Rethinking the informal labour from an evolutionary point of view

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Abstract

The model presents the dynamics and the equilibrium of an overlapping generation economy when there is informal employment, a pension system and altruistic agents. The model inspires from stylised facts on developping and Euro-Mediteranean countries where family plays a central role in risk insurance. The rational is emphasised by lower costs compared to private and public insurance systems. Given an initial distribution of the informally employed individuals, the model captures the effects of social security decisions and anticipated bequests on the choice of the agents about accessing formal or informal labor market segments. The impact of fiscal policies on this distribution is analysed when opportunist politicians are considered. The opportunist behaviour would amplify the relative size of the informal employment.

1 Introduction

Reforms of pension systems have recently become a major concern in many countries. Since the problem has many dimensions i.e. demographic pattern, characteristics of labour market, economic, governmental and institutional constraints, an optimal pension design is not straightforward and increasingly complicated with interconnections and externalities. Furthermore, the question is highly political and there is a need for a long lasting social agreement,

which makes the final picture even blurrier. Many policy recommendations point out the necessity of parametric and structural pension system reforms combined with active labor market policies to decrease budgetary burdens of pension expenditures. Within this scope, dual labor market that is segmentation into formal and informal employment reveals as a major topic for policy makers especially in developing countries and interestingly enough in developed Euro-Mediteranean countries where informal employment is higher than European average. This part of population who are not participating to public insurance system will probably face welfare fluctuations and generate larger health and pension expenditures to be financed. As the share of informal employment grows the burden of these expenditures on the budget will get increasingly important. Aside from the fact that there is an informal demand of labour there is a striking characteristic on supply side: people may prefer not to insure themselves against these risks of fluctuations in welfare and quality of life. Why individuals accept to work as unregistered?

We can argue that economic and social factors influence the decision making process in a complex interactive manner. We propose an evolutionary model to clarify this process. The model is mainly inspired from the stylised facts about social insurance in developing countries and also Euro-Mediterranean countries where family support is acting as an insurance mechanism against a wide range of risks and may substitute or complete public insurance or any other insurance services as workers and sometimes even public authorities perceive the cost of family support cheaper than public insurance. A similar fact has been revealed by Kotlikoff and Spivak (1981) that found out that family support can substitute as much as 70% of the coverage of a complete annuity market without additional cost or risk such as moral hazard and adverse selection. Bugra and Keyder (2006) underline the role of the family in Turkish welfare regime where under the prevailing unfavorable labour market structure (high level of self employment, unpaid family labour, and informal employment)[1] formal social security system offers very limited social protection and family takes a central role in the insurance against risky situations and substitute formal safety nets to provide care for

[1]In countries where family plays a central role in income insurance, low level of female participation to labour market or high informal female employement is observed due to inadequate labor market conditions i.e. the lack of greater range of part-time jobs and generalised childcare services etc.. High unemployment rate is another factor. The informal sector offers a greater job opportunity with less security.

the elderly[2] and point out the similarities with Southern European social protection model (Ferrera, 1996). Consequently, we take into account this private informal insurance mechanism to analyse the choice of working in informal sector.

An important feature of informal employment in developing countries is that governments do not struggle in an intensive manner to formalise informally employed workers since if informal market is formalised and legal minimum wage and associated payroll taxes are paid, these will induce a higher unemployment and welfare loss. In other words the choice of informal employment based on social realities is coupled with a tolerant government. In Turkey, policy makers have been considering family[3] as the major pillar of public social insurance which caused high non-contributory expenditures and a misconception of public insurance system.

> "The official social policy discourse still refers to the family as the central welfare institution, and defines the role of the government as providing support to the family because it is supposed to fulfil the task of assuring social protection to the individual" Bugra and Keyder (2006).

This lack of consideration is analysed through the behaviour of politicians. When there is initially a large informal labour category we see that under electoral concerns this segment will prevail and there will not be any fight against. Empirical evidence suggests that successful political parties give priority to the interests and liberties of electors and collective demand. As this informal category will benefit both from bequests from social network

[2]In Turkey, the share of informal employment in total employment is estimated to be above 50 percent. First, agriculture still accounts for one-third of the labour force. Second, self-employed and unpaid family workers constitute around 30 percent and 20 percent of employment respectively. Unpaid family workers mainly consist of women in agricultural sector and they constitute the largest category among different groups of informal workers, with self-employed people as the second largest group. The fact that some of these informal workers have access to health services through a formally employed family member appears to be an important factor, which could explain the burden on social security funds financed by premiums paid by formal sector employees and their employers.

[3]The fact that in Turkey, law dated 1976 on non-contributory social protection (Social Protection and Old Age Pension) regime that concerns disabled individuals and elderly who are not covered by any social insurance requires that potential beneficiaires should not have any close relatives reflect that particular outlook where family solidarity and other networks of charity are seen as the proper means of dealing with poverty.

and non-contributory protection regimes, political discourse will respond to this initial segmentation of labour market and contribute even to this segmentation.

2 THE MODEL

This model accounts for labour supply decisions when workers face a segmented labour market and social security decisions are affected by bequests. Time horizon is limited to two periods for an easy interpretation: working period and retirement period. We consider only labour supply decisions. We suppose that there are two types of labour market in the economy: a formal and an informal market. The representative worker can choose to work in the formal or informal segment of labour market given that there is an unemployment risk in formal labour market and there are bequests. We include government and pension system and suppose that any deficit option overcome the financial burden.

2.1 Population

We consider an economy where consumers live two periods: the first period is the working period and the second period is the retirement period. We suppose that population can be summarised into one representative family where a representative working and retired member coexist. There are two types of labour segments in the economy that we classify as formal and informal labour. The superscript $k \in \{F, I\}$ denotes agent category where F is for formal labour and I for informal labour. For the generation t, s_t is the share of formal labour and $1 - s_t$ will be the share of informal labour.

At the first period agent is endowed with one unit of labor that he inelastically supplies in the labor market. We suppose that there is an unemployment probability ε which is uniformly distributed within formal labor category and there are always informal available jobs. We introduce the unemployment as a demand side effect and suppose that the labor demand is short comparing to labor supply. The expected wage for formal employment is then $w^F = (1 - \varepsilon)y^F + \chi\varepsilon y^F$ where y^F is formal wage rate and χy^F is unemployment benefit. w^I is the wage rate in the informal segment.

Remark 1 *We have to emphasize that here the agent does not choose entering the informal segment when he is unemployed long enough. We try to*

capture this factor by including the risk of being unemployed in the formal wage. The latter becomes an expected income

The agents derive utility from consumption of private and public goods. The instantaneous utilities of a working agent $u(c_t^k, g_t)$ and an elderly agent $u(d_t^k, g_t)$ are supposed to have the following properties: $u' \geq 0$ and $u'' < 0$ with c_t^k working period consumption, d_t^k retirement period consumption and g_t public goods and services. The income of formal labour is allocated to consumption c_t^k after the payment of pension contribution, wage income tax and bequest at rates θ and τ and q^k respectively and informal workers consume all their income after bequests. The bequests will constitute the income of the elderly members of their families who are not protected by any social security scheme.

Remark 2 *We suppose that agents do not invest in capital markets without any loss of generality or we may also say that savings are done through social networks and bequests are a kind of saving or social insurance mechanism. The reason behind this is twofold: first there is the social rule to protect elderly members without any social security and second there is the positive probability to work in informal segment and to become a future unprotected elderly member of the family.*

At the second period, both type of workers are retired. Their incomes are after tax pension benefits b_t^k for formal workers and family bequests for informal workers. We consider an unfunded or Pay-As-You-Go (PAYG) scheme. The principle of PAYG is to finance the pension benefits of retirees by the contributions of current workers. Given the contribution rate θ, the budget constraint of PAYG scheme is then as follows:

$$s_t \theta w^F = s_{t-1} b_t^F$$

where the collection of contributions equal the payment of pensions and from this equation we calculate the pension benefit in the formal labour segment as $b_t^F = \frac{s_t \theta w^F}{s_{t-1}}$. At the retirement period, they consume their total incomes. The resulting consumption level for each category and both periods in con-

sideration are given by:

$$\begin{aligned} c_t^F &= (1-\tau-\theta-q^F)w^F \\ c_t^I &= (1-q^I)w^I \\ d_t^F &= (1-\tau)b_t^F = (1-\tau)\frac{s_t\theta w^F}{s_{t-1}} \\ d_t^I &= \frac{s_t q^F w^F + (1-s_t)q^I w^I}{1-s_{t-1}} \end{aligned} \tag{1}$$

Remark 3 *Notice that an elderly informal agent is expected to receive bequests from both category of labour according to their shares. Here population acts like a family as a whole. Both category provides income to informal members. Notice also that the share of formal retired will be* s_{t-1} *and informal retired* $1-s_{t-1}$.

2.2 Labour supply decisions

Given this social framework, the representative worker will choose formal or informal employment when he enters labour market and this choice will determine his first and second period consumption levels and therefore his lifetime utility. We suppose that the representative worker is boundedly rational in the sense that the choice of labour segment is not done based on intertemporal maximisation, instead we suppose that initially economy is populated with agents in both segments of labour market and the population evolves in a manner favouring better performing choices in the long run. We can equally say that the behaviour which gives higher relative payoff will be replicated and its share in the population will increase as long as it performs better than the average payoff.

Since the agent does not perform any intertemporal maximisation, he has to calculate an estimate of lifetime utility for each segment of labour. This is done through the simple calculation of the weighted average of the utility in formal and informal segment $u^F(c_t^F, d_t^F, g_t)$ and $u^I(c_t^I, d_t^I, g_t)$ respectively where the weight is given by p. We suppose that this parameter reflects the intertemporal preference of each type of agent. Thus we have the following

utilities:

$$u^F(c_t^F, d_t^F, g_t) = \underbrace{pu(c_t^F, g_t) + (1-p)u(d_t^F, g_t)}_{u((1-\tau-\theta-q^F)w^F+g_t)+(1-p)u((1-\tau)\frac{s_t\theta w^F}{s_{t-1}}+g_t)} p \quad (2)$$

$$u^I(c_t^I, d_t^I, g_t) = \underbrace{pu(c_t^I, g_t) + (1-p)u(d_t^I, g_t)}_{pu((1-q^I)w^I+g_t)+(1-p)u(\frac{s_t q^F w^F+(1-s_t)q^I w^I}{1-s_{t-1}}+g_t)}$$

The dynamic process determines how population shares corresponding to different choices evolve over time. The evolution of population shares follows the selection of better performing behaviours. We have defined discrete time selection dynamics describing the evolution of the formal in the economy by the following equation:

$$\frac{s_{t+1} - s_t}{s_t} = \alpha(1-s_t)(u^F(c_t^F, d_t^F, g_t) - u^I(c_t^I, d_t^I, g_t)) \quad (3)$$

where α is the velocity parameter. It is clear that better performing choices have a higher growth rate which does not necessarily imply that the average utility grows. The reason is that even if a worker is replaced by a worker choosing a more rewarding labour segment, this new distribution of workers may reduce the utility of some other workers. We will determine stable rest points of this dynamics and most importantly we will explore if starting from an initial positive informal labour segment, the population will evolve in such a way that there will always be a positive percentage of informal labour.

Remark 4 *All the rest points of the evolutionary dynamics are given by the solution of the right hand side of 3. Notice that $s = 1$ and $s = 0$ are rest points of 3. Hoewever we are only interested if an interior solution is stable or not i.e. the stability of $s \in (0,1)$ will be explored. Those rest points may be given by the solutions of the equality of formal and informal expected utility i.e. $u^F(c_t^F, d_t^F, g_t) = u^I(c_t^I, d_t^I, g_t)$.*

This remark will lead us to the following result.

Proposition 5 *If $u^F(c_t^F, d_t^F, g_t)\big|_{s=0} > u^I(c_t^I, d_t^I, g_t)\big|_{s=0}$ there is a stable $s^* \in (0,1)$.*

The proposition states that if the economy is populated by both types of labour then there will always be an informal labour segment because of the specific characteristics of the economy.

Example 6 *When we take the utility function to be* $u(c) = c$ *we get* s^* *is obtained as a function of the fiscal, social security and preference parameters of the economy. We can have a clearer picture when we normalise informal wage to unity and* $w^F = 2w^I$ *and the preference for future consumption is taken to be* $p = 0.5$*. In this case* $s^* = \frac{1-2\tau-2q^F-2\theta\tau}{1-2\tau-2\theta\tau}$ *with* $\frac{\partial s^*}{\partial \tau} = \frac{-4(1+\theta)q^F}{(-1+2\tau+2\theta\tau)^2} < 0$.

We see that the size of the informal sector will grow with the level of income tax. Next we will use this result to analyse the determination an income tax rate.

2.3 Government

In this section we will suppose that income tax rate and government expenditure will be set given the steady state informal labour share. We suppose that the government imposes a tax on wage income ($s_t\tau w^F$) to finance unemployment benefits and government expenditures ($g_t + s_t\varepsilon\chi y^F$). As public budget is balanced public expenditure will follow the determination of income tax rate. The latter in return is set through electoral competition. The budget constraint for the government is then as follows:

$$g_t + s_t\varepsilon\chi y^F = s_t\tau w^F$$

where unemployment benefits and government expenditures equals fiscal revenue as $g_t = s_t(\tau w^F - \varepsilon\chi y^F)$.

The population of voters are the family of workers who have preferences over public and private consumption goods and public good is financed through taxation. The policy that workers must choose is the proportional income tax rate to fund public good. Here labour segments are differentiated by the fact that informal workers will not have to pay income tax while former workers do. The utilities of these four categories of voters are given by the following:

$$\begin{aligned}
u^F(c_t^F, g_t) &= u((1-\tau-\theta-q^F)w^F, s_t(\tau w^F - \varepsilon\chi y^F)) \qquad (4)\\
u^F(d_t^F, g_t) &= u((1-\tau)\frac{s_t\theta w^F}{s_{t-1}}, s_t(\tau w^F - \varepsilon\chi y^F))\\
u^I(c_t^I, g_t) &= u((1-q^I)w^I, s_t(\tau w^F - \varepsilon\chi y^F))\\
u^I(d_t^I, g_t) &= u(\frac{s_t q^F w^F + (1-s_t)q^I w^I}{1-s_{t-1}}, s_t(\tau w^F - \varepsilon\chi y^F))
\end{aligned}$$

Notice that different segments have different preferences over policies. The ideal policy is given by the income tax rate that maximises the utility which depends on income tax rate as well as formal labour share which turns out to be function of income tax rate. Thus fiscal policy acts in the utility of workers through multiple channels. The effect of an increase in income tax on fiscal revenue and therefore public expenditure is twofold, first it increases tax collection for a given taxpayer population second it decreases the share of formal workers who happen to be the only taxpayers in the economy and thus decreases fiscal revenue. The effect of an increase in income tax on public expenditure is the result of these two opposite effects and therefore uncertain. The effect of an increase in income tax on utilities of agents can be classified into the effect on private consumption and public consumption. As we have explained the latter is uncertain and there are negative effects on private consumption for formal young and elderly but no effect for informal young. For informal elderly bequests from formal workers will fall as an increase in income tax increases informal labour share and there will be more informal elderly to share bequests from both segments, the effect is definitely negative.

The population of politicians are supposed to be opportunist that is they do not have any preferences over the policies but they want to win office. The interpretation of this behaviour can be find in the search of a politician for the perks of the office or in the search of a party for the power to implement policies since only in the case the party is elected that it can implement its policies whether they coincide with their promise or not. In this case the electoral competition is a competition over the number of votes.

Proposition 7 *If* $s'(\tau w^F - \varepsilon\chi y^F) + sw^F > 0$ *then* $\tau^L < \tau^* < \tau^H$.

The electoral competition wll result in the choice over a policy which will be closest to every voter. In this case we know that if the condition is satisfied the ideal tax policy of formal young and informal elderly (τ^L) will certainly be less than the preference of formal elderly and informal young (τ^H). The policy choice will lie between those values and therefore favorising informal workers welfare over formal workers welfare.

A The proof the proposition 5

Proposition 5If $u^F(c_t^F, d_t^F, g_t)\big|_{s=0} > u^I(c_t^I, d_t^I, g_t)\big|_{s=0}$ there is a stable $s^* \in (0, 1)$.

We need the following lemma to prove the proposition.

Lemma 8 *Given a population state which consists of both labour segments ($s \in (0,1)$) and a monotonic selection dynamic ξ, s is asymptotically stable if* $(2s-1)(u^F(s) - u^I(s)) < 0$.

Proof. If $(2s-1)(u^F(s) - u^I(s)) < 0$, then $u^F(s^*) > u^I(s^*)$ when $s^* = 0$ and $u^F(s^*) < u^I(s^*)$ when $s^* = 1$. By continuity of utility in population share, there exists a neighborhood N of s^* such that, for all $s \in N - s^*$, $u^F(s^*) > u^I(s^*)$ when $s^* = 0$ and $u^F(s^*) < u^I(s^*)$ when $s^* = 1$. If the dynamics are monotonic, then $\xi(s) > 0$ when $s^* = 0$ and $\xi(s) < 0$ when $s^* = 1$. ■

The Lemma states simply that a population state is asymptotically stable if $u^F(s^*) < u^I(s^*)$ in a population which consist of both labour segments. The proposition now may be proved.

Proof. For $s^* \in (0,1)$ to be asymptotically stable we need the following conditions: $u^F(s^*) < u^I(s^*)$. Notice that the formal expected utility is constant for all $s \in (0,1)$ ($\frac{\partial u^F(s)}{\partial s} = 0$) and the informal utility is increasing over the same interval ($\frac{\partial u^I(s)}{\partial s} > 0$) with $u^F(s)\big|_{s=1} < u^I(s)\big|_{s=1}$ since $pu((1-q^I)w^I + g) + (1-p)u(\lim_{s\to 1}\frac{sq^F w^F}{1-s} + q^I w^I + g) > u((1-\tau-\theta-q^F)w^F + g) + (1-p)u((1-\tau)\theta w^F + g)$ where the utility of informal employment is significantly larger as there less people to share bequests from both segments. Then if we satisfy the condition $u^F(s)\big|_{s=0} > u^I(s)\big|_{s=0}$ we make sure that there is one rest point which is stable. ■