41.0 | 3.0 | 12.0 |
| Sweden | 1875 | 45.4 | 4.6 | 17.2 |
| France[a] | 1893 | 44.9 | 3.4 | 20.3 |
| Japan | 1923 | 42.6 | 5.8 | 30.8 |
| Brazil | 1940 | 36.7 | 8.0 | 28.9 |
| India | 1945 | 32.1 | 8.3 | 28.3 |

(5) Family circumstances reflect improvements in standards of living. For example, reductions in the fertility rate represent a demographic transition from high to low levels of mortality and fertility. In the past, fertility was constrained by physical conditions such as malnutrition, as well as by customs of marriage and child-rearing. Given these constraints and given the number of children dying before adulthood, most parents didn't attempt to limit family size. The

reduction in fertility more recently has been allowed by a mixture of traditional contraceptive methods and newer techniques such as the pill, the intrauterine device and sterilisation.

**Total Fertility Rate, Major Areas of the World, 1950–55 and 1990–95**

|  | *1950–55* | *1990–95* | *Decline* |
|---|---|---|---|
| More developed areas | 2.8 | 1.7 | 1.1 |
| Less developed areas | 6.2 | 3.3 | 2.9 |
| China | 6.2 | 1.9 | 4.3 |
| India | 6.0 | 3.6 | 2.4 |
| Rest of Asia | 6.1 | 3.4 | 2.7 |
| Latin America | 5.9 | 3.0 | 2.9 |
| Northern Africa | 6.8 | 4.0 | 2.8 |
| Sub-Saharan Africa | 6.5 | 5.9 | 0.6 |

(6) School enrollment and literacy does not follow the same trends. instead, the mantle shifts to Scandinavia, the German states and the USA. For example, the percentage of the school-age population in primary school in 1830 was 77% in Germany, 66% in Scandinavia, 56% in the USA and only 4% in Russia, India and Brazil. However, the trend worldwide is as with most other indicators.

(7) Political democracy can be understood in two ways. The executive branch measure gives weight to procedures for executive recruitment and limits on the executive's power. The legislative effectiveness measures whether a legislature exists and how important it is in decision-making. Political change can be fairly sudden, but within these stuttered stepwise changes lies a longer-term trend. This is broadly towards democracy for the UK, France, Sweden, Japan, Brazil and India, though it is not unidirectional. In the less developed world, this development is very limited, with India as the primary exception.

**Indicators of Democratic Institutions in Six Countries, 1820–29 to 1990–94**
( *from minimum of 0 to maximum of 1.0*)

| *Country* | *Branch of Government* | *1820–29* | *1895–1905* | *1950–59* | *1990–94* |
|---|---|---|---|---|---|
| United Kingdom | Executive | 0.3 | 0.7 | 1.0 | 1.0 |
|  | Legislative | 1.0 | 1.0 | 1.0 | 1.0 |
| France | Executive | 0 | 0.8 | 0.9 | 0.8 |
|  | Legislative | 0.7 | 1.0 | 1.0 | 1.0 |
| Sweden | Executive | 0 | 0.1 | 1.0 | 1.0 |
|  | Legislative | 0.7 | 1.0 | 1.0 | 1.0 |
| Japan | Executive | 0 | 0.4 | 1.0[a] | 1.0 |
|  | Legislative | 0 | 0.7 | 1.0 | 1.0 |
| Brazil | Executive | 0[b] | 0.1 | 0.6 | 1.0 |
|  | Legislative | 0.3 | 0.7 | 1.0 | 1.0 |
| India | Executive | (0)[c] | (0)[c] | 0.9 | 0.8 |
|  | Legislative | (0) | (0) | 1.0 | 1.0 |

(8) By all measures, standards of living have improved dramatically compared to the 1800s. The rate of change in less developed countries have been in many ways fantastic, and it is not yet evident that there are limits to growth in the quality of life.

## 2.5. Trends in the Distribution of Household Income Between 1979 and 2007 (CBO 2011).

(1) It is worth defining the terms of the report. Income is adjusted for inflation and adjusted for differences in household size. A household with children has at least one member under 18. An elderly childless household is headed by a person age 65 or older with no member under age 18. Market income includes labour income, business income, capital gains, capital income and other income. Transfer income includes cash payments from various government programs, as well as the value of in-kind benefits. After-tax income is equal to market income plus transfer income minus federal tax paid. Average tax rates are calculated by dividing federal taxes paid by the sum of market income and transfer income. The Gini index is a measure of income inequality based upon the relationship between shares of income and shares of the population, ranging from complete equality at 0 and complete inequality at 1. A concentration index is similar to a Gini index.

(2) From 1979 to 2007, average real household after-tax income grew by 62%. For the 1% of the population with the highest income, average real household after-tax income grew by 275%.

For the top 20%, it grew by 65%. For the next 60%, it was just under 40%. For the lowest 20%, it grew by 18%. Due to the uneven income growth, the distribution of after-tax disposable income in the USA was substantially more unequal in 2007 compared to 1979. By 2007, the after-tax income received by the top 20% exceeded the remaining 80%.

(3) The main reason for the growing unevenness was due to an increase in the concentration of market income. The highest income quintile's share of market income increased from 50% to 60%, while every other quintile's share of market income declined. This was due to the increase in the concentration of each source of market income, as well as a shift in the composition of that income. Labour income has been more evenly distributed than capital and business income, and both of the latter have been more evenly distributed than capital gains. Between 1979 and 2007, the share of income coming from capital gains and business income increased.

(4) In the early years of the period, 90% of the market income concentration increase was a result of an increasing concentration of labour income sources. In the middle years, both factors were equally important. In the latter years, an increase in the share of total income from the highly concentrated source of capital gains accounted for around 80% of the total increase in concentration. Over the period as a whole, the increasing concentration of each source of market income was the more significant factor, accounting for 80% of the increase.

(5) Average real household market income for the top 1% tripled in that period, while it increased by 19% for the median. This caused the share of total market income received by the 1% to more than double to 20%. It could have been caused by changes in the labour market for superstars, changes in the structure of executive compensation, increases in firm size and complexity and increases in the scale of the financial sector. The income for the top 1% shifted from capital income to labour and business income.

(6) Shifts in government transfers and taxes contributed, with the dispersion of market income growing by 25% while the dispersion of after-tax income grew by 33% from 1979 to 2007. Progressive transfers reduce the dispersion of after-transfer pre-tax income compared to market income, while progressive taxes would reduce the dispersion of after-tax income compared to market income. The dispersion of after-tax income in 2007 was 80% as large as market income, with 60% of this due to transfers and 40% due to federal taxes.

(7) Transfers and taxes are progressive, but have become less so. The size of transfer payments relative to market income rose between 1979 and 2007. However, those transfers shifted away from the households in the lower part of the income scale. In 1979, households in the bottom quintile received over 50% of the transfer payments. In 2007, that was down to 35%. The overall average federal tax rate fell, the composition of federal revenues shifted away from income taxes to less progressive payroll taxes and income taxes became slightly more concentrated at the higher end of the income scale. The first two factors were more dominant.

(8) The share of after-tax household income going to the top income quintile grew from 43% to 53%. The share of after-tax household income for the top 1% doubled from 8% to 17%, Those in the lowest quintile fell from 7% to 5%, while the middle quintiles each fell by 2 to 3%.

## 2.6. Striking it Richer (Saez 2020).

(1) The dramatic rise in income inequality in the USA is well-documented. It is worth exploring to whom the benefits accrued and who suffered. Income is the sum of all income components reported on tax returns before individual income taxes and excluding government transfers. Non-taxable fringe benefits such as employer-provided health insurance are also excluded.

(2) The top decile includes all families with market income above $135,000 in the USA. The share of this top decile was 45% from the mid-1920s to 1940. It stabilised around 33% from World War Two to the 1970s. It increased dramatically across the past 25 years, reaching 50% in 2018.

(3) Crucially, by decomposing the top decile, it is clear that most of the fluctuations have arisen from fluctuations within the top percentile. It went from 18% before World War One, peaking at 24% in the late 1920s, shrinking to just under 10% from the postwar period till 1980 and finally rising to 24% by 2007.

(4) Average real income growth per family grew by 30% between 1993 and 2018. However, excluding the top 1% which grew by 100.5%, that drops to 18.3%. That is, the top 1% incomes captured 48% of the economic growth of real incomes per family. It is possible to better understand the bottom 99%'s income distribution by differentiating into five sub-periods 1. 1993 to 2000 expansion of the Clinton administrations 2. 2000 to 2002 recession 3. 2002 to 2007 expansion of the Bush administrations 4. 2007 to 2009 Great Recession 5. 2009 to 2018 recovery.

(5) Both expansions had rapid growth of the top 1%'s income, by 98.7% and 61.8% respectively. The bottom 99% grew by 20.3% and 6.8% respectively, meaning that the top 1% captured 66% of income growth in the latter period.

(6) Both recessions saw the top 1%'s income fall, by 30.8% and 36.3% respectively due to stock market crashes reducing capital gains. The bottom 99% saw drops of 6.5% and 11.6%, meaning that the top 1% absorbed a larger fraction of the losses in the first (57%) than in the second (49%). Notice the fall for the bottom 99% in the Great Recession was the largest fall on record in a two year period since the Great Depression.

(7) From 2009 to 2018, average real income per family grew by 16.8%. The top 1% grew by 41.6% while the rest grew by 11.4%, with the top 1% capturing 45% of the income gains.

(8) Ultimately, the top percentile's share has changed very drastically across the past century. The specific timing suggests that shocks incurred by capital owners during 1914 to 1945 played a key role. Indeed, from 1914 till the 1960s, the very top income were composed of capital income and some business income, with the wage income share being modest. However, the share of wage and salary income increased sharply from the 1970s, with the share of total wages and salaries earned by the top 1% wage income earners has jumped from 5.1% in 1970 to 12.4% in 2007. This increased capture of macroeconomic productivity gain can be explained by the retreat of institutions such as progressive tax policies, powerful unions, corporate provision of health and retirement benefits and changing social norms regarding pay inequality.

## 3. Labour and Financial Markets

### 3.1. Employment Report (BLS March 2020).

(1) Total non-farm payroll employment fell by 701,0000 in March and the unemployment rate rose to 4.4%. Employment in leisure and hospitality fell by 459,000, with other industries affected by COVID-19 including healthcare and social assistance, professional and business services, retail trade and construction. The household survey measures labour force status by demographic while the establishment survey measures non-farm employment, hours and earnings by industry.

(2) The 0.9% increase in the unemployment rate was the largest over-the-month increase since January 1975. The number of unemployed people who reported being on temporary layoff doubled to 1.8 million. The number of permanent job losers increased from 177,000 to 1.5 million. The number of unemployed persons jobless for less than 5 weeks rose by 1.5 million to 3.5 million, accounting for half of the unemployed. The long-term unemployed (i.e. for more than 27 weeks) stayed at around 1.2 million.

(3) The participation rate of 62.7%, decreased by 0.7 percentage points. Total employment fell by 3 million to 155.8 million, with the employment-population ratio dropping by 1.1 percentage points to 60%. The underemployed increased by 1.4 million to 5.8 million. Discouraged workers increased by 109,000 to 514,000, but the marginally attached stayed at 1.4 million.

(4) Leisure and hospitality fell by 459,000, mostly in food services and drinking place (417,000). Healthcare and social assistance fell by 61,000. Professional and business services fell by 52,000. Retail trade fell by 46,000. Construction fell 29,000. Other services fell by 24,000. Manufacturing fell 18,000. Federal employment rose 18,000.

### 3.2. How the Government Measures Unemployment (BLS 2014).

(1) The government conducts a monthly survey called the Current Population Survey. There are 60,000 eligible households/110,000 individuals in the sample, selected to be representative of the entire US population. Every month, 25% of the households in the sample are change. After a household is interviewed for 4 consecutive months, it leaves the sample for 8 months and is interviewed for the same 4 calendar months a year later before leaving the sample for good. That means the sample is 75% same month-to-month and 50% same year-to-year. Census employees conduct the survey and the results are weighted for the population at large.

(2) People with jobs are employed. People who are jobless, looking for a job and available for work are unemployed. The labour force is made up of the employed and the unemployed. The civilian non-institutional population 16 years and over is made up of the labour force and those not in the labour force. Those marginally attached to the labour force are individuals without jobs who are not looking for work but want a job, are available for work and have looked for a job in the last 12 months. Discouraged workers are a subset of the marginally attached who are not currently looking for work due to job-related reasons.

(3) The unemployment rate is the number of unemployed as a percentage of the labour force. The labour force participation rate is the number of people in the labour force as a percentage of the civilian non-institutional population 16 years and over. The employment-population ratio is the number of employed as a percentage of the civilian non-institutional population 16 years and over.

(4) The Bureau of Labour Statistics adjusts for seasonal fluctuations in employment. The BLS publishes a set of alternative measures of labour under-utilisation. U1 is the percentage of the labour force unemployed for 15 weeks or longer. U2 is the percentage of the labour force that lost jobs or finished doing temporary work. U3 is the official unemployment rate where people are without jobs and have actively looked for work in the past four weeks. U4 is U3 plus discouraged workers. U5 is U3 plus marginally attached workers. U6 is U5 plus part-time workers who cannot work full-time due to economic reasons.

(5) The Local Area Unemployment Statistics program published monthly estimates for 7,300 areas, including all states, counties, metropolitan areas and cities with over 25,000 people. State level numbers are based on a statistical model with input from the CPS, the Current Employment Statistics program and unemployment insurance systems. This is used for 7 large sub-state areas. Most sub-state areas are done via the 'handbook method', which involves data from the CPS, CES, the Quarterly Census of Employment and Wages program, state UI systems and the decennial census. This is disaggregated for estimates of smaller areas.

(6) CES produces industry estimates of employment, hours and earnings of workers on non-farm payrolls. It surveys 145,000 businesses and government agencies monthly i.e. 697,000 worksites.

(7) Unemployment insurance programs provide assistance to jobless people looking for work. People file 'initial claims' and must continue filing 'continuing claims' for each week that they seek benefits. However, this excludes several groups. Self-employed workers, unpaid family workers, workers for some non-profits and some other seasonal worker categories are not covered by UI. Unemployed workers who have exhausted their benefits, who have no yet earned benefit rights, who have been unemployed due to their own actions rather than economic conditions and who do not file for benefits are all uncounted. In fact, only around 33% of the total unemployed have received regular UI benefits on average acorss the past decade.

## 3.3. Who Suffers During Recessions (Hoynes 2012).

(1) The seasonally adjusted unemployment rate increased from 5% in December 2007 to 9.5% in June 2009, the start and end of the Great Recession according to NBER. From 2007 to 2010, the median real family income fell by 6% and the povert rate increased from 12.5% to 15.1%. The recovery has been slow, and the unemployment rate only reached 8.3% in February 2012. However, the effects of the Great Recession have not been symmetric across all workers. First we shall look at cyclical fluctuations in unemployment from 1979 to 2011 and compared it to the Great Recession. Then we shall compare the individual-level data to illustrate how unemployment has changed.

(2) The labour market decline in the Great Recession was deeper and longer than the early 1980s recession. This recession was mostly strongly felt by men, black and Hispanic workers, youth and low-education workers. The demographic differences in cyclicality is stable across three decades and across recessionary vs expansionary periods. The differences in 2007 are largely explained by variation in the groups' exposure to cycles across industry.

(3) The US economy from 1979 to 2011 has seen five recessions 1. January 1980 to July 1980 2. July 1981 to November 1982 3. July 1990 to March 1991 4. March 2001 to November 2001 5. December 2007 to June 2009. Combining the two in 1980 and 981, we can look at the labour market dimension of those recessions, by considering seasonally adjusted unemployment (among the labour force) and employment (among the population).

**U.S. Seasonally Adjusted Unemployment Rate, Months since Peak**
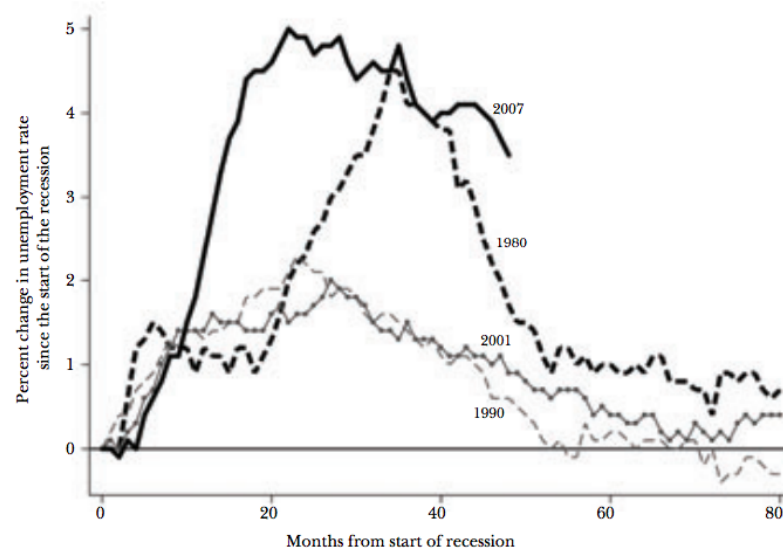


**U.S. Seasonally Adjusted Employment, Months since Peak**
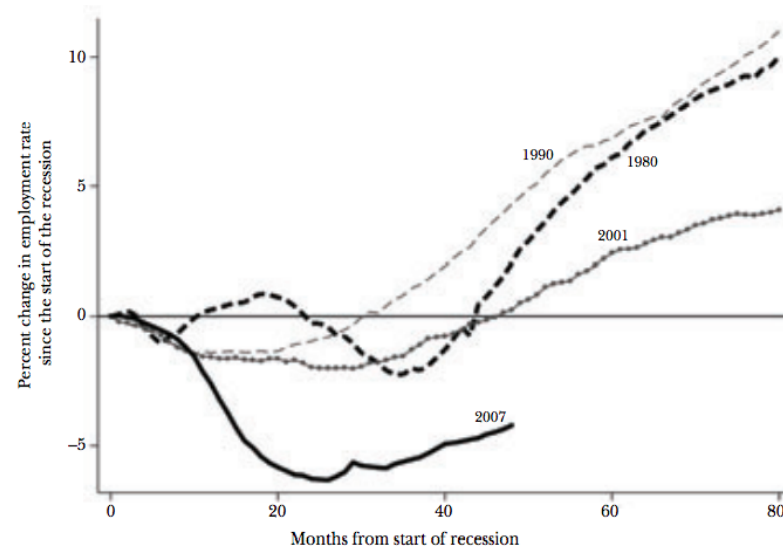
(4) We can see that the paths of the 1991 and 2001 recessions were similar. The 1980-1982 recession had a delay midway through, due to being two back-to-back recessions, but sharply fell eventually. By contrast, 2007 had the steepest and largest increase in unemployment from 5% in Dcember 2007 to a peak of 10.1% in October 2009, with unemployment remaining at nearly 2 percentage points higher after the end of the recession compared to the other recessions. The weak recovery of 2010 to 2011 is seen by the fact that in all three other cases, employment had returned to its pre-recession level by 48 months since the start, which we are far from.

(5) In the 2007 recession, the demographic groups who have high baseline unemployment rates had the greatest increases in unemployment. Men had larger increases than women, blacks and Hispanics more so than whites, youth more than the middle-aged and low-education groups more than the well-educated. Compared to the 1980s recession, the increase in unemployment is greater in 2007. The largest increases relative to 1980 are for Hispanic women and those with a high school degree. If we consider employment rates, similar groups experienced greater reductions in employment compared to the population. However, employment rates fell more compared to the 1980 recession for all groups except Hispanic men. One reason could be the secular increase in women's labour force participation during the 1980s that masked any business cycle sensitivity.

(6) Comparing raw data across time can ignore changes due to shifting compositions of certain groups in relation to other groups. By conducting regression analysis, it is possible to see that the labour market cycle in the Great Recession hit especially hard the youth, with the responsiveness of 16 to 19 year old unemployment to group unemployment being more than twice that of those in their mid-20s, with the coefficients of responsiveness declining until the mid-50s. The unemployment rate of men is more responsive to business cycle movements than for women, blacks more so than Hispanics who in turn are more so than whites, and low education groups more so than high education groups.



**Effect of State Unemployment Rate on Group Unemployment Rate, by Race/Sex and Education**
(*percentage points*)
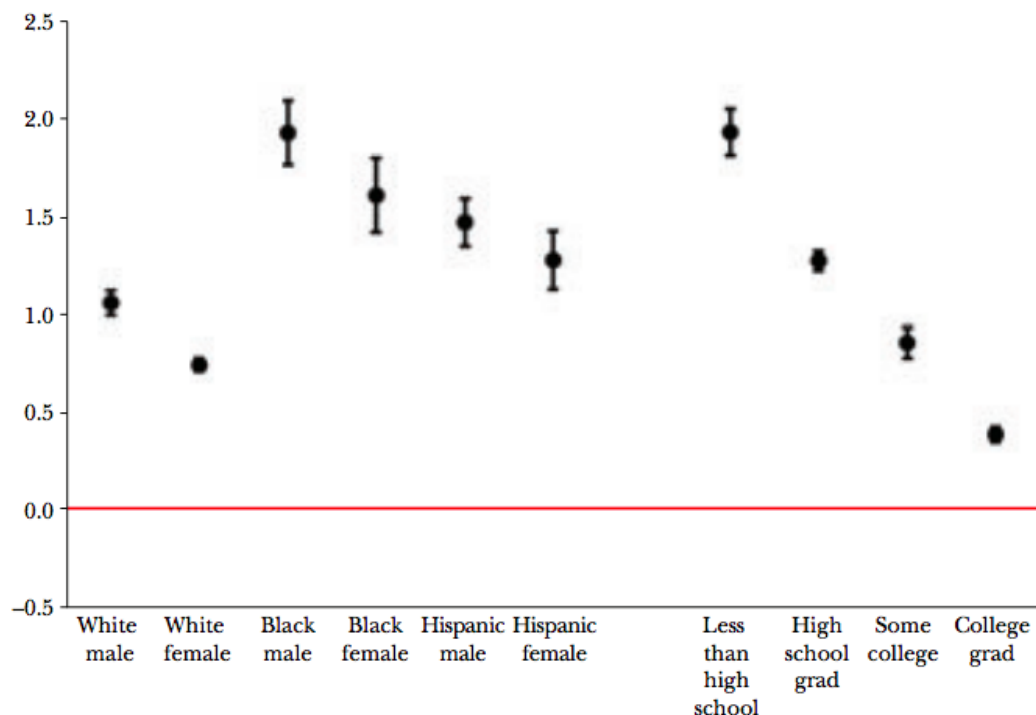
(7) The patterns for race and sex groups are somewhat different when measuring employment compared to unemployment in the recession. Although they are in the same direction, the gender differences are much greater. In fact, they dominate the racial differences, with women having low cyclical responsiveness of their employment rate, a result of women being more

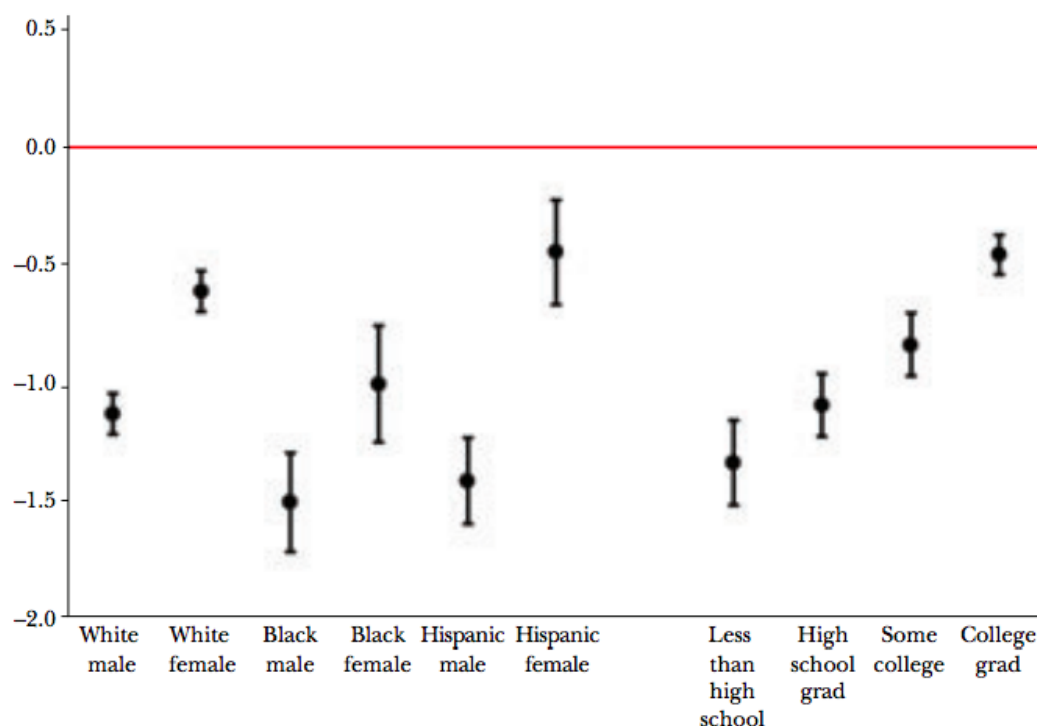likely to act as added workers (labour force increasing in recessions) and men being discouraged workers (vice versa).

**Effect of State Unemployment Rate on Group Employment Rate, by Race/Sex and Education**
*(percentage points)*



(8) We can evaluate whether business cycle responsiveness for each group was the same between the 1980 recession and the Great Recession. We can also look at how the responses to recoveries compare across the demographic groups. The responsiveness for each group was fairly similar across the recessions, although the Great Recession had larger impacts for older workers and for all education groups. However, the cyclicality for race and sex groups is significantly lower for the recovery following the Great Recession, but comparable for age and education groups.

(9) One explanation of this is that construction and manufacturing are more-cyclical industries compared to services and government. Men, those with lower education levels and minorities are more likely to be employed in the first set of industries. This accounts for the disparity, although it is not a perfect predictor for young workers. This may be because those with job tenure can mitigate firing more than the youth.

(10) Ultimately, the labour market decline has been deeper and longer than any recession since the Great Depression. Its effects have not been uniform across demographics. However, these demographic disparities are consistent across time since the late 1970s. There was increased responsiveness for some workers in this recession, but by and large those who lost out in the Great Recession are those who lose out every recession. Thus, 2007 differs from other business cycles not in type, but in size and length.

### 3.4. The Efficient Markets Hypothesis and its Critics (Malkiel 2003).

(1) The accepted view used to be that the efficient market hypothesis was true - that securities markets were efficient in reflecting information about individual stocks and about the stock market as a whole. When information arises, the news spreads quickly and is incorporated into the price of securities without delay. Technical analysis is the study of past stock prices in an attempt to predict future prices. Fundamental analysis is the analysis of financial information to help investors select undervalued stocks.

(2) EMH would suggest that neither could help an investor achieve returns greater than those that could be obtained by a randomly selected portfolio of individual stocks with comparable risk. That means that price changes represent random departures from previous prices in a 'random walk', suggesting that one ought to buy a broad-based index fund that charged low expenses.

(3) However, economists increasingly emphasise the psychological and behavioural components of stock-price determination, meaning that future stock prices are somewhat predictable on the basis of past stock price patterns alongside some fundamental valuation metrics. This might allow investors to earn excess risk adjusted rates of return.

(4) We will endeavour to examine the attacks on EMH and the belief that stock prices are partially predictable. Here, efficient financial markets are such that markets do not allow investors to earn above-average returns without accepting above-average risks. That is, markets can be efficient even if they make errors in valuation, even if many participants are irrational and even if stock prices exhibit greater volatility than can be explained by fundamentals. This doesn't require suggesting that market pricing is always perfect or that psychological factors influence securities prices. But Graham (1965) seems correct in that although the stock market is a voting mechanism in the short-run, in the long-run it is a weighing mechanism where true value wins out.

(5) There are several patterns of possible predictability. One is short-term momentum. Originally, work by Cootner (1964) would suggest that the way a stock price behaved in the past is not useful in predicting how it will behave in the future. However, Lo and MacKinlay (1999) found that short-run serial correlations are non-zero, with Lo, Mamaysky and Wang (2000) confirming the predictive power of some non-parametric statistical techniques. Schiller (2000) describes the rise in the US stock market in the late 1990s as being a result of psychological contagion leading to irrational exuberance. Behaviouralists offered an alternative to this bandwagon effect, which is a tendency of investors to underreact to new information, causing a positive serial correlation.

(6) However, Odean (1999) suggests that statistical significance is not equivalent to economic significance, since the transaction costs of making these tiny gains may lead to doing worse than buy-and-hold investors, even when clear positive momentum exists. Secondly, Fama (1998) notes that underreaction is as likely as overreaction, and many predictable patterns disappear after they are published in financial literature.

(7) Another possible predictability comes from long-run return reversals. Fama and French (1988) found that 25% to 40% of the variation in long holding period returns can be predicted as negative correlation with past returns, with Poterba and Summers (1988) concurring that there was substantial mean reversion over longer horizons. DeBondt and Thaler (1985) suggest this could be because of waves of optimism and pessimism, while Kahneman and Tversky (1979) concur, noting systematic overconfidence in predictions can lead to overreactions to events.

(8) However, this mean reversion is not uniform, with the strongest results coming from the great Depression. They may also be caused by the tendency for interest rates to be mean reverting, with bond and stock prices decreasing when interest rates rise.

(9) A further possible predictability is from seasonal and day-of-the-week patterns. Returns from an equally weighted stock index tend to be unusually high in the first two weeks of the year, as documented by Haugen and Lakonishok (1988) and Keim (1983). French (1980) documents significantly higher Monday returns, while Hawawini and Keim (1995) found different days in other countries. However, these are fairly undependable and once transaction costs are included, do not offer arbitrage opportunities.

(10) Some research has considered using initial valuation parameters to predict future stock returns. Fama and French (1988) and Campbell and Shiller (1988) tested whether dividend yields could forecast future returns, attributing 40% of the variance of future returns to be predictable from

the initial dividend yield. However, these findings are not inconsistent with efficiency. Dividend yields of stocks tend to be correlated with interest rates, and their ability to predict returns may be caused by the stock market's adjustment to general economic conditions. It also doesn't work consistently with individual stocks as noted by Fluck, Malkiel and Quandt (1997). Campbell and Shiller (1998) found that price-earning ratios could explain up to 40% of the variance of future returns, with low PE multiples garnering larger long horizon returns. However, this and other similar patterns are unreliable across time, may reflect varying risk premiums and do not necessarily generate profitable trading strategies.

(11) Some factors for prediction are based on firm characteristics and valuation parameters. Fama and French (1993) found that by dividing all stocks into deciles according to their size as measured by total capitalisation, the smaller ones generate higher average returns. Stocks with low price-earning multiples are 'value' stocks, which may have higher returns because of the investor tendency to be overconfident of their ability to project high earnings growth and overpay for 'growth' stocks. This was shown by Nicholson (1960) and Basu (1983). Similarly, a low price-to-book ratio had this characteristic according to Fama and French (1997). However, these characteristics suffer from similar issues to above.

(12) More generally, there is a survivorship bias in only examining the firms that persist, and with enough data mining, it is possible to find correlations that will be published. Given their publication will lead to exploitation, it seems unlikely that these inefficiencies can be utilised.

(13) A broader claim of inefficiency relates to drastic crashes. For example, the one third drop in market prices in October 1987 seems unexplainable by rational considerations. However, the increase in long-term Treasury bond yields from 9% to 10.5% in the preceding two months, coupled with the threat of a merger tax from Congress and a devaluation of the dollar from Secretary of the Treasury James Baker could all have contributed. Indeed, this can account for large changes by considering the pricing of stocks as the present value of the expected future stream of dividends. For a long-term hold of stocks, this is represented by

$$r = \frac{D}{P} + g$$

where $r$ is the rate of return, $\frac{D}{P}$ is the expected dividend yield and $g$ is the long-term growth rate.

(14) Consider $r$ to be the required rate of return for the market. If the riskless rate on government bonds is 9% and there is an equity risk premium of 2%, $r = 0.11$. Supposing a typical stock's expected growth rate $g$ is 7% with dividend $4 per share. The appropriate price of the stock index $P$ is $100. However, if government yields rise to 10.5% and risk perceptions increase to a premium of 2.5%, the price falls to $66.67.

(15) The Internet bubble would suggest that market values were inconsistent with rational valuation. However, there were no arbitrage opportunities available before the bubble popped.

(16) The strongest proof of market efficiency comes from seeing if professional fund managers can outperform the market as a whole. If market prices were determined by irrational investors and systematically deviated from rational estimates, and this could be easily spotted, professional fund managers should outperform index funds. Jensen (1968) found that active mutual fund managers tended to underperform the market by approximately the amount of their added expenses. Moreover, the funds that succeeded in one period had no reliability.

(17) Ultimately, some market participants are less than rational, causing pricing irregularities and predictable patterns in stock returns that may persist for a short period of time. As Grossman and Stiglitz (1980) noted, if markets were perfectly efficient, there would be no incentive for professionals to uncover the information that gets reflected in market prices. However, market inefficiency are unlikely to persist and are aberrations. As such, they will not provide investors a method to obtain extraordinary returns.

### 3.5. **Trendspotting in Asset Markets (Nobel Prize Committee 2013).**

(1) Eugene Fama, Lars Peter Hansen and Robert Shiller won the 2013 Nobel in economics for their work in studying asset prices. Although there is no way to predict whether the price of stocks and bonds will go up or down over the next few days or weeks, it is possible to foresee the broad course of prices across longer time periods.

(2) The behaviour of asset prices is essential for many important decisions, not just for professional investors. For example, the choice of how to save depends on the risks and returns associated with different assets. Asset prices also provide information for macroeconomic decisions with respect to consumption and investment. Although asset prices generally reflect fundamental values, there are bubbles and crashes to the contrary. These mispricings can contribute to financial crises and damage the overall economy.

(3) If markets work well, prices should have little predictability. Prices would follow a random walk, with random movements that reflect the arrival of news. However, risky assets need to deliver a higher return, meaning that its price can be predicted to rise faster. To detect market malfunctioning, one would need to have an idea what reasonable compensation for risk ought to be.

(4) One way to approach predictability is to see if asset prices over the past period of time can be used to predict tomorrow's price. Fama's 1960s work has shown this to be not possible. Another way is to examine how prices react to information. Fama, Fisher, Jensen and Roll (1969) investigated stock price movements after news about stock splits. They found that information was incorporated very quickly. with the price path being unpredictable after the initial shift from the news.

(5) However, Shiller's empirical work demonstrated that stock pries are predictable in the long-run. Shiller (1981) demonstrated that stock prices move much more than can be explained by dividend streams. Since basic theory would suggest that a stock's value should equal the expected value of future dividends, this price volatility suggests that is not the case. Indeed, a high price-dividend ratio will tend to be followed by a fall in price relative to dividends in subsequent years, and vice versa. This means there is longer run predictability in stock and bond markets.

(6) Standard theory says that investors rationally calculate what assets are worth. Thus its value should be based on the payment stream that it is expected to generate in the future, with future payments being discounted. Shiller found that assuming a constant discount factor meant the theory was hard to reconcile with the excess price fluctuations. However, it was possible large and varying discount factors could do so.

(7) The most basic model connecting asset prices to the savings and risk-taking decisions by rational individuals is the Consumption Capital Asset Pricing Model developed in the 1970s. Hansen presented the Generalised Method of Moments in 1982 that was suited to dealing with the peculiar properties of asset-price data. Using GMM, he found that the basic CCAPM was inconsistent with historical stock-price data, even allowing for time-varying discount rates. Modern researchers continue to use GMM to quantify risk-taking behaviour and extend CCAPM.

(8) Another way to interpret longer run predictability is to abandon the idea of fully rational investors. Mistaken expectations and excessive optimism may lead to high asset prices, reflecting overestimates of future payment streams. There is a question of why rational investors do not eliminate the excessive price swings by betting against the less rational, and this may be due to institutional credit constraints and conflicts of interest.

(9) There is also a question of differences in returns across stocks i.e. does stock-picking pay? The classical Capital Asset Pricing Model suggests that stocks that have high returns when the overall market return is high should yield a high return as a compensation for risk, while ones

with high returns when overall return is low should yield relatively low returns on average. Fama's testing showed that a stock's correlation with the market is not a key predictor for its future returns, with other factors being more important. For example, having the company's total market value be large and its book value to market value ratio be low have low returns on average.

(10) Ultimately, the work of the three laureates have found patterns for the long-run predictability of overall asset returns and the predictability of returns across assets, with the main research being the investigation of rational investor models and behavioural models. They have also informed the fact that mutual funds tend to generate negative returns once asset management fees are taken into account.

## 4. Basics of Money

### 4.1. **Some Monetary Facts (McCandless and Weber 1995).**

(1) The Federal Reserve System was established in 1913 to provide an elastic currency, discount commercial credit and supervise the banking system. The Employment Act of 1946 and the Full Employment and Balanced Growth Act of 1978 instructed the Fed to 'maintain long-run growth of the monetary and credit aggregates commensurate with the economy's long-run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices and moderate long-term interest rates'. This implicitly suggests that the Fed's control over some definitions of money can affect these economic variables. Can it?

(2) A central bank's main instrument is the growth rate of the money supply. This is via some nominal interest rate target. The target for price stability is some measure of the country's inflation rate, while the target for real economic activity is usually the growth rate of national output. In order to determine the effectiveness of monetary policy, it is necessary to examine the statistical correlations between money growth and inflation as well as output growth. We shall examine long-run correlations over a large cross section of countries.

(3) This produces three monetary facts 1. there is a very high correlation between the rate of growth of the money supply and the rate of inflation 2. there is no correlation between the growth rates of money and real output (but not for subset of OECD countries where there is a positive correlation) 3. there is no correlation between inflation and real output.

(4) We consider the long-run correlations because of reservations about the ability of economists to forecast or make short-run changes. We study a cross section of countries such that our results are independent of policy rules e.g. if there were a constant growth rate rule for the money supply, we would find no correlation between the growth rate of money and inflation. If there were a feedback rule where the growth rate of money was determined by the inflation, we would find perfect correlation. This study looks at time series data for 110 countries, taking the 30-year geometric average rate of growth of real GDP, a standard measure of the general price level and three definitions of money in M0, M1 and M2. M0 is currency plus bank reserves. M1 is money easily used in transactions. M2 is money easily used in or converted into use for transactions. There are two sub-samples involving 21 OECD countries and 14 Latin American countries.

(5) The first fact was that in the long-run, there is an almost perfect correlation between money growth and inflation. In particular, the broader definitions of M1 and M2 are more correlated. This linear relationship brings to mind the quantity equation of

$$MV = PY$$

where $M$ is the money supply, $V$ is the velocity of money i.e. how many times each dollar in the money supply is spent each year, $P$ is the price level and $Y$ is real output. This can be

understood in growth rates as a linear relationship between money growth and inflation

$$M' + V' = P' + Y'$$

## Correlation Coefficients for Money Growth and Inflation*
Based on Data From 1960 to 1990

| Sample | Coefficient for Each Definition of Money | | |
| --- | --- | --- | --- |
| | M0 | M1 | M2 |
| All 110 Countries | .925 | .958 | .950 |
| Subsamples | | | |
| 21 OECD Countries | .894 | .940 | .958 |
| 14 Latin American Countries | .973 | .992 | .993 |

*Inflation is defined as changes in a measure of consumer prices.

## Money Growth and Inflation:
## A High, Positive Correlation

Average Annual Rates of Growth in M2 and in Consumer Prices
During 1960–90 in 110 Countries
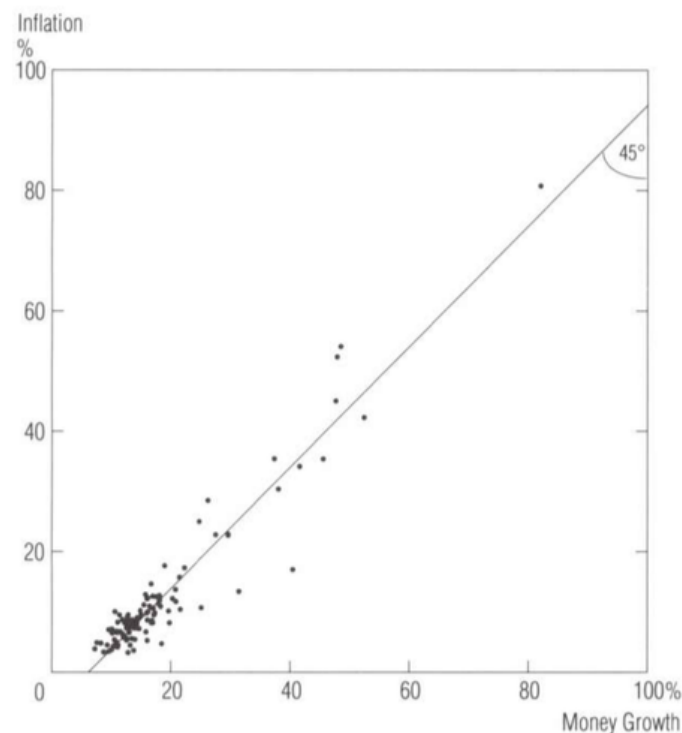


(6) This suggests that a central bank cannot generate a particular long-run rate of inflation by choosing an equal long-run money growth rate, since it is influenced by three other factors. However, it can be confident that a higher money growth rate will result in a proportionally higher inflation rate over the long-run.

(7) The second fact is that there is no correlation between money growth and real output in the long-run, except for in the sub-sample of OECD countries. In the OECD sub-sample, there is a positive correlation which is strongest for M0. However, the correlation coefficient doesn't show the magnitude. By running a regression for real output growth on money growth, the slope coefficient was approximately 0.1, which suggests that an increase in money growth was

associated with increases in real output growth around one-tenth as large. this doesn't imply causation, since it may simply be a feedback rule from real output growth to money growth.

**Correlation Coefficients for Money Growth and Real Output Growth\***

Based on Data From 1960 to 1990

| Sample | Coefficient for Each Definition of Money | | |
|---|---|---|---|
| | M0 | M1 | M2 |
| All 110 Countries | −.027 | −.050 | −.014 |
| Subsamples | | | |
| 21 OECD Countries | .707 | .511 | .518 |
| 14 Latin American Countries | −.171 | −.239 | −.243 |

\*Real output growth is calculated by subtracting changes in a measure of consumer prices from changes in nominal gross domestic product.

(8) The third fact is that there is no correlation between inflation and real output growth in the long-run. This holds especially once the outlier of Nicaragua is excluded.

**Correlation Coefficients for Inflation and Real Output Growth\***

Based on Data From 1960 to 1990

| Sample | Coefficient With Outlier\*\* | |
|---|---|---|
| | Included | Excluded |
| All 110 Countries | −.243 | −.101 |
| Subsamples | | |
| 21 OECD Countries | .390 | .390 |
| 14 Latin American Countries | — | −.342 |

\*Inflation is defined as changes in a measure of consumer prices. Real output growth is calculated by subtracting those inflation rates from changes in nominal gross domestic product.
\*\*The outlier is Nicaragua.

(9) These three facts suggest that we can adjust money growth in order to adjust long-run inflation, but it doesn't mean we can hit specific inflation targets, as that requires accurate predictions of real output growth and velocity. It also suggests that monetary policy has no long-run effect on real output.

## 4.2. Monetary Neutrality Nobel Prize Lecture (Lucas 1995).

(1) Robert Lucas received the Nobel Prize for helping to understand how changes in monetary policy can influence inflation, employment and production. The beginning of modern research into monetary theory was David Hume's 1752 essays *Of Money* and *Of Interest*. He formulated the quantity theory of money, emphasising its neutrality i.e. changes in the number of units of money in circulation will have proportional effects on all prices and no effect on anything real. However, Hume goes on the note the recessionary effect a monetary contraction can have. How can this be reconciled? Thus the question - under what assumptions and for what kinds of changes can we expect monetary changes to be neutral?

(2) The central predictions of the quantity theory are that money growth should be neutral in its effect on real output growth and should affect inflation rate on a one-for-one basis in the long-run. McCandless and Weber (1995) provided evidence for both. Stockman (1996) plots the Phillips curve for sub-periods between 1950 and 1994, which seems to demonstrate a clear negative relation between inflation and unemployment. However, this relies upon shifting the curve and the axes. Friedman and Schwartz's 1963 *A Monetary History of the United States* showed that every major depression in the USA between 1867 and 1960 was associated with a large contraction in the money supply, and every large contraction was associated with a depression.

(3) Sargent (1986) examined large and sudden reductions in the rate of money growth, which dwarf both McCandless and Weber (1995) as well as Friedman and Schwartz (1963). However, they were not associated with output reductions that were large by historical standards or in some cases reductions at all, which could be explained by the fact that these reductions were well anticipated. Thus it seems that prices responding proportionally to changes in money in the long-run is confirmed by empirical data, while the observation that money changes induce output changes in the same direction has mixed confirmation.

(4) As economic theory has progressed, the quantity theoretic neutrality theorems have been stated with precision and rigour via static general equilibrium theory. Patinkin interprets the monetary theory from Wicksell's 1898 *Interest and Prices* in his own 1956 *Money, Interest and Prices* as concerned with processes of adjustment between one quantity-theoretic equilibrium position and another.

(5) The depression of the 1930s shifted attention to the potential of monetary policy for short-run stimulus, as seen in Keynes's 1936 *General Theory* and Tinbergen's 1936 statistical model of the US economy. Tinbergen's work was mathematically explicit and could be simulated to yield quantitative answers to policy questions, two key advantages over earlier macroeconomic theory. By the 1960s, there were two styles of macroeconomic theory. One aimed at a unified monetary and value theory based on the extensions of static general equilibrium theory to accommodate money but with a tâtonnement process for dynamics. On the other hand, there were macroeconometric models that could be fit to data and yield quantitative normative policy implications, but whose relation to microeconomic and classical monetary theory was unclear.

(6) As intertemporal elements and expectations grew in importance, the inconsistency between the price expectations implied by theory and the results of models that simply combined several sectoral models grew. John Muth's 1961 *Rational Expectations and the Theory of Price Movements* showed how rational expectations of future prices could reconcile this. Friedman (1968) and Phelps (1968) both noted that there could be no long-run Phillips curve, while Sargent (1971) and Lucas (1972) reinforced the need to accept the natural rate hypothesis.

(7) The field had produced two general equilibrium frameworks by the 1960s. The first was in the vein of Hicks (1939), Arrow (1951), Debreu (1954) and McKenzie (1954), which resulted in the seminal work of Kydland and Prescott (1982). The second, which was better suited to the study of monetary questions, was along the lines of Samuelson (1958) and Lucas (1972). Samuelson's model had people living for two periods, such that there is a constant population with one young cohort and one old cohort. Every year, the young become old, the old die and there is a new young cohort, with no family structure i.e. no inheritances and no financial support across cohorts. Suppose a young person can work to produce goods, while an old person can consume goods only. We shall assume everyone's preferences are represented by

$$U(c) - n$$

where the pair $(c, n)$ has $n$ as the units of labour supplied when young and $c$ as the units of good consumed when old.

(8) Assuming a labour-only technology where one unit of labour yields one unit of goods. If goods were storable, they would be solving the problem

$$\max_n [U(n) - n]$$

(9) Let's call the solution $n^*$. However, if the good were not storable, any individual by themselves would be unable to produce for their own pleasure, making the best choice enjoying leisure when young and never consuming. Clearly, it would be better if society could induce the young to produce for the consumption of their contemporary old. A monetary system may be an institution to do so, since the failure of autarchic allocation is one arising from the absence of the double coincidence of wants that barter requires.

(10) If this exchange occurs in a single competitive market with price $p$ being formed, someone who works $n$ units will get $pn$ units of cash, which can be spent on $n$ units of consumption. If the money supply is constant and evenly distributed for $m$ per person, the equilibrium price will be constant at $p = \frac{m}{n^*}$. If $m$ is increased, the price level will be increased proportionally without any effect on the quantities of labour and production.

(11) However, if we instead assume that the quantity of money grows at a constant percentage rate i.e. each young person receives an equal share of the newly created money in between his youth and old age irrespective of how much he has earned from working. Supposing a money supply $m$ and a lump sum transfer $m(x - 1)$, each young person solves for

$$\max_n [U(\frac{pn + m(x - 1)}{p'}) - n]$$

where $p$ is the price at which they sell goods today and $p'$ is the price at which they buy goods tomorrow. This has first order condition

$$U'(\frac{pn + m(x - 1)}{p'})\frac{p}{p'} = 1$$

(12) Since the only thing that changes over time is the money supply, the equilibrium is one where the price level is proportional to the money stock. That is, $p = km$ for a constant $k$. If labour is valued at a constant $\hat{n}$, $k = \frac{1}{\hat{n}}$. Tomorrow's price $p' = kmx = \frac{mx}{\hat{n}}$ since the money supply is multiplied by factor $x$ every period. By substituting into the first order condition produces

$$U'(\hat{n}) = x$$

(13) That means the price level will increase between periods at exactly the rate of growth of the money supply, with the equilibrium level of employment $\hat{n}$ being a decreasing function of the rate of money growth. Notice that the faster money grows, the more important the overnight transfer is compared to the cash from working. Goods production declines as the inflation rate rises, suggesting a non-neutrality.

(14) We can get rid of this inflation tax by transferring in proportion to the balances one has earned from working. That is, for $n$ units of work, one receives $pn(x - 1)$ and has $pnx$ to spend in the next period, which makes the first order condition

$$U'(\hat{n}) = 1$$

(15) That is, $\hat{n}$ is always at efficient level $n^*$. In order to get an output effect from a monetary shock, we need to imagine that the exchange of money for goods does not occur in a centralised Walrasian market. Instead, the exchange occurs in two markets, each with different number of goods suppliers. A given price increase can signal that the money transfer $x$ is large and encourage the supplier not to react, or it can mean that there are only few suppliers and respond by producing more. The best an individual supplier can do is to hedge, making labour supply and production an increasing function $f(x)$ of the monetary transfer. The equilibrium prices $\frac{mx}{f(x)}$ move in proportion to $m$ which is known to all trades, but increase less than proportionally with transfer $x$. By the next period, the transfer is known, but there has already been a transition where production is increased.

(16) As such, it is clear that anticipated money changes will not stimulate production and some unanticipated changes can. Anticipated money changes can have inflation tax effects, but are not associated with stimulus to employment and production.

## 5. The Federal Reserve and Monetary Policy

### 5.1. **The Federal Reserve System: Purposes and Functions (Fox et al 2005).**

(1) The Federal Reserve System is the USA's central bank.
  (a) It conducts monetary policy to promote maximum employment, stable prices and moderate long-term interest rates in the US economy.
  (b) It promotes the stability of the financial system and seeks to minimise and contain systemic risks through active monitoring and engagement in the US and abroad.
  (c) It promotes the safety and soundness of individual financial system institutions and monitors their impact on the financial system as a whole.
  (d) It fosters payment and settlement system safety and efficiency through services to the banking industry and the US government that facilitate US dollar transactions and payments.
  (e) It promotes consumer protection and community development through consumer-focused supervision and examination, research and analysis of emerging consumer issues and trends, community economic development activities and the administration of consumer laws and regulations.

(2) It is composed of the Board of Governors, 12 banks and the Federal Open Market Committee. The Board is an independent federal agency that reports to Congress. Each Reserve Bank is responsible for one of the 12 districts of Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas and San Francisco. Each has a nine-member board of directors, with six being elected by commercial banks that hold stock in the Reserve Bank and three Class C being chosen by the Board. The six are split into 3 Class A that represent those member banks, and 3 Class B that represent the public. The Fed is funded entirely by interest earned on the securities it owns from open market operations, as well as fees received for services provided to depository institutions.

(3) The President nominates the Board, as well as a Chair and a Vice Chair, which the Senate must confirm. They serve a single 14-year term. The FOMC is composed of the seven Board members and five rotating Reserve Bank presidents, one of which must be the NY Fed president. Reserve Bank presidents are nominated by the Class B and Class C directors.

(4) Reserve Banks supervise and examine state member banks as well as financial institutions deemed systemically important. They provide lending to depository institutions to ensure liquidity in the financial system. They provide key financial services, such as distributing currency, clearing checks, operating the clearinghouse systems and serving as a bank of the US Treasury. They examine certain financial institutions to ensure compliance with federal consumer protection and fair lending laws. They also provide information to the Federal Reserve System that allows the formulation of a national monetary policy.

(5) All Reserve Bank presidents attend FOMC meetings, but only those the 4 vote alongside the Board and NY president. The FOMC is responsible for open market operations, which affect the federal funds rate. It also directs operations in foreign exchange markets and currency swap programs with foreign central banks. Depository institutions are important to the system and are required to meet reserve requirements, with excesses being available to be lent out to other depository institutions.

(6) There are also four advisory councils 1. Federal Advisory Council comprising 12 representatives of the banking industry, each from a district 2. Community Depository Institutions Advisory Council which represent thrift institutions, credit unions and community banks 3. Model Validation Council to provide expert advice on Fed stress tests 4. Community Advisory Council to offer perspectives from consumers, especially low-income communities.

(7) Monetary policy manages the level of interest rates and influences the availability and cost of credit in the economy. Interest rates affect stock prices, wealth and currency exchange rates. Via these channels, it influences spending, investment, production, employment and inflation. It can use open market operations, reserve requirements, discount window lending, forward guidance and large-scale asset purchases.

(8) The Fed has a statutory mandate to conduct monetary policy 'as to promote effectively the goals of maximum employment, stable prices and moderate long-term interest rates'. This was clarified in its 'Statement on Longer-Run Goals and Monetary Policy Strategy'. It reaffirmed its judgement to target 2% inflation as measured by the annual change in the price index for personal consumption expenditure. It emphasised the promotion of maximum employment, with the median FOMC estimate of normal unemployment being 4.4%. It clarified that where its goals contradicted, it would follow a balanced approach of promoting them, taking into account the magnitude of the deviations and time horizons since monetary policy has a time lag. It also considers broader risks associated with the financial system and economic outlook.

(9) Low and stable inflation allows actors to make more accurate longer-run financial decisions about borrowing and lending, as well as saving and investment. It also allows people to hold money with little erosion. Inflation that is too low means lower short-term interest rates that limit monetary room. Deflation would increase the burden of household and consumer debts.

(10) Maximum employment is equally important, but the neutral rate of employment that doesn't lead to higher inflation is largely determined by non-monetary factors e.g. trends in the size and makeup of the population, changes in the types of jobs and skills needed as well as education and training policies. As such, the FOMC doesn't target a fixed goal, instead using a range of indicators to estimate. These estimates on the longer-run outlook are presented four times a year in the Summary of Economic Projections.

(11) The Fed primarily changes the federal funds rate, which is the interest rate for overnight borrowing between banks. A reduction will reduce short-term interest rates e.g. rate of return paid to holders of US Treasury bills or commercial paper. This is transmitted to reducing medium and long-term interest rates e.g. Treasury notes and bonds, corporate bonds, fixed-rate mortgages and other consumer loans. Furthermore, these longer-term rates are affected by expectations of future changes. Changes in these longer-term rates can propagate, with a reduction leading investors to purchase stocks, causing a wealth effect. Lower interest rates will make yields on US dollar assets less attractive, causing a lowering in the value of the dollar and thus boosting exports. All of these interest rate changes will elicit changes in consumer spending and investment decisions.

(12) All of these decisions are taken with several considerations in mind 1. the degree of slack or overheating in the economy i.e. resource utilisation 2. the time lag associated with monetary policy 3. other anticipated factors 4. demand and supply shocks.

(13) The actual mechanism for open market operations is as follows 1. FOMC decides to reduce funds rate target 2. FRBNY's Open Market Desk purchases US Treasury securities from one of the primary dealers 3. the primary dealers ensure the market for US Treasury securities are always liquid 4. OMD credits the account of the primary dealer's bank 5. securities are acquired as assets and the dealer's bank account at the Fed is a liability 6. the banks can make more loans.

(14) There are over 12,5000 depository institutions with accounts at the Federal Reserve. At the end of the business day, they may need to borrow funds overnight to make payments, to cover a shortfall in their Fed balances or meet reserve requirements. The Fed pays interest on reserve balances and excess balances. The former eliminates the implicit tax imposed by reserve requirements, while changing the IOER changes the attractiveness of holding excess balances.

(15) Reserve requirements create a stable demand for reserves. OMOs affect the volume of reserves. The 4 types of discount window lending can alleviate pressures in the federal funds market and act as an upper limit ton the funds rate. Primary credit is short-term lending to sound depository institutions, and is seen as a backup source of funding. Secondary credit is very short-term and usually overnight, for helping riskier institutions meet their liquidity needs. Seasonal credit is to help smaller institutions manage seasonal swings in their deposits and loans. Finally, there are credit terms for US government agencies and foreign banks. All of these loans require assets as collateral, with the Fed lending the value of that asset minus a haircut.

(16) During the 2007 to 2009 financial crisis, the Fed expanded its lending through the discount window. Via the Congressional expansion of its authority, it introduced programs to address the need by financial institutions for short-term liquidity. It also engaged in dollar liquidity swap arrangements with foreign central banks to address dollar funding pressures abroad. It dropped the federal funds rate to near zero, and this was bolstered by the use of large-scale asset purchases and forward guidance. The Fed's expanded authority is derived from section 13(3) of the Federal Reserve Act that allows the provision of liquidity to non-depository institutions under 'unusual and exigent' circumstances, though this must be broad based ad not designed to support a single institutions.

(17) Financial stability is where financial institutions and markets are able to provide households, communities and businesses with the resources, services and products needed to invest, grow and participate in a well-functioning economy e.g. business lines of credit, mortgages, student loans, savings accounts, brokerage services, retirement accounts etc. Traditional micro-prudential supervision focuses on the safety and soundness of individual institutions, while the post-2008 macro-prudential also looks at the stability of the financial system as a whole.
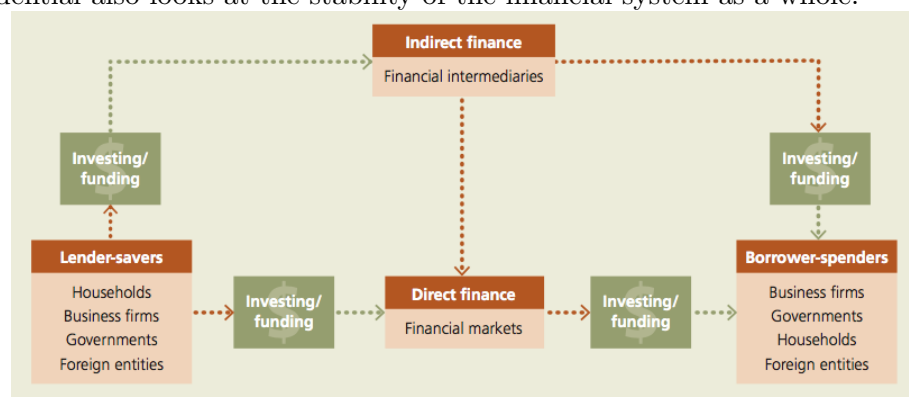


(18) There are four components to financial system vulnerability review. The first is asset valuations and risk appetite. The second is the financial system's leverage. The third is the risk on providers of liquidity and maturity transformation. The fourth is borrowing by the non-financial sector. The Fed engages in stress testing as well as engagement with other agencies in the domestic Financial Stability Oversight Council and via various multinational organisations. The Fed supervises and regulates bank holding companies, savings and loan holding companies, state member banks, financial market utilities and non-bank financial companies.

5.2. **The Role of Monetary Policy (Friedman 1968).**

(1) There is agreement that the goal of economic policy is high employment, stable prices and rapid growth. There is less agreement about their compatibility and comparative importance. There is the least agreement on the role of various instruments in achieving these goals. Specifically, we shall consider monetary policy. Initially, the Federal Reserve's capacity for fine tuning was credited with the stability of the 1920s. The Keynesian critique that monetary policy was a string you could pull on to stop inflation but couldn't push on to halt recession undermined its importance. However, there was a revival via the argument that changes in the real quantity of money can affect aggregate demand even if they didn't alter interest rates, via the wealth channel.

(2) Monetary policy faces two limitations 1. it cannot peg interest rates for more than limited periods 2. it cannot peg the rate of unemployment for more than limited periods. Suppose the Fed tries to keep interest rates low. It buys securities, raising their prices and lowering their yields. It also increases bank reserves and the amount of money available. However, this monetary growth will stimulate spending, raising incomes. This in turn raises the demand for loans and prices, reversing the downward pressure on interest rates. The rising prices will become expected, meaning borrowers and lenders will agree to higher interest rates. As such, it is better to look at the rate of change of the quantity of money than interest rates, as an indicator of monetary policy's looseness.

(3) Similarly, suppose monetary authorities try to peg the market rate of unemployment below the natural rate when it is currently above it. It conducts expansionary monetary policy, which will initially result in an increase in output and employment. However, as prices rise faster than the prices of factors of production, real wages will go down. This will eventually adjust such that unemployment returns to its former level. The only way to keep the peg is to keep increasing inflation.

(4) Thus, there is a temporary trade-off between inflation and unemployment but not a permanent one, which is because the trade-off comes about from unanticipated inflation. Monetary authorities can only control nominal quantities, but not peg a real quantity.

(5) However, monetary authorities can still have important effects on real magnitudes. The first is that monetary policy can prevent money itself from being a major source of economic disturbance. The second is to provide a stable background for the economy, such as by maintaining stable prices. Thirdly, it can offset major disturbances from other sources. However, monetary policy should be guided by magnitudes it can control, such as the price level or a monetary total. It must also avoid sharp swings in policy, perhaps by setting a constant rate of increase of the monetary total.

5.3. **Monetary Policy Strategy: Lessons from the Crisis (Mishkin 2011).**

(1) The state of monetary policy before the crisis had nine main principles, the first eight of which form the neoclassical synthesis. The first is that inflation is always and everywhere a monetary phenomenon.

(2) Price stability brings important benefits. High inflation undermines the role of money as a medium of exchange by acting as a tax on cash. It leads to over-investment in the financial sector as a way to mitigate the costs of inflation. It creates uncertainty about the future price level, making economic decision-making difficult and less efficient. Unanticipated inflation causes redistributions of wealth from creditors to debtors.

(3) There is no long-run trade-off between unemployment and inflation. The economy will gravitate towards some natural rate of unemployment in the long-run, making the Phillips curve vertical. Any attempts to lower unemployment below this natural rate will result only in higher inflation.

(4) Expectations play a crucial role in the macro-economy. Economic agents will take into account their expectations of future variables. As such, managing expectations and what is anticipated matters in monetary theory.

(5) The Taylor Principle is necessary for price stability. It says that stabilising monetary policy must raise the nominal interest rate by more than the rise in inflation.

(6) The time-inconsistency problem is relevant to monetary policy. That is, monetary policy conducted on a day-by-day discretionary basis leads to worse long-run outcomes than by committing to a policy rule. For example, if policymakers attempt to exploit a short-run Phillips curve, private agents cognisant of this will adjust expectations such that it will only result in higher inflation with no short-rim increase in employment.

(7) Central bank independence improves macroeconomic performance. This is in part because they are more insulated from the tendencies of the time-inconsistency problem. However, the mandate of monetary policy is one within the realms of democratic decision-making, in a way that the mechanism of monetary policy instruments is not.

(8) The credible commitment to a nominal anchor promotes price and output stability. An institutional commitment provides a counterbalance to the time-inconsistency problem, as it makes clear that the central bank will focus on the long-run. It can promotes price stability, thus stabilising inflation expectations and avoid inflation scares. It also makes stabilisation policy more effective e.g. if countercyclical monetary policy makes the private sector less certain about the longer-run inflation outlook, the inflation risk premium could increase the real costs of long-term financing and mitigate the policy.

(9) Financial frictions play an important role in the business cycle. When there are information asymmetric shocks that increase financial frictions, the ensuing instability means the financial system is less able to channel funds to those with productive investment opportunities.

(10) These nine principles led to an optimal monetary theory involving optimising an objective function subject to the constraints of the economic model. The former was expressed in two components - the deviations of inflation from its optimal rate and the costs of underutilised resources. There was also a representative-agent framework where all agents were alike. Their homogeneity meant that financial frictions weren't accounted for, as they require agents to differ.

(11) The crisis has changed our thinking in five main ways. The first is that developments in the financial sector have a far greater impact on economic activity than we realised.

(12) The macro-economy is highly non-linear. Economic downturns lead to increase uncertainty about asset values, triggering an adverse feedback loop. The deterioration of balance sheets can intensify adverse selection and moral hazard as it removes a channel of mitigating information asymmetries - collateral. The description of the economy in linear dynamic equations is not suitable for exigent circumstances. The quadratic objective function does not reflect the extent to which individuals have strong preferences for minimising the incidence of tail-end scenarios.

(13) The zero lower bound is more problematic than we realised. This is because reaching the zero lower bound is a far more frequent occasion than expected. This is also because the contractionary shocks to the economy are far greater than previously anticipated.

(14) The costs of cleaning up after financial crises is very high. There are three additional costs 1. financial crises are typically followed by slow growth 2. the budgetary position of governments deteriorates 3. the exit strategy for central banks is complicated and may hinder its ability to manage the economy in the future. V-shaped recoveries generally occur after deep recessions, but this is not the case of recessions following financial crises due to a long deleveraging process.

(15) Price and output stability do not ensure financial stability, and it may be the opposite.

(16) None of these five lessons invalidate the first nine principles. They do question the linear-quadratic framework and the exclusion of the financial sector in the representative-agent framework. It does suggest a few adjustments to the practice of monetary policy.

(17) Flexible inflation targeting might be improved by altering the inflation target. However, there is a history of inflation rising out of control once it exceeds 3%, and due to the rarity of the zero lower bound being binding, this is perhaps unwise. Another suggestion is to shift to price level targeting. This can act as an automatic stabiliser, since a negative demand shock will create an expectation of a rise in inflation, lowering the real interest rate and stimulating aggregate demand. However, it could produce more output variability because unanticipated shocks to the price level are not treated as bygones, as well as being harder to communicate.

(18) Risk management might be altered away from the gradualism that the linear-quadratic framework implies. It might need to act preemptively to prevent macroeconomic risk i.e. an increase in the probability that a financial disruption will cause a deterioration in the real economy via the adverse feedback loop. This requires timely, decisive and flexible action.

(19) The traditional Greenspan doctrine suggested that monetary policy should not lean against asset price bubbles but clean up afterwards. This is because of the difficulty in detecting bubbles, the blunt nature of monetary policy, the risk of causing the bubble to pop harder and the ease of managing it. In this lean vs clean debate, it is worth differentiating between credit-driven bubbles and irrational exuberance bubbles, the latter being far less problematic. This suggests that it may be worth leaning against the former, especially since they are easier to spot. Although the Tinbergen principle says that each policy objective should have its own instrument, it is likely that macro-prudential policies are too subject to political considerations to be effective.

## 6. Fiscal Policy

### 6.1. The Size and Role of Government (Labonte 2010).

(1) The government intervenes in the economy in four ways. it produces goods and services, such as infrastructure, education and defense. It transfers income vertically and horizontally. It taxes to pay for its outlays, which can reduce economic efficiency by distorting behaviour. Even running a deficit can impose its own burdens. It alters economic activity via regulation.

(2) There are different ways of measuring the size of the government. This is especially difficult due to the role of regulation and government corporations. We could measure the size of government in dollars, on a per capita basis, by total employees or as a percentage of GDP. Dollars ought to be adjusted for inflation, while ignoring demographic changes seems unrepresentative. An employee count will ignore the substitution of capital for labour. The question of whether to look at receipts or outlays also matters, with outlays being more representative and more in control by legislatures. There is also a distinction between government production and transfers.

(3) Economic efficiency is where the marginal cost of producing one more unit is equivalent to the marginal benefit of consuming one more unit. A perfectly competitive market with many buyers and sellers, no barriers to entry, perfect information and no externalities will result in an efficient outcome. There are six main types of market failures 1. public goods 2. common resources 3. monopoly power 4. externalities 5. asymmetric information 6. a failure to optimise.

(4) Taxes on efficient allocations distort behaviour and reduce efficiency. Economic theory suggests that the efficiency loss from a tax increases geometrically as the tax decreases. However, taxes also fund interventions that can increase efficiency. Furthermore, some taxes do not distort behaviour, such as a capitation tax i.e. a fixed dollar tax everyone must pay. To add to that, there are other goals as fairness.

(5) Growth is another useful goal to consider, and long-term growth is caused by increases in the labour supply, physical capital stock and productivity. It is fairly ambiguous whether government spending on consumption goods will affect growth. However, government spending on capital investment can increase growth, if what it is crowding out is private consumption. Tax and transfers could change the incentives to work, but could also increase growth by redistributing vertically to those with a greater marginal propensity to consume.

## 6.2. **Policies to Address Poverty in America (Hamilton Project 2014).**

(1) 15% of Americans lived in poverty in 2012 - that's 30.4 million adults and 16.1 million children. This rises to 16% if counted for by the Supplemental Poverty Measure, with 29.6% of families living within 150% of the poverty line. Furthermore, between 2009 and 2011, around 31.6% of Americans or 90 million people were episodically poor i.e. poor for two or more consecutive months in a thirty-six month period.

(2) The 14 solutions to poverty have been organised into four categories. The first is promoting early childhood development. Achievement gaps between children from low and high-income families appear early and persist throughout lives. By age four, children in the highest income quintile score near the 70th percentile on literacy and numeracy tests compared to the 30th percentile for children in the lowest income quintile.

(3) The second is supporting disadvantaged youth. They face barriers at every turn, often struggling in school, being involved in a criminal environment, have few adult role models and lack sufficient skills to succeed in the workforce. Nearly 40% of eight-grade students from families in the lowest income quartile did not graduate from high school.

(4) The third is building skills. Skill development and job creation is crucial in fighting against poverty. Stagnant wage growth is a threat to low-skilled workers. High school graduates and those with less than a high school diploma saw their real wages to fall throughout the 1980s and stay stagnant since. Those with college degrees or some college education have seen some improvement. Those with more than sixteen years of education have seen their wages rise steadily since the 1970s, outpacing even college graduates significantly. There has also been a polarisation in job opportunities, with prospects for middle-skilled workers being hollowed out.

(5) The fourth is improving safety net and work support. A strong safety net is crucial, with government programs halving the share of Americans classified as poor from 31% to 16%. This compares well to 1967, where government benefits only cut poverty by a quarter. Social Security, medicare and Supplemental Security Income have been incredibly successful in helping elderly Americans. The Earned Income Tax Credit and the Supplemental nutritional Assistance Program have been useful too. Work support could extend this safety net to reduce and mitigate the impacts of unemployment.

(6) Proposal 1 is expanding preschool access for disadvantaged children. Proposal 2 is addressing the parenting divide to promote early childhood development for disadvantaged children via targeted interventions. Proposal 3 is reducing unintended pregnancies for low-income women, especially via raising awareness about long-acting reversible contraceptives.

(7) Proposal 4 is designing effective mentoring programs for disadvantaged youth, which could raise lifetime earnings by approximately $7,500 while only costing around $1,600 per child. Proposal 5 is expanding summer employment opportunities for low-income youth, which would cost around $2,000 per participant. Proposal 6 is addressing the academic barriers to higher education, such as by providing college remediation classes.

(8) Proposal 7 is expanding apprenticeship opportunities, which could raise earnings by an average of $78,000 over three years after leaving the program, while costing around $5,500 per apprentice. Proposal 8 is improving employment outcomes for disadvantage students, by incentivising

public colleges to offer class in high-return fields. $2 billion in expenditures could provide funding for the occupational training of 2 million individuals, with wage gains of up to 30%. Proposal 9 is providing disadvantaged workers with skills to succeed in the labour market via the Workforce Innovation and Opportunity Act, increasing earnings by between $300 and $900 a quarter.

(9) Proposal 10 is supporting low-income workers through refundable child-care credits. Proposal 11 is expanding the EITC, such as increasing the after-tax income of one-child EITC by $1,000 to around the same as for two-child families, raising 410,000 people out of poverty. Proposal 12 is encouraging and subsidising work sharing to reduce unemployment during economic downturns, which could have saved 12.5% of the jobs lost during the Great Recession. Proposal 13 is designing thoughtful minimum wage policy at a state or local level, considering median wages and local costs such that there is a minimal impact on employment. Proposal 14 is using predictive analytics and rapid-cycle evaluation to improve service delivery.

## 6.3. Postwar Business Cycles (Knoop 2015).

(1) The study of business cycles demonstrates that they are not cyclical - they do not exhibit a regular pattern. It is therefore worth investigating the characteristics of postwar business cycles up till 2007. There is also a question of whether there has been any moderation in output fluctuations in the postwar era compared to before, as that would be strong circumstantial evidence validating advances in business cycle theory.

(2) The 1945-1961 period was characterised by small, regular business cycles. After the initial 19% and 2.8% drops in 1946 and 1947, there short and mild recessions in 1948-1949, 1953-1954, 1957-1958 and 1960-1961. The drops in the immediate postwar years stabilised because durable goods consumption and housing spending increased, financed by wartime savings. Unemployment remained stable due to women leaving the labour force and soldiers going to college via the GI Bill. Each of the recessions were preceded by sharp but temporary decreases in the money supply, and they were all aggregate demand recessions. Real GDP grew at 2.1% on average, while unemployment crept up from 3% in the early 1950s to 4$ by the late 1950s. Inflation was greater than 2% in many years, suggesting that aggregate supply may have decreased. By and large, the Fed was learning from its mistakes and coupled with the automatic stabilisers from the New Deal program, recessions were short and controlled.

(3) The 1961-1969 expansion lasted 106 months and was the longest in American history till the 1990s expansion. Real output growth averaged 4.5% a year with investment and consumption respectively growing at 8% and 9% a year on average. Increases in money supply, increased government spending on Vietnam and the Great Society, as well as reductions in taxes all spurred aggregate demand. The failure of the 1968 Johnson tax increase to slow above-trend output growth was because its temporary nature meant households paid for this out of their savings, anticipating future tax reductions. This was a blow to the Keynesian paradigm, and seen as evidence for the Lucas critique of stabilisation policy. Another unanticipated consequence was accelerating inflation, going from 1.5% in 1964 to 5% by 1969, with the Fed cutting money growth in 1965 and 1969. This led to a recession from 1969-1970, with unemployment rising to 5.8%. However, inflation rose to 5.5% in 1970, leading to the period of stagflation.

(4) The collapse of the Penn Central Railroad shook financial markets, leading to the Fed increasing the money supply. This spurred economic activity and rising inflation till 1973, even in spite of Nixon's wage and price controls. The abandonment of the Bretton Woods system of fixed exchange rates allowed further money growth, whereas previously it was impossible to devalue the dollar. By 1973, inflation had risen to 5.9% and real GDP growth to 5.3%, but began to slow in the autumn. This was due to the OPEC oil embargo in October 1973 increasing the price of a barrel of oil from $3 to $12. The 1973-1975 recession was the worst since the 1930s, with unemployment rising from 4.8% to 8.9% from trough to peak and inflation rising to 12.1% by 1975. This discredited much of Keynesian economics as well as monetarism, as the recession was largely driven by supply factors. When the embargo was loosened in 1975, the Fed assisted by increasing money growth such that inflation grew from 6.4% in 1976 to

8.9% in 1979. The question of why the Fed persisted in increasing money supply even during times of healthy output growth might be because they were wrong about the natural rate of unemployment. However, the increasing oil prices, government price controls, structural unemployment from the failing automobile and steel industries, as well as the entry of baby boomers and more women all raised this natural rate. In the spring of 1979, the Iranian revolution led to another jump in oil prices from $14 to $29 a barrel. However, the 1980 recession was the shortest in American history, and six months later it was over due to the relaxation of monetary policy and credit restrictions. However, inflation continued to rise from 7.3% in 1979 to 8.5% in 1980, setting the stage for a campaign to reduce inflation with the election of Reagan in 1980.

(5) The 1981-1982 recession was America's deepest since the Depression, with unemployment peaking at 10.8%. The Volker Fed decreased money growth to drive down inflation, at the expense of increases in unemployment. This drove inflation down to 3.6% in two years, with inflation expectations and wages adjusting downwards rapidly to this credible commitment. By late 1982, the Fed was ending its monetarist experiment and loosened monetary policy, providing the foundation for a protracted expansion lasting till 1990. This was reinforced by Reagan's fiscal policy that had large defense increases, income tax reductions and budget deficits. The OPEC cartel collapsed in 1986, dropping oil prices from $27 back to $14, leading to around 3% output growth and inflation annually, as well as unemployment falling to below 5% by the end of the decade. Even the 1987 stock market crash, which erased around wealth equivalent to 20% of annual GDP, had no serious impacts due to the Fed's management. The expansion stopped by 1990, due to the supply shock of the 1990-1991 Gulf War, a 1990 tax increase and new financial regulations. The Fed had also tightened money growth in 1990 in response to inflation fears, alongside the world economy slipping into recession and reducing exports.

(6) Following the Gulf War, consumer expectations and money growth rebounded strongly, with the longest expansion in American history from 1991 to 2001. Unemployment reached a 40-year low by 2000, raising questions of whether the USA had entered a new era of permanently higher productivity growth and faster improvements in living standards without the threat of inflation. Real wages grew by 1.3% a year during that decade, the highest real wage growth since the 1950s, while home ownership reached 68%, the highest in history. Those with college education jumped from 40% to 57%, while capital inflows amounted to $2.3 trillion in net foreign investment. This new economy was driven by supply-side improvements, with globalisation, the deregulation of financial markets and advances in management systems all contributing. Expansionary and accommodative monetary policy kept interest rates low and provided high levels of cheap credit to fuel growth. Tight fiscal policy, with a 1993 tax increase, a reduction in military spending and increases in tax receipts allowed budget surpluses upwards of 2% of GDP by the end of the decade. Perhaps the biggest influence was the IT revolution, with the real cost of information processing falling by 10-20% a year during the 1990s.

(7) The 2001 recession was difficult to spot - NBER did not recognise a recession had began until it ended, and it took 20 months after it ended for NBER to recognise it being over. The size of the recession was only a 0.5% drop in output and lasted only eight months. Stock prices fell by roughly 40% from their highs. Fixed business investment fell by 5.6% a year during 2001 and 2002, with sharp reductions in IT equipment investment. There was a jobless recovery, with international political turmoil and corporate scandals affecting the business environment and causing a 30% fall in the Consumer Confidence Index from its 2000 high. Fiscal and monetary policy were aggressive, with tax cuts in 2011 leading to a $250 billion surplus in 1999 to turn into a $300 billion deficit by 2003. The Fed dropped the funds rate from 6.5% in 2000 to 1% by mid-2003, while the money supply grew at 12% a year.

(8) The low interest rates financed the housing mortgage, with 40% or $2.4 trillion worth of all home mortgages being refinanced between 2001 and 2003. Debt levels continued to rise from 2003 to 2007, while real wage growth stagnated. Much of the wealth that was created was held in appreciations in the housing and financial markets.

(9) The interwar period was enormously volatile, with changes in output being 2.5 times more volatile than the prewar or postwar periods. Compared to previous eras, the postwar period until the last decade was generally a period of declining volatility in output growth and inflation, bar the 1970s. Output volatility was between one-third and one-half of what it was before World War Two, while inflation volatility fell 80%. There has also been a trend of duration stabilisation where recessions were seven months shorter and expansions two years longer, with only 20% of the postwar period in recession compared to 40% prewar. This Great Moderation was particularly notable in the 1960s and in the New Economy of 1985-1997. In part, this was caused by the diversification of the American economy, which benefited the financial markets and allowed investment to be less volatile. The switch towards services and nondurables which have less volatile demand, alongside the increased use of energy-saving technology that reduced the reliance on volatile energy prices also helped. Management improvements in supply-chain logistics and just-in-time procedures reduced the variation in the most volatile component of GDP.

(10) However, what is perhaps most important has been the use of macroeconomic stabilisation policy. In the prewar period, government spending average 2% of GDP and macroeconomic policy didn't exist. Indeed, the evidence suggests that automatic fiscal stabilisers, monetary stimulus and a good dose of luck explain most of the reduction in volatility. However, there have also been cases of self-inflicted problems, with the Fed overreacting to control inflation.

### 6.4. If, When, How: A Primer on Fiscal Stimulus (Elmendorf and Furman 2008).

(1) Economists view monetary policy as the first line of defense for three reasons 1. the Fed can adjust faster than Congress with the delivery lag being less 2. the Fed is better equipped to judge the timing and magnitude of the needed stimulus 3. poorly crafted fiscal stimulus can have long-run economic harm. However, the benefit of automatic fiscal stabilisers operates in parallel to this, with Auerbach and Feenberg (2000) estimating that at a federal level, they offset around 8% of any decline in GDP.

(2) A key potential strength of discretionary fiscal stimulus is that it can boost economic activity more quickly if implemented well. It is also useful if the Fed reaches its zero lower bound and if monetary policy is neutered due to an unwillingness for lenders to lend or borrowers to borrow. Furthermore, if policymakers want to achieve full employment with higher interest rates, fiscal policy can do so whereas monetary policy would lower interest rates.

(3) The first principle of fiscal stimulus is that it should be timely. If it is mistimed, it could stimulate an economy that is already growing, leading to over-expansion and higher inflation. However, Dynan and Elmendorf (2001) show that estimates of GDP tend to miss turning points, making it uncertain whether fiscal stimulus is appropriate. One approach is to go ahead with a tax cut or spending increase. Another is to wait for more economic data and only engage in stimulus when a greater slowdown or even negative growth is projected. A third possibility is to enact a stimulus now that only takes effect if a specific triggering event occurs. For example, Feldstein (2007) suggested a stimulus beginning after a three-month cumulative decline in payroll employment and ending after employment rises to its pre-downturn level. This would avoid the typical delay and boost confidence, although it would be ignoring many other economic indicators.

(4) The second principle of fiscal stimulus is that it should be well-targeted. It should be directed such that each dollar generates the largest possible increase in the short-run GDP. It should also be directed to provide the greatest benefit to people who are most affected by an economic slowdown. These two goals are complementary, as the macroeconomic impact of fiscal stimulus is largest when it targets lower-income households, which are more liquidity-constrained and unable to smooth their consumption over the business cycle. Although the stimulus can have a multiplier effect, the higher interest rates from a long-run deficit mitigates investment, while the consumer spending may end up being for imports.

(5) Between 2001 and 2003, there were several packages of fiscal stimulus. From July to September 2001, stimulus involved income tax rebates worth $38 billion across 90 million households. It was coupled with bonus depreciation, which offered a temporary tax incentive for business investment. Johnson, Parker and Souleles (2007) found that households spent two-thirds of the rebate in the 6 months after receiving it, with low-income families spending a larger fraction of their rebates than the average. However, Cohen and Cummins (2006) reported that only 10% of businesses considered the incentive to be an important factor in their decisions about the level and timing of investment. Fed econometric models confirm that federal purchases are more effective than tax cuts, which are more effective than investment tax credits. They also note that temporary stimulus can be much more cost-effective due to the reduced effect on the long-run budget deficit and interest rate. Furthermore, it suggests that targeting the poor is very important.

(6) The third principle of stimulus is that it should be temporary. In the long-run, fiscal stimulus will simply lead to tighter monetary policy, and budget deficits that reduce national saving will lower investment, which determines the capital stock and long-run growth trajectory. The increased interest rate from the deficit will also restrain investment decisions.

(7) As such, some effective options include extending unemployment insurance temporarily, increasing food stamps temporarily and using flat, refundable tax credits (which actually get to the over 25 million working households without income tax liability). Less effective options include increasing infrastructure investment and temporary investment tax incentives. The least effective option is reducing tax rates permanently.

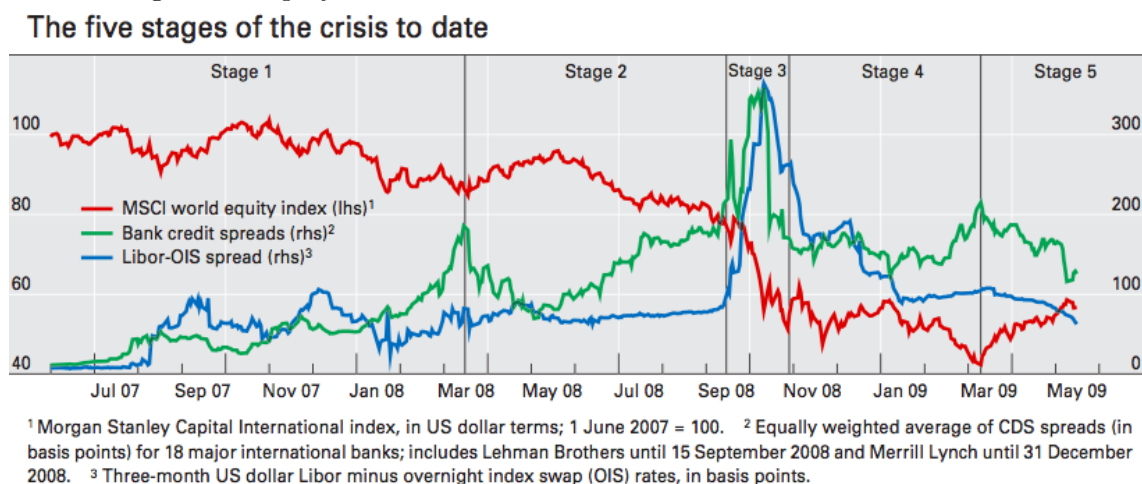## 6.5. What Have We Learned about Fiscal Policy from the Crisis (Romer 2011).

(1) The pre-crisis consensus was that macroeconomic fluctuations were under control, with financial disruptions and the ZLB being unimportant and our policy being driven by DSGE models. This consensus has been shattered. There are four fiscal policy lessons.

(2) The first is that we need fiscal tools for short-run stabilisation, and can no longer rely on monetary policy exclusively. The zero lower bound is a significant constraint that non-conventional monetary tools cannot completely compensate for.

(3) The second is that we have stronger evidence than pre-crisis that fiscal stimulus is very effective.

(4) The third is that fiscal space matters. A look at China, Korea and Australia demonstrate the value of having the ability to engage in large fiscal expansions.

(5) The fourth is that political economy considerations are incredibly important. Most countries did not adopt back-loaded fiscal contraction together with short-run stimulus, in large part due to a public pressure that suggested government stimulus would be profligate.

## 7. The Financial Crisis and International Trade/Finance

## 7.1. The Global Financial Crisis (Bank of International Settlements 2009).

(1) The financial crisis began with the subprime mortgage-related turmoil between June 2007 and mid-March 2008. This was primarily a problem of funding liquidity, with bank losses continuing to accumulate as cyclical deterioration led to renewed asset price weakness. The second stage of the crisis from March to mid-September 2008 involved funding problems translating into solvency concerns. The demise of Lehman Brothers on 15 September triggered the third stage - a global loss of confidence. This was arrested by unprecedented policy intervention, culminating in a fourth stage of gloomy outlooks from late October 2008 to mid-March 2009. The fifth stage began in mid-March 2009, marked by signs that markets were regaining some optimism even while normalisation was far away.

(2) These five stages are displayed below.

**The five stages of the crisis to date**



[1] Morgan Stanley Capital International index, in US dollar terms; 1 June 2007 = 100.   [2] Equally weighted average of CDS spreads (in basis points) for 18 major international banks; includes Lehman Brothers until 15 September 2008 and Merrill Lynch until 31 December 2008.   [3] Three-month US dollar Libor minus overnight index swap (OIS) rates, in basis points.

(3) The first stage was where concerns over US subprime mortgage loans escalated into wider financial stress. From June 2007, it was clear that there were large-scale vulnerabilities in subprime mortgages, with the use of leverage and off-balance sheet financing. This meant that supposedly low-risk assets were funded on a rolling basis by short-term loans. The losses on the underlying asset disrupted this funding model, triggering turmoil in interbank markets by 9 August 2007. As valuation losses mounted, the pressure on bank balance sheets led to a severe liquidity shortage at Bear Stearns in mid-March 2008, forcing a government-facilitated takeover by JP Morgan Chase. Although this prevented outright bank failure, it left the financial system weakened.

(4) The second stage involved financial asset prices coming under pressure after the brief respite of the 16 March takeover. Interbank markets did not recover after the Bear Stearns rescue, with the spreads between interbank rates for term lending and overnight index swaps continuing to be significantly above pre-August 2007. Despite central banks intervening to support money market functioning, there was a reluctance by banks to commit to lending activities involving other banks. As weakness in the housing market continued, the government-sponsored enterprises of Fannie Mae and Freddie Mac faced credit spreads on their debt and on mortgage-backed securities they underwrote had risen back to levels last seen in March 2008. Equity prices fell by over 70% from end-May levels. Credit spreads tightened and equity prices recovered as the US Treasury increased a line of credit for GSEs on 13 July 2008.

(5) However, bank funding needs and counterparty risk remained uncertain in money markets. Thus, LIBOR-OIS spreads remained elevated globally in spite of central bank actions, such as the Fed's Term Auction Facility providing longer-maturity loans. Due to news of larger than expected losses in August, shares for Fannie and Freddie fell to levels unseen since the late 1980s. Without confidence in solvency, the US government took control on 7 September, which turned the focus to bank balance sheets. Investment banks and Lehman Brothers in particular experienced pressure due to their exposure to impaired assets, funding and leverage. Spreads on CDS insuring Lehman's debt surged caused the firm's clearing agent to demand power to seize collateral and short-term creditors to cut lending lines. Coupled with weak results for the third quarter. shares fell by 45% on 9 September and fell more in the next few days, leading to speculation of a Bear Stearns-style takeover in the weekend of 13-14 September.

(6) With Lehman filing for Chapter 11 bankruptcy on 15 September, there was a crisis of confidence across markets and countries, with many fearing that financial institutions were facing the risk of default. This third stage meant liquidty support was insufficient, with policy having to switch to system-wide bank recapitalisations. As emerging markets were hit by collapsing exports and tighter financing conditions, the global nature of the crisis was clear. Luckily, the CDS market was more shielded that expected from the Lehman bankruptcy. Firstly, a special trading session on 14 September allowed main CDS dealers to rebalance their books through the replacement of trades and net out counterparty positions. Secondly, AIG, which held more than $440 billion of positions in CDS contracts, received a government support package on 16

September. This prevented AIG from failing, insulating clients' balance sheets from CDS risk. Thirdly, Lehman's CDS exposures ended up smaller than expected.

(7) However, the initial opacity meant funding markets came under pressure. In particular, money market mutual funds were pressured by losses from short and medium-term notes issued by Lehman. Reserve Primary, manager of the fastest growing US fund family announced on 16 September it was breaking the buck i.e. less than one dollar's worth of net assets for each dollar invested. This was unprecedented for a major money market mutual fund, and was the second time it had happened for any money market fund. This led to an unprecedented volume of money market fund redemptions i.e. a bank run on them, forcing the liquidation of assets into an illiquid market. This spilled over into the markets for commercial paper and bank certificates of deposit, with CP volumes plummeting by $325 billion from $1.76 trillion. This increased demand for US dollar interbank funds, causing short-term credit to seize up. This acute systemic pressure forced UK and US authorities to suspend short selling, while the US Treasury announced a temporary guarantee for money market fund investors. Equity markets recovered and the S&P 500 rose by 4% on 19 September, with its European counterparts rising by 8%. However, the pressure persisted, with the UK nationalising mortgage lender Bradford & Bingley and European governments providing capital injections to insurance company Fortis. When the House of Representatives voted down the Treasury's $700 billion plan to take troubled assets off the books of financial institutions, the S&P 500 fell by 8.8% and the major CDS index spreads surpassed the highs from the Lehman failure. Emerging market stocks as measured by the MSCI index continued to drop, losing 40% of its level just before Lehman.

(8) This widespread fear was arrested by a round of coordinated cuts in policy rates by six major central banks, with the UK announcing bank recapitalisation plans on 8 October and the Fed increasing dollar swap lines on 13 October. On 14 October, the Treasury portioned $250 billion of the $700 billion rescue package to recapitalise banks. This led to easing pressure as liabilities became quasi-governmental debt, with the three-month US dollar LIBOR-OIS spread falling below 100 basis points by January 2009. Conditions stabilised similarly across the globe, with emerging markets being supported by the IMF and the Fed's expansion of swap lines to include emerging economies.

(9) With crisis of confidence being concluded, it transitioned into the fourth stage of uncertainty regarding financial sector stability and the likelihood of a deepening global recession. For example US 10-year yields fell to a record low of 2.05%, with the previous records being 2.10% in 1941. This was broadly true across the world, especially in the early parts of 2009 although unlike the the panic in September 2008, it was more differentiated.

(10) By mid-March, the fifth stage had been reached as asset valuations improved. This was due to further policy action, with the BoE announcing they would buy private sector assets and government bonds and the Fed announcing it would acquire up to $300 billion of long-term Treasury securities. The financial sector was more optimistic, with the S&P 500 rising by 29% between 9 march and end-April. However, there was still market dysfunction as evidenced by the the LIBOR-OIS spread staying above pre-crisis levels. Normalisation was clearly a protracted process.

## 7.2. Does Third World Growth Hurt First World Prosperity? (Krugman 1994).

(1) The idea that Third World competition threatens living standards in advanced countries seems straightforward. Suppose someone has learned to do something that used to be my speciality. If they are willing to work for a fraction of my wage, won't I either be out of a job or have a lower standard of living? However, this is misleading - when world productivity increases as Third World countries converge, average world living standards must rise. This suggests that the extra output will be reflected in higher Third World wages i.e. foreign competitors who cut prices may lower my wage but also raise my purchasing power. It is unclear why the adverse effect would dominate. In order to understand this world. let's consider some models of the world.

(2) Suppose our first model. Let's imagine a world where one good, chips, is produced using one input, labour. All countries produce chips, but labour is more productive in some places. In the absence of capital and differentiation, the determinant of wages would be what they produce i.e. annual real wage in chips would be equal to the number of chips each worker produced in a year. The CPI would include nothing but chips, with each country's real wage in terms of CPI equalling the productivity of labour in each country. Arbitrage would keep chip prices the same across the world, making relative wages the ratio of their workers' productivity. If a country with previously low wages and low productivity increased its productivity, it would see its wage rates increase, with no effect on other high wage countries.

(3) Clearly this is a simplification. For one, the homogeneity of products makes one wonder why international trade is necessary. This is confirmed in real life by advanced industrial nations only spending 1.2% of their combined GDPs on imports of manufactured goods from newly industrialising economies in 1990. Another issue is the lack of capital for investment, although more than 70% of national income accrues to labour in the USA. Finally, the idea that wages rise with productivity may seem like a simplification, but that has held constant throughout history. As such, this model points to the fact that 1. an increase in Third World labour productivity causes an increase in wages for Third World workers 2. it is ambiguous whether the effect on First World economies is adverse.

(4) Trade in manufactured goods between the First and Third Worlds is largely an exchange of sophisticated high-technology goods for labour-intensive ones. Theoretical and empirical work suggests that the impact of productivity growth abroad on domestic welfare depends on the bias of that growth i.e. in what sectors it occurs. As such, our second model involves many goods with one input of labour. Suppose two regions - North and South. This world produces high-tech, medium-tech and low-tech goods. Northern labour is more productive in all categories, but most advantaged in high-tech, moderately so in medium-tech and least so in low-tech. A likely outcome is where high-tech is produced only in the North, low-tech only in the South and medium-tech in both. Competition will ensure that the ratio of the wage rate in the North to in the South is the ratio of their productivity in the area where they compete - medium-tech.

(5) If we suppose Northern labour is ten times as productive in HT, five times in MT and two times in LT. The Northern wage will be five times as high as in the South. As such, unit labour costs in the South for LT will be two-fifths compared to the North, and twice as high for HT compared to the north. This means Southern LT workers receive one-fifth of the Northern wage, even though they are half as productive as Northern LT workers. If Southern productivity increases in LT, there is no effect except to raise real wages by making LT goods cheaper. If it rises in MT, relative Southern wages will rise. Since productivity has not risen in LT production, LT prices will rise and reduce real wages in the North. If it rises equally in LT and MT, the relative wage rate will rise but be offset by the productivity increase. The prices of LT goods in terms of Northern labour will stay constant, keeping Northern real wages constant.

(6) This is clearly a less predictable situation with two salient points 1. the way growth in the Third World hurts the First World is due to rising wages increasing the price of exports, not because of undercutting 2. this should appear in the terms of trade i.e. the ratio of export to import prices - however, the terms of trade of developed economies has improved by 12% from 1982 to 1992. As such, we reach the same conclusion that productivity growth leads to higher Third World wages.

(7) Most labour doesn't move internationally, while international investment does. In theory, these flows into Southern countries could lower Northern wages. Let's add capital into the model, while remembering that the productivity of labour depends on how much capital it has to work with. If Third World countries became more attractive for First World investors, this means capital is not invested at home, causing Northern productivity and wages to fall. However, during the 1980s there was essentially no net North-South investment, with the peak of emerging market investment in 1993 totalling $100 billion. Compared to the combined investment of $3.5 trillion across North America, Western Europe and Japan in 1993, this is minuscule, reducing

the growth in capital stocks by less than 0.2% and wages by around 0.15%. Most capital is going to domestic budget deficits, and the US has run up more than \$3 trillion in federal debt since 1980, which is equivalent to over ten times the amount invested in emerging economies by all advanced economies combined.

(8) Finally, let us consider that there are two kinds of labour - skilled and unskilled, with the ratio of unskilled to skilled being much higher in the South. One would expect the ratio of skilled to unskilled wages to be lower in the North than in the South. As such, the North would export skill-intensive goods and services. Functionally, the two countries exchanging skill-intensive goods for skill-unintensive goods are trading skilled for unskilled labour. In effect, it makes Northern skilled labour scarcer, which would raise the wage it commanded. This could theoretically lead to greater inequality in wages with a higher premium for skill. There should be a factor price equalisation, where the wages of low-skilled Northern workers declining towards Southern levels. Since trade with low-wage countries is such a small amount of GDP, the net flows of labour embodied in trade are fairly small, although that evidence is less secure.