# An application: Pension systems and transitions

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Abstract

The classical IS-LM model does not have inflation and inflation expectation in it; it is exogenous. The LM curve shifts as the price level changes and subsequently the real money supply changes assuming the money stock stays the same. The decreasing interest rate pressure on the private sector translates into an accelerating rise in investments. Suppose an economy is at unemployment equilibrium. Inflation is stable so the central bank has no price-caused reason to intervene. To stimulate the economy, the central bank cuts (nominal) interest rate horizon.

One type frequently discussed is when expansionary fiscal policy reduces investment spending by the private sector. The government spending is "crowding out" investment because it is demanding more loanable funds and thus causing increased interest rates and therefore reducing investment spending. This basic analysis has been broadened to multiple channels that might leave total output little changed or even smaller.

As Keynesian economics, the Phillips curve provided a menu of tradeoffs for policy-makers: They could use demand management policies to increase output and decrease unemployment, but this could only be done at the expense of higher inflation.

Keywords: IS-LM model; dynamic general equilibrium (DGE); Monetary Policy, Policy Design and Consistency; discrete regression; prices; econometric methods

JEL classification: C13; E44; E41; E21

## 1 Introduction

National reform in monetary sector has been and remains a fundamental issue. Fiscal policy plays a key role in the process of macroeconomic stabilization, but also in the process of anchoring to European Union standards. The proposal of a country to adopt a pension reform, be it a progressive or a budget deficit adjustment, is being looked at very carefully at this time. The second decade of the 21st century has changed a lot, with the Moldovan economy facing a severe recession (2015 and 2020 due to the COVID-19 pandemic), with fiscal policy facing challenges to implement new ways to stabilize the way out of this collapse. Even now, more than 29 years after independence, in which pension reform has played a major role in the management of public finances, the situation of contradictory debates among economists about the benefits of a single tax system persists. Some authors as Blannchard (1985), Heijdra and Ligthart (1998), Benttendorf (1998) see the strengths in the simplicity and correctness that emerges from the tax code with its application, lower costs, given that individual agents live in two different periods and seek analytically the applicability of fiscal policy, but also from here a compliance of the single tax rate (18%) could influence consumer behaviour compared to the actual fiscal structure, the elimination of ballast losses characteristic of progressive current income tax, the effect on business and foreign investors, simplification of bureaucracies, etc. Other authors Seo, Inamura and Ando (2001), however, come to criticize, arguing that the adoption of a “flat tax” type of tax system can lead to double taxation. Given that opinions are divided, this fiscal policy measure is considered useful as long as the conditions of a fixed tax regime are fully respected. In this paragraph we aim to analyse the impact of adopting a tax mechanism on the population.

Paul Samuelson once stated that “macroeconomics, even with all of our computers and with all of our information is not an exact science and is incapable of being an exact science”. Perhaps this quote captures the view that the field of macroeconomics, the study of aggregate behaviour of the economy, is full of loose ends and inconsistent statements that make it difficult for economists to agree on anything.

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While there is truth to the fact that there are plenty of disagreements among macroeconomists, we believe such a negative view is unwarranted. Since the birth of macroeconomics as a discipline in the 1930s, in spite of all the uncertainties, inconsistencies, and crises, macroeconomic performance around the world has been strong. More recently, dramatic shocks, such as the Great Financial Crisis or the Covid pandemic, have been managed – not without cost, but with effective damage control. There is much to celebrate in the field of macroeconomics.

Macroeconomics was born under the pain of both U.S. and UK's protracted recession of the 1930s. Until then, economics had dealt with markets, efficiency, trade, and incentives, but it was never thought that there was place for a large and systematic breakdown of markets. High and persistent unemployment in the U.S. required a different approach.

The main distinctive feature to be explained was the large disequilibrium in the labour market. How could it be that a massive number of people wanted to work, but could not find a job? This led to the idea of the possibility of aggregate demand shortfalls – and thus of the potential role for government to prop it up, and, in doing so, restore economic normalcy. "Have people dig a hole and fill them up if necessary" is the oft-quoted phrase by Keynes. In modern economic jargon, increase aggregate demand to move the equilibrium of the economy to a higher level of output.

Thus, an active approach to fiscal and monetary policy developed, entrusting policy makers with the role of moderating the business cycle. The relationship was enshrined in the so-called Phillips curve, a relationship that suggested a stable tradeoff between output and inflation. If so, governments simply had to choose their preferred spot on that tradeoff.

Then things changed. Higher inflation in the 60s and 70s, challenged the view of a stable tradeoff between output and inflation. In fact, inflation increased with no gain in output, the age of stagflation had arrived. What had changed?

The answer had to do with the role of expectations in macroeconomics.1

The stable relationship between output and inflation required static expectations. People did not expect inflation, then the government found it was in its interest to generate a bit of inflation – but that meant people were always wrong! As they started anticipating the inflation, then its effect on employment faded away, and the effectiveness of macro policy had gone stale.

The rational expectations revolution in macroeconomics, initiated in the 1970s, imposed the constraint that a good macro model should allow agents in the model to understand it and act accordingly.

This was not only a theoretical purism. It was needed to explain what was actually happening in the real world. The methodological change took hold very quickly and was embraced by the profession. As a working assumption, it is a ubiquitous feature of macroeconomics up to today. Then an additional challenge to the world of active macroeconomic policy came about. In the early 1980s, some macroeconomists started the "real business cycles" approach: they studied the neo-classical growth model – that is, a model of optimal capital accumulation – but added to it occasional productivity shocks. The result was a simulated economy that, they argued, resembled on many dimensions the movements of the business cycle. This was a dramatic finding because it suggested that business cycles could actually be the result of optimal responses by rational economic agents, thereby eschewing the need for a stabilizing policy response. What is more, active fiscal or monetary policy were not merely ineffective, as initially argued by the rational expectations view: they could actually be harmful.

This was the state of the discussion when a group of economists tackled the task of building a framework that recovered some of the features of the old Keynesian activism, but in a model with fully rational agents. They modelled price formation and introduced market structures that departed from a perfectly competitive allocation. They adhered strictly to the assumptions of rational expectations and optimization, which had the added advantage of allowing for explicit welfare analyses. Thus, the New Keynesian approach was built. It also allowed for shocks, of course, and evolved into what is now known as dynamic stochastic general equilibrium (DSGE) models.

Macroeconomic policymaking evolved along those lines. Nowadays, DSGE models are used by any respectable central bank. Furthermore, because this type of model provides flexibility in the degree of price rigidities and market imperfections, it comprises a comprehensive framework nesting the different views about how individual markets operate, going all the way from the real business cycle approach to specifications with ample rigidities.

But the bottom line is that macroeconomics speaks with a common language. While differences in world views and policy preferences remain, having a common framework is a great achievement. It allows discussions to be framed around the parameters of a model (and whether they match the empirical evidence) – and such discussions can be more productive than those that swirl around the philosophical underpinnings of one's policy orientations.

## 2 Literature Review

Let us put our OLG framework to work in analyzing the topic of pensions, a particularly suitable topic to be discussed using this framework. This is a pressing policy issue both in developed and developing countries, particularly in light of the ongoing demographic transition by which fewer working-age individuals will be around to provide for the obligations to retired individuals.

It is also a controversial policy issue because the question always looms as to whether people save enough for retirement on their own. Also, even though the models of the previous paper[1] suggested there may be instances in which it may be socially beneficial to implement intergenerational transfers such as pensions, this hinged on a context of dynamic inefficiency that was far from established. And then, if the economies are not dynamically inefficient, should the government interfere with the savings decisions of individuals? These are interesting but difficult policy questions. Particularly because it confronts us head-on with the difficulties of assessing welfare when there is no representative agent. Also, because, as we will see, once general equilibrium considerations are taken into account, sometimes things turn out exactly opposite to the way you may have thought they would!

So, let's tackle the basics of how pension systems affect individual savings behaviour and, eventually, capital accumulation. As in the previous paper, the market economy is composed of individuals and firms. Individuals live for two periods (this assumption can easily be extended to allow many generations). They work for firms, receiving a wage, and also lend their savings to firms, receiving a rental rate. If there is a pension system, they make contributions and receive benefits as well.

In addition to including the time dimension of fiscal policy, any persuasive analysis of this subject should include the general equilibrium effects of policy choices on endogenous economic variables such as interest rates, wages, and savings. The scientific innovation and novelty stems from the fact that studying fiscal policy in a dynamic general equilibrium model involves a number of issues thar are nor present in static models. These include treatment of expectations, aggregation of the behavior of overlapping generations, and solving for the equilibrium transition path of the economy. The difficulties in obtaining either qualitative or quantitative analytical results in any but extremely simple and highly unrealistic dynamic models influenced our decision to use a computer simulation model to study the dynamics of fiscal policy. Although this methodological approach to analyzing fiscal policy issues is commonplace, the model developed here appears to be unique in that it can be used to study the effects of a wide range of important fiscal policies on intertemporal general equilibria under the assumption of ration expectations

## 3 Fully funded and pay-as-you go systems

There are two types of pension systems. In pay-as-you-go, the young are taxed to pay for retirement benefits. In the fully funded regimes, each generation saves for its own sake. The implications for capital accumulation are radically different.

Let $d_t$ be contribution of a young person at time $t$, and let $b_t$ be the benefit received by an old person at time $t$. There are two alternative ways of organizing and paying for pensions: fully funded

[1] **Fiscal Reform in the Republic of Moldova. Stochastic Dynamic General Equilibrium (SDGE) simulation.** Al-Farabi 9th International Conference on Social Sciences. May 2-4, 2021 Nakchivan, Azerbaidjan

and pay-as-you-go. We consider each in turn.

**Fully funded system** Under a fully funded system, the contributions made when young are returned with interest when old:

$$b_{t+1} = (1+r_{t+1})\, d_t \qquad (1)$$

This is because the contribution is invested in real assets at the ongoing interest rate. Pay-as-you-go system Under a pay-as-you-go system, the contributions made by the current young go directly to the current old:

$$b_t = (1+n)\, d_t \qquad (2)$$

The reason why population growth pops in is because if there is population growth there is a larger cohort contributing than receiving. Notice the subtle but critical change of subscript on the benefit on the left-hand side.

There are many questions that can be asked about the effects of such pension programs on the economy. Here we focus on only one: Do they affect savings, capital accumulation, and growth?[2] With pensions, the problem of an individual born at time *t* becomes.

$$\text{Max } \log(c_{1t}) + (1+\rho)^{-1} \log(c_{2t+1}) \qquad (3)$$

subject to

$$c_{1t} + s_t + d_t = w_t \qquad (4)$$

$$c_{2t+1} = (1+r_{t+1}) s_t + b_{t+1} \qquad (5)$$

The first-order condition for a maximum is still the Euler equation

$$c_{2t+1} = \left(\frac{1+r_{t+1}}{1+\rho}\right) c_{1t} \qquad (6)$$

Substituting for $c_{1t}$ and $c_{2t+1}$ in terms of $s$, $w$, and $r$ implies a saving function

$$s_t = \left(\frac{1}{2+\rho}\right) w_t - \frac{(1+r_{t+1})d_t + (1+\rho)b_{t+1}}{(2+\rho)(1+r_{t+1})} \qquad (7)$$

Again, savings is an increasing function of wage income, and is a decreasing function of contributions and benefits – leaving aside the link between those, and the general equilibrium effects through factor prices. These will mean, however, that savings will be affected by the pension variables in a complicated way.

With Cobb-Douglas technology, the firm's rules for optimal behaviour are

$$r_t = \alpha k_t^{\alpha-1} \qquad (8)$$

and

$$w_t = (1-\alpha) k_t^{\alpha} = (1-\alpha) y_t \qquad (9)$$

## 4 Fully funded pension system

Fully funded systems do not affect capital accumulation. What people save through the pension system they dissave in their private savings choice.

Let us start by looking at the effect of this kind of program on individual savings. (The distinction between individual and aggregate savings will become critical later on.) We can simply insert (1) into (7) to get

[2] See Feldstein and Bacchetta (1991) for a good non-technical introduction to some of the other issues, including distribution, risk, and labour market implications.

$$s_t = \left(\frac{1}{2+\rho}\right) w_t - d_t \quad (10)$$

Therefore,

$$\frac{\delta s_t}{\delta d_t} = -1 \quad (11)$$

In words, holding the wage constant, pension contributions decrease private savings exactly one for one. The intuition is that the pension system provides a rate of return equal to that of private savings, so it is as if the system were taking part of that individual's income and investing that amount itself. The individual is indifferent about who does the saving, caring only about the rate of return.

Hence, including the pension savings in total savings, a change in contributions *d* leaves overall, or aggregate savings (and, therefore, capital accumulation and growth) unchanged. To make this clear, let's define aggregate savings as the saving that is done privately plus through the pension system. In a fully funded system the aggregate savings equals

$$s_t^{agg} = s_t + d_t = \left(\frac{1}{2+\rho}\right) w_t \quad (12)$$

This is exactly the same as in previous example, without pensions.

## 5 Pay-as-you-go pension system

Pay-as-you-go pension schemes reduce the capital stock of the economy.

To see the effect of this program on savings, insert (2) into (7) (paying attention to the appropriate time subscripts) to get

$$s_t = \left(\frac{1}{2+\rho}\right) w_t - \frac{(1+r_{t+1})d_t + (1+\rho)(1+n)d_{t++1}}{(2+\rho)(1+r_{t+1})} \quad (13)$$

This is a rather complicated expression that depends on dt and dt+1 – that is, on the size of the contributions made by each generation. But there is one case that lends itself to a simple interpretation.

Assume $d_t = d_{t+1} = d$, so that contributions are the same per generation. Then equation (13) becomes

$$s_t = \left(\frac{1}{2+\rho}\right) w_t - d\left[\frac{(1+r_{t+1})d_t + (1+\rho)(1+n)}{(2+\rho)(1+r_{t+1})}\right] \quad (14)$$

Note that, from an individual's perspective, the return on her contributions is given by *n*, and not *r*. This return depends on there being more individuals to make contributions to the pension system in each period – you can see how demographic dynamics play a crucial role here!

From (14) we have

$$\frac{\delta s_t}{\delta d_t} = -\frac{(1+r_{t+1})d_t + (1+\rho)(1+n)}{(2+\rho)(1+r_{t+1})} < 0 \quad (15)$$

We can see contributions decrease individual savings – and, in principle, aggregate savings, as here they coincide (see the caveat below). Why do private and aggregate savings coincide? Because the pension system here is a transfer scheme from young to old, and not an alternative savings scheme. The only source of capital is private savings $s_t$.

## 6 How do pensions affect the capital stock?

So far we have asked what happens to savings holding interest and wages constant – that is to say, the partial equilibrium effect of pensions. In the case of a fully funded system, that is of no consequence, since changes in contributions leave savings – and hence, capital accumulation, wages, and interest rates – unchanged. But it matters in the case of a pay-as-you-go system.

To examine the general equilibrium effects of changes in contributions within the latter system, recall that capital accumulation is given by

$$k_{t+1} = \frac{s_t}{1+n} \tag{16}$$

Substituting (14) into this equation we have

$$k_{t+1} = \left(\frac{1}{2+\rho}\right)\frac{w_t}{1+n} - h(k_{t+1})\, d \tag{17}$$

where

$$h(k_{t+1}) = \frac{1+(1+\rho)(1+n)(1+r_{t+1})^{-1}}{(1+N)(2+\rho)} \tag{18}$$

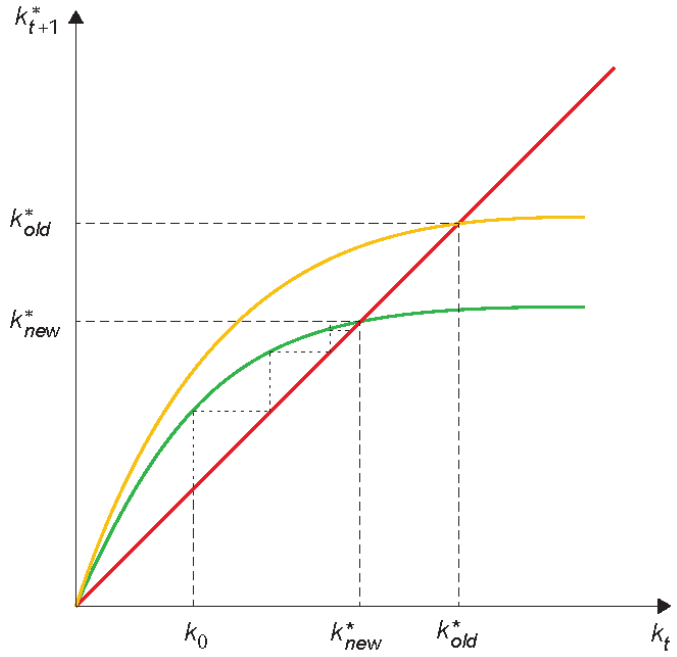
$$= \frac{1+(1+\rho)(1+n)(1+\alpha K_{t+1}^{\alpha-1})^{-1}}{(1+N)(2+\rho)} \tag{19}$$

and where $h'(k_{t+1}) > 0$ (Note the use of (8) above.)

Next, totally differentiating (17), holding $k_t$ constant, and rearranging, we have

$$\frac{\delta k_{t+1}}{\delta d_t} = -\frac{h(k_{t+1})}{1+h'(k_{t+1})} < 0 \tag{20}$$

Therefore, the effect of an increase in contributions in a pay-as-you-go system is to shift down the savings locus. The consequences appear in Figure 1. The new steady-state capital stock is lower. If the capital stock at the time of the policy shock is to the left of the new steady state, the economy continues to accumulate capital, but at a rate slower than before the change.




## 7 Pensions and welfare

Is this a desirable outcome? Does it raise or lower welfare? Suppose before the change dt = 0, so the change amounts to introducing pensions in a pay-as-you-go manner. Who is better off as a result?

The old at time t, who now receive total benefits equal to (1+n)dt and contribute nothing, are clearly better off. What about other generations? If r was less than n before the introduction of pensions, then the policy change reduces (perhaps totally eliminates) dynamic inefficiency, and all other generations benefit as well. In that case, introducing pensions is Pareto improving. The

recent work suggests that this possibility is not as remote as one may have previously thought. In fact, this idea has colored some recent policy thinking about reform in places like China[3].

But if r is equal to or larger than n before the introduction of the pension system, then the policy change creates a conflict. The old at time t still benefit, but other generations are worse off. In this case, introducing pensions is not Pareto improving. Even if that is the case, this by no means implies that it is always a bad idea politically, or even that is always socially undesirable. The point is that there will be winners and losers, and the relative gains and losses will have to be weighed against one another somehow.

## 8 Moving out of a pay-as-you-go system

The effects on the capital stock from transitioning from a pay-as-you-go system to a fully funded system depend on how the transition is financed. If it is financed with taxes on the young, the capital stock increases. If it is funded by issuing debt, the capital stock may decrease

There are several transitions associated with the introduction or revamping of pensions systems, and that we may want to analyze. For example, you could move from no pension system and implement a full capitalization system. As aggregate saving behavior does not change, we do not expect anything really meaningful to happen from such change in terms of capital accumulation and growth. (That is, of course, to the extent that rational behavior is a good enough assumption when it comes to individual savings behavior. We will get back to this pretty soon when we talk about consumption.) Alternatively, as discussed above, if we implement a pay-as-you-go system, the initial old are happy, while the effect for future generations remains indeterminate and depends on the dynamic efficiency of the economy.

However, in recent years it has become fashionable to move away from pay-as-you-go systems to fully funded ones. The reasons for such change is different in each country, but usually can be traced back to deficit and sometimes insolvent systems (sometimes corruption-ridden) that need to be revamped. But one of the main reasons was to undo the capital depletion associated with pay-as- you-go systems. Thus, these countries hoped that going for a capitalization system would increase the capital stock and income over time.

In what remains of this chapter we will show that what happens in such transitions from pay-as-you-go to fully funded systems depends very much on how the transition is financed. There are two options: either the transition is financed by taxing the current young, or it is financed by issuing debt. Both have quite different implications.

To make the analysis simple, in what follows we will keep $n = 0$. (Note that this puts us in the region where $r > n$, i.e. that of dynamic efficiency.)

Aggregate savings without pensions or with a fully funded system are

$$s_t^{agg} = \left(\frac{1}{2+\rho}\right) w_t \tag{21}$$

With a pay-as-you-go system, they are

$$s_t^{agg} = s_t = \left(\frac{1}{2+\rho}\right) w_t - \frac{(1+r_{t+1})d+(1+\rho)d}{(2+\rho)(1+r_{t+1})} \tag{22}$$

which is trivially lower (we knew this already). So now the question is how savings move when going from a pay-as-you-go to a fully funded system. You may think they have to go up, but we need to be careful: we need to take care of the old, who naturally will not be part of the new system, and their retirement income has to be financed. This, in turn, may have effects of its own on capital accumulation.

[3] As an example, check out this headline: 'China hopes social safety net will push its citizens to consume more, save less' (Washington Post, July 14, 2010).

## 9 Financing the transition with taxes on the young

If the transition is financed out of taxes, the young have to use their wages for consumption ($c_{1t}$), private savings ($s_t$), to pay for their contributions ($d$ and also for taxes $\tau_t$):

$$c_{1t}+s_t+\mathrm{d}+\tau_t=w_t \tag{23}$$

Future consumption is in turn given by

$$c_{2t+1}=(1+r_{t+1})s_t + (1 + r_{t+1})d \tag{24}$$

as we are in a fully funded system. Because taxes here are charged to finance the old, we have $\tau_t = \mathrm{d}$ (remember we have assumed population growth to be equal to zero). If you follow the logic above, it can be shown that in this case we have

$$s_t^{agg} = \frac{(w_t-\tau_t)}{(2+\rho)} \tag{25}$$

You may notice that this is lower than the steady-state savings rate (next period, i.e. in 30 years, there are no more taxes), but you can also show that it is higher than in the pay-as-you-go system. To do so, replace $\tau_t$ with d in (25) and then compare the resulting expression with that of (22).

So savings goes up slowly, approaching its steady-state value. These dynamics are what supports World Bank recommendations that countries should move from pay-as-you-go to fully capitalized systems. Notice however that the reform hurts the current young that have to save for their own and for the current old generation. Then remember that one period here is actually one generation, so it's something like 30 years. What do you think would be the political incentives, as far as reforming the system, along those lines?

**Financing the transition by issuing debt**

Now let's think about how things would change if the transition is financed by issuing debt. (Maybe that is a politically more palatable option!) In this case, for the current young there are no taxes, and debt is another asset that they can purchase:

$$C_{1t} + s_t + d + g_{debt} = w_t \tag{26}$$

so consumption in old age can be

$$C_{2t+1} = (1 + r_{t+1})s_t+(1+r_{t+1})d + (1 + r_{t+1})g_{debt} \tag{27}$$

Following the same logic as before, private savings are

$$s_t = \frac{w_t}{(2+\rho)} - d - g_{debt} \tag{28}$$

How about aggregate savings? Note that contributions to the fully funded system d, work as savings from an aggregate perspective: they are available to finance the accumulation of capital. However, the amount of debt issued by the government is in fact not used for capital accumulation, but rather for consumption, because it is a transfer to the old. As such, aggregate savings are given by

$$s_t^{agg}=s_t + d = \frac{w_t}{(2+\rho)} - g_{debt} = \frac{w_t}{(2+\rho)} - d \tag{29}$$

where in the last step we use the fact that (under no population growth) the government issues $g_{debt} = \mathrm{d}$ of debt to pay benefits to the current old.

Let's see how this compares to the pay-as-you-go savings. Rewriting equation (22) which shows

the savings rate in a pay-as-you-go system

$$s_t^{agg} = s_t = \left(\frac{1}{2+\rho}\right) w_t - d\frac{(1+r_{t+1})+(1+\rho)}{(2+\rho)(1+r_{t+1})} \quad (30)$$

Notice that if

$$\frac{(1+r_{t+1})+(1+\rho)}{(2+\rho)(1+r_{t+1})} < 1, \quad (31)$$

then in this case savings is even lower than in the pay-as-you-go system, which happens because the government now pays r on its debt, which in this case is higher than n.
Another way to see this is if the government imposed a fully funded system but then makes the pension firms purchase government debt that is used for the current old (i.e. for consumption). There is no way this type of reform can increase the capital stock.

**10 Discussion**

The above discussion embodies the dimensions of intergenerational equity, the potential efficiency effects, and also the importance of how policies are implemented. Moving from a pay-as-you-go system to a fully funded one is not immune to the way the transition is financed. This should capture your attention: you need to work out fully the effects of policies!

Pension reform has been an important debate in developed and developing countries alike. In the 1990s there was an emerging consensus that moving to a fully funded system would be instrumental in the development of local capital markets. This view triggered reforms in many countries. Here we want to discuss two cases that turned out very different: those of Argentina and Chile[4].

Chile, for many years, was considered the poster-child for this reform. It implemented a change to a fully funded system in 1980. Furthermore, this was done at a time of fiscal consolidation. In the framework of the previous section, this is akin to the current working-age generation saving or their own retirement, as well as to pay for their contemporaneous old. As the theory suggested, the resources were deployed into investment, the savings rate, and Chile had a successful growth spurt, which many observers associated with the reform.

Argentina, on the other hand, also migrated to a fully funded system, but rather than streamlining the budget, the deficit increased. In fact, it increased by an amount not very different from the loss in pension funds that were now going to private accounts. In the framework of the previous section, this is akin to financing the transition with debt.

As we saw, in this case the reform reduces savings and, in fact, there was no discernible development of Argentine capital markets. The inflow of contributions into the pension funds went directly to buy government debt. But it was even worse: the bloating of the deficit increased the government's explicit debt. Of course, the counterpart was a reduction in future pension liabilities. But the market was not persuaded, and in 2001 Argentina plunged into a debt crisis. Many observers associated this macroeconomic crisis to the pension reform. A few years later, Argentina renationalized the pension system, moving away from a fully funded approach. The temptation to do so was big. The current generation basically ate up the accumulated, albeit little, capital stock, again, as predicted in our simple OLG specification.

While the contrast with Chile could not be starker, the system there eventually also came under attack. The math is simple. If the return to investments is 5%, an individual that contributes 10% of her wage to a pension system for say, 42 years, and has an expected pension life of 25 years, can actually obtain a replacement ratio of close to 100% (the exact number is 96%). But reality turned out to be far from that. When looking back at the evidence, the average retirement age in Chile has been around 62 years, and the pension life 25 years. However, people reach retirement with, on average, 20 years of contributions, not 42. This allows for a replacement ratio of only 24%. It is this low replacement ratio that has been the focus of complaints. Thus, most of these attempts eventually introduced some sort of low income protection for the elderly.

[4] Chile is perhaps the best-known example, with its pioneering move in the early 1980s. (See also Feldstein's discussion.) For a discussion of the real-world pitfalls, Google this NYT article from January 2006: "Chile's Candidates Agree to Agree on Pension Woes".

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## 12 Notes

1 It is important to notice, however, that technological change is not only relevant to manufacturing, but similarly has significant impacts in other sectors of the economy. A good

example of this is increased productivity in agriculture, which has been essential for accelerated economic growth in many developing countries.

2 According to some analysts, the distribution of income among all people in the world has become more equal over the last two decades.

3 It has also had negative impacts on income distribution. During the 1970s, for instance, demand for skilled workers in heavy and chemical industries pushed up domestic wages and increased wage differentials between skilled and unskilled workers.

4 The validity of official inequality measures has been questioned, however.

5 These included reduction in tariff levels, tariff dispersion and elimination of major non-tariff restrictions.

6 Moldova is on the other extreme, having increased its openness to trade five times between the early eighties and the first years of the current decade.

7 Job creation has shifted towards the private services sector, in both highly remunerated activities (financial services, telecommunications, etc.) and activities with low barriers to entry, such as informal commerce and personal services (UN ECLAC, 2004a).

8 In 2000, income levels in the informal sector were 72 per cent lower than those pre- vailing in the formal sector on average in the region, up from a 59 per cent differential in 1990.