Informal Employment and Pension Reforms: Considering Turkish Pension System in View of Informal Employment*

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Abstract

This paper analyses the Turkish pension system using general equilibrium with overlapping generations. The objective of the paper is to evaluate the effects of current pension policies on macroeconomic aggregates when informal employment is allowed. We introduce a composite factor of formal and informal labour, operating as perfect substitutes, to characterise the labour demand. Given the monitoring of unregistered labour by government and private and public transfers to informal retirees, this specification allow for a characterisation of informal employment in the economy. Ultimately, we aim to find the unregistered employment share and its implications on welfare of all agents.

1 INTRODUCTION

Since the early 1980's, most of the discussions on public social policies are concentrated on the optimality of unfunded pension systems given the fact that pension system deficits are increasing. Unfunded pensions, based on the payment of the retirement benefits of the elderly by the current working generations' contributions, are a common financing choice of pensions in

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many developed and developing countries since this scheme spreads risks and any dynamic political inefficiencies among and within generations. However, publicly managed compulsory unfunded Pay-As-You-Go (PAYG) pensions are often critisised, on one hand for creating distortions to labour supply and saving decisions and for heavily contributing to public deficit on the other hand. The performance of such pension systems is strongly related to demographics, pension parameters and economic performance of the country and as such the main pension issue differ significantly between countries. Developped countries suffer mostly from aging while developping countries struggle with incompliances with the legislation arising from structural shortcomings. In fact, in many developping countries, one of the major structural problems that directly affect the budget of social insurance systems is high levels of informal or more precisely unregistered employment of workers.

The litterature studying informal employment goes back to the work of Lewis (1954) which propose a segmented labour market structure as formal and informal where jobs qualified as "better" e.g. defined over pecuniary and non-pecuniary compensations offered, are rationed. As such, better paying formal jobs with better working conditions are assumed inaccessible by certain workers. The latter are then forced to work in informal jobs with lower wages as well as worse working conditions that fail to meet requirements of legal work codes and public social insurances. This view of segmentation of the labour market has been largely accepted by theoretical works trying to explain large informal employment in developing countries. While such description resulted from theoretical wisdom, empirical studies present contradictory results on the fact that formal jobs would pay higher wages than informal jobs[1]. Other possible explanations of labour market segmentation are based on the level of unionisation in the labour market and on the role of labour market rigidities and distorsions created by labour market regulations and labour taxes. However, the fall in unionisaton level and increase in informal employment in many Latin American countries and Turkey points out to the fragility of such an explanation nowadays[2]. It is obvious that

[1]Magnac (1991) for Colombia, Maloney for Mexico (2004), Pratap and Quintin(2004) for Argentina tested the hypothesis on labour market segmentation as formal and informal and could not find strong evidence to conclude for such a segmentation.

[2]For Turkey data on unionisation levels show that there is substantial fall since 1970's while the informal employment is increasing for the same period. See Bulutay (...???...) for historical data on unionisation levels in Turkey. See Layard et al. (1991) and Gasparini and Tornarolli (2006) for Latin America.

labour taxes have a direct effect on labour cost and may contribute to the size of informal employment in an economy that fails appropriate measures for monitoring and penalisation of incomplainces with regulations. In a similar vein, the approach pioneered by Rauch (1991) emphasizes size duality and argues that small firms are more likely to employ informal labour while large firms tend to comply more with employment regulations. While the previous theoretical contributions are concentrated on the demand side of informal employment, later works such as De Soto (1989) and more recently Maloney (2004) points out to the supply side of this relationship. In fact, they provide information on the fact that informal employment may not be as bad as it is argued and the non-pecuniary rewards of such jobs and alternative employment ethics and insurance networks that they allow should also be considered. An alternative to dualistic explaination of informal employment is provided by Amaral and Quintin (2006). They formalise a unique and competitive labour market where workers are supposed to be indifferent between formal and informal employment and firms differ in their managerial ability, size, access to credit markets and compliance with tax regulations. In this context, the equilibrium occurs where large firms operate formally and small firms informally and a competitive labour market provides equal formal and informal wages for workers with same ability. This paper in on one hand considers the demand for informal labour conditional upon labour taxes, monitoring and incompliance penalties while workers supply inelastically labour formally or informally. Moreover, in line with the recent litterature emphasizing the informal support networks that insure informal employment risks, we allow for family altruism that together with the presence of social protection programs creates moral hazard problems in accepting informal jobs.

This paper is organised a follows: The first part presents a descriptive overview of the informal employment in Turkey. The second part describes the theoretical model; the third part includes calibration of the model and presentation of alternative scenarios. The last section presents simulation results and concludes.

2 The Model

The small open economy consists of three agents: firms, households and government. Firms produce one good that can be used as a consumption and capital good. Households own capital and inelastically supply labour for pro-

duction. Firms use capital and labour as inputs in the production process and have the opportunity to hire unregistered workers, in other words, income taxes and pension contributions of a certain share of their total labour demand are not paid to government. There is an auditing process to catch this illegal employment practice and a penalty imposed in such situations. During retirement period, agents receive pension benefits if they have contributed to social insurance during their working years. Retirees that were unregistered receive transfers from working members of their family. This modelisation allow for a non-market mean of intergenerational risk sharing. We do not include any deficit option for the government, neither for the pension schemes and agents are liquidity constrained.

2.1 Population

All agents are born and enter labour market and following the demand for informal labour, they are distributed to formal and informal jobs. The life span is two periods: working and retirement periods. We describe household behaviour in per capita values and we suppose that households are representative actual and future physical capital owners and consumers of the economy. We suppose that firms register only a part of their employees and remaining employees are working informally. Firms pay pension contribution τ_w on behalf of their registered employees. Firms pay on behalf of their registered workers income tax at rate τ and a pension contribution at a rate θ_u upon gross wage w. Workers on the other hand make private transfers as a family support, at a rate θ_q to retirees that were formerly unregistered and who do not have a pension benefit. Registered workers receive pension benefit b_u from unfunded scheme when they retire. There is no tax on pension benefits. Firms do not pay any income tax and pension contribution for their unregistered employees. Retirees having no income from formal social insurance institution receive transfers $\bar{g}_T$ from the government within the scope of social protection program and private transfers b_q from working members of the family. All individuals are supposed to pay interest income tax at rate τ_r on return of their savings.

2.2 Firms

The production process requires labour and capital and we suppose that firms do not register a part (λ) of total labour employed in the production process

and for cost minimisation purposes employ unregistered workers illegally. We suppose that there is no productivity difference between formal and informal workers, then we can denote two labour inputs as perfect substitutes. We suppose that production technology can be represented by a Cobb-Douglas production function as follows:

$$y(k, l^{1,d}, l^{2,d}) = Ak^{\alpha}(l^{1,d} + l^{2,d})^{1-\alpha} \tag{1}$$

where $l^{1,d}$ is the demand of unregistered labour and $l^{2,d}$ is the demand for registered labour, α is the output elasticity of capital and A is the constant global productivity factor. As firms decide on the share of different types of labour, total labour demand is expressed as follows: $l^d = l^{1,d} + l^{2,d} = \lambda l^d + (1-\lambda)l^d$. We suppose that the production technology has constant returns to scale in labour and private capital and capital depreciates at a constant rate δ. The total cost of one unit of capital is then $(r+\delta)$. The cost of registered workers includes, in addition to gross wage w, a payroll tax at a rate τ_w and the cost of unregistered workers equals net wage of a registered employee (out of income tax and pension contribution). Employment of unregistered labour is subject to the payment of gross wage, payroll tax, a lump sum penalty $\bar{\phi}$ and a proportional penalty ϕ if this behaviour is caught through auditing. We suppose that as auditing is costly, only firms selected randomly are audited or we might equally say that firms are audited with an auditing probability $f(\lambda, s)$ (with $f'_{\lambda} > 0$ and $f'_{s} > 0$) where s is average size of firms in the sector[3]. This can allow for a certain share of tax evasive behaviour in the economy. Remark that firms choose how much unregistered labour they will employ since there are no productivity difference between these workers and there might be cost minimisation in employing workers without registering them. The firm's problem is to maximise the profit per capita Π with respect to labour, capital and evasion from tax:

$$\underset{\{k_t, l_t^d, \lambda_t\}}{Max}\ \Pi_t = y_t - (r+\delta)k_t - (1+\tau_w)w_t l_t^{2,d} - (1-f)(1-\tau-\theta_u)w_t l_t^{1,d} - f(1+\phi+\tau_w)w_t l_t^{1,d} \tag{2}$$

Given the income tax, pension contribution, input prices and penalty rule firms determine their optimal factor demands.

[3] Galiani at al. (2007) points out see paper modeling informal sector formally!!!

2.3 Households

For the determination of income, we have to consider two possibilities because a formal employee and an informal employee caught during inspection have the same lifetime income and if an informal employee is not caught, this employee will have a different retired income. For the first case ($h = 2$), the probability is $m_t = (1 - \lambda_t) + \lambda_t f$ and for the second case ($h = 1$), the probability will be $1 - m_t$. Agents invest in capital market a_t^h given r real interest rate, w wage rate. The utility of an agent h is a function of his instantaneous consumption c_t^h in working period and d_{t+1}^h in retirement period. If we denote the time preferences by ρ, we have the following discounted lifetime utility function:

$$\bar{U}^h = U(c_t^h) + \beta U(d_{t+1}^h) \tag{3}$$

where $\beta = \frac{1}{1+\rho}$ is the subjective discount factor with $\rho \geq 0$, the instantaneous utility is supposed to take the following form: $U(c) = \log c$. The budget constraint becomes:

$$\begin{aligned} c_t^h + a_t^h &= (1 - \tau - \theta_u - \theta_q) w_t \\ d_{t+1}^h &= q_{t+1}^h + \bar{R} a_t^h \end{aligned} \tag{4}$$

where $\bar{R} = (1 + (1 - \tau^r) r)$, c_t^h, $d_{t+1}^h \geq 0$ and $a_t^h \geq 0$ and $a_{t+1}^h = 0$. The restriction on $a_{t+1}^h = 0$ implies that there is no bequest motive at the end of the lifetime and $a_t^h \geq 0$ means that agents are liquidity constrained. The income of the elderly q_t^h is defined as follows:

$$q_t^h = \begin{cases} b_t^u & \text{for } h = 2 \\ b_t^q + \bar{g}_{T,t} & \text{for } h = 1 \end{cases} \tag{5}$$

Agents solve an intertemporal maximisation problem subject to (4) to choose their lifetime consumptions and savings as follows:

$$\underset{c_t^h, d_{t+1}^h}{Max} \left\{ U(c_t^h) + \beta U(d_{t+1}^h) \right\} \tag{6}$$

2.4 Social Insurance

We consider an unfunded (PAYG) scheme and transfers from young to old supplementing this formal social insurance.

2.4.1 Formal social insurance - PAYG

The unfunded PAYG pension scheme is self-financing. The contributions of young registered workrers pay the benefits of registered retirees. The budget constraint is then:

$$(\theta_u + \tau_w)(l_t^{2,d} + fl_t^{1,d})w_t = (l_{t-1}^{2,d} + fl_{t-1}^{1,d})b_t^u \tag{7}$$

The pension benefit of a retired agent is defined by $b_t^u = \varphi_t w_{t-1}$ thus the accrual rate φ_t is equal to $\frac{(\theta_u+\tau_w)(l_t^{2,d}+fl_t^{1,d})w_t}{(l_{t-1}^{2,d}+fl_{t-1}^{1,d})w_{t-1}}$.

2.4.2 Informal social insurance - Altruistic transfer

The retirement of employees that have worked informally and not been caught during inspection is financed by transfers from all working agents. We suppose that young agents share their income at rate θ_q with these elderly having no formal pension benefit. θ_q is determined by social concensus through maximisation of expected utility. Note that only employees working informally when young face the risk of having no pension benefit when retired and these agents will have an incentive to determine $\theta_q^{1,*} > 0$. Young agents working formally would have no intention to provide transfers if only their choice was concerned $\theta_q^{2,*} = 0$. We could argue that an average private transfer rate $\theta_q = (1 - m_t)\theta_{q,t}^{1,*} + m_t\theta_{q,t}^{2,*}$ becomes a social norm through familial bonds and legal enforcement. The private transfer received by an elderly without a formal social insurance b_t^q is given by the following budget constraint:

$$\theta_q l_t^d w_t = (1 - f)l_{t-1}^{1,d} b_t^q \tag{8}$$

where the maximisation of expected utility will provide the level of private transfer rate: $\theta_q = (1 - m_t)\theta_{q,t}^{1,*}$. We see that this rate imposed by social concensus operates as taxation for formal employees.

2.5 Government

We suppose that government collects taxes on wages and interest income and penalties to finance public goods and services (g_t) and social protection transfers for uncovered retired population ($g_{T,t}$). As government can not issue debt, we have to respect the following constraint:

$$g_t + g_{T,t} = w_t(\tau l_t^{2,d} + f(\tau + \phi)l_t^{1,d}) + r\tau^r \sum_h a_t^h \tag{9}$$

where transfers are $g_{T,t} = (1-f)l_{t-1}^{1,d}\chi_T w_t$. The government should determine an optimal level of audit probability as auditing is costly. The cost of auditing a company, $h(\lambda, s)$ is a function of informality and average size of firms. We suppose that government determine the level of auditing by maximising social welfare $W = \Pi + \bar{U} + G$.

2.6 Capital Market

We suppose that savings of households are in form of capital share purchases. We suppose that capital is fully depreciated. Each period, economy's total saving is invested and determines the next period capital stock. We can express the capital market equilibrium as follows:

$$\sum_h a_t^h = k_t$$

2.7 Goods Market

We suppose that the only good produced in the economy is consumed as well as a capital good, private and public consumption good. In equilibrium, sum of consumption of working generations and retirees, government expenditures and investment is equal to output produced in the economy. Goods market equilibrium can be written as follows:

$$y_t = \sum_h (c_t^h + d_t^h + a_t^h) + g_t \tag{10}$$

2.8 Equilibrium

Given a set of policy rules for the government $\{\tau,\ \tau_r,\ \tau_w\}$ and contribution rates to formal PAYG pension scheme $\{\theta_u,\ \theta_q\}$and an initial wealth distribution $\{\bar{a}^h\}$, an equilibrium for this economy satisfies the following: the sequence of decision rules $\{c_t^h,\ d_{t+1}^h,\ a_t^h\}$ solves agents' dynamic optimisation problem, the allocation rule $\{k_t,\ l_t^d,\ \lambda_t\}$solves firms' maximisation problem, PAYG budget is balanced, $\theta_{q,t}^{h,e}$ maximises of expected utility when old, public budget is balanced and all markets clear.

3 Equilibrium and steady state

We can write first order conditions for firm maximisation as follows:

$$\begin{aligned} r+\delta &= \alpha\frac{y_t}{k_t} && \text{(11a)} \\ w_t(1+\tau_w+\lambda_t(f\phi-(1-f)(\tau+\theta_u+\tau_w))) &= (1-\alpha)\frac{y_t}{l_t^d} \\ \frac{df}{d\lambda}\lambda_t+f &= \frac{\tau_w+\tau+\theta_u}{\tau_w+\tau+\theta_u+\phi} \end{aligned}$$

We can write first order conditions for household intertemporal maximisation as follows:

$$\frac{(c_t^h)^{-1}}{\beta(d_{t+1}^h)^{-1}}=\bar{R}$$

We have to use the intertemporal budget constraint $c_t^h+\frac{d_{t+1}^h}{\bar{R}}=(1-\tau-\theta_u-\theta_q)w_t+\frac{q_{t+1}^h}{\bar{R}}$ to get the level of expenditures and consumption. Define $Q_{h,t}=(1-\tau-\theta_u-\theta_q)w_t+\frac{q_{t+1}^h}{\bar{R}}$ as lifetime income. The income for registered employees is $Q_{2,t}=(1-\tau-\theta_u-\theta_q)w_t+(\theta_u+\tau_w)q_{2,t+1}w_t$ where $q_{2,t+1}=\frac{m_t l_{t+1}^d w_{t+1}}{m_{t+1}l_t^d w_t\bar{R}}$ from the pension budget and rules and the income for unregistered employees is $Q_{1,t}=(1-\tau-\theta_u-\theta_q)w_t+\theta_q q_{1,t+1}w_{t+1}+\frac{\bar{g}_{T,t+1}}{\bar{R}}$ where $q_{1,t+1}=\frac{l_{t+1}^d}{(1-m_t)l_t^d\bar{R}}$ from the private transfer rate and rules. The optimal consumption is $c_t^h=\frac{Q_{h,t}}{1+\beta}$ and $d_{t+1}^h=\frac{\beta\bar{R}Q_{h,t}}{1+\beta}$ and $\sum_h(c_t^h+d_t^h)=\frac{(m_t l_t^d Q_{2,t}+(1-m_t)l_t^d Q_{1,t})}{1+\beta}+\frac{\beta\bar{R}(m_{t-1}l_{t-1}^d Q_{2,t-1}+(1-m_{t-1})l_{t-1}^d Q_{1,t-1})}{1+\beta}$. In equilibrium, markets clear: $\sum_h(c_t^h+d_t^h+a_t^h)=y_t$. Equilibrium implies: $\frac{\beta\bar{R}(m_{t-1}l_{t-1}^d Q_{2,t-1}+(1-m_{t-1})l_{t-1}^d Q_{1,t-1})}{1+\beta}+(1-\tau-\theta_u-\theta_q)w_t l_t^d=\left(\frac{\alpha\tilde{w}_t}{(r+\delta)(1-\alpha)}\right)^{\alpha}l_t^d$.

$$\frac{\beta\bar{R}(m_{t-1}l_{t-1}^d((\theta_u+\tau_w)\frac{m_{t-1}l_t^d w_t}{m_t l_{t-1}^d w_{t-1}\bar{R}}w_{t-1})+(1-\tau-\theta_u-\theta_q)w_{t-1}+(1-m_{t-1})l_{t-1}^d(\theta_q\frac{l_t^d}{(1-m_{t-1})l_{t-1}^d\bar{R}}w_t+\frac{\bar{g}_{T,t}w_t}{\bar{R}}))}{(1+\beta)l_t^d}+$$

$$(1-\tau-\theta_u-\theta_q)w_t=\left(\frac{\alpha\tilde{w}_t}{(r+\delta)(1-\alpha)}\right)^{\alpha}$$

$$\frac{\beta(m_{t-1}\frac{(\theta_u+\tau_w)m_{t-1}l_t^d w_t}{m_t}+(1-\tau-\theta_u-\theta_q)\bar{R}w_{t-1}+\theta_q l_t^d w_t+(1-m_{t-1})l_{t-1}^d\bar{g}_{T,t}w_t)}{(1+\beta)l_t^d}+(1-\tau-\theta_u-$$

$$\theta_q)w_t=\left(\frac{\alpha\tilde{w}_t}{(r+\delta)(1-\alpha)}\right)^{\alpha}$$

$$\frac{\beta((\theta_u+\tau_w)m+(1-\tau-\theta_u-\theta_q)\bar{R}+\theta_q+(1-m)\bar{g}_T)}{(1+\beta)}+(1-\tau-\theta_u-\theta_q)=\left(\frac{\alpha\tilde{w}}{(r+\delta)(1-\alpha)}\right)^{\alpha}\frac{1}{w}$$

4 Determination of private transfers

The expected utility in retirement of an employee working informally is $fU(d^2_{t+1})+(1-f)U(d^1_{t+1})$. The expected utility for an informal agent facing the risk of being without social insurance when old is as follows: $u(\theta_q)=(1+\beta)f\log(\frac{Q_{1,t}}{1+\beta})+(1+\beta)(1-f)\log(\frac{Q_{2,t}}{1+\beta})+\beta\log(\beta\bar{R})$. The maximisation of utility implies: $\frac{\partial u}{\partial\theta_q}=f(1+\beta)\frac{1}{Q_{1,t}}\frac{\partial Q_{1,t}}{\partial\theta_q}+(1-f)(1+\beta)\frac{1}{Q_{2,t}}\frac{\partial Q_{2,t}}{\partial\theta_q}+\beta f\frac{1}{Q_{1,t}}\frac{\partial Q_{1,t}}{\partial\theta_q}=0$. We have $\frac{\partial u}{\partial\theta_q}=(1-f)(1+\beta)\frac{-w_t}{Q_{2,t}}+f(1+\beta)\frac{-w_t+\frac{l^d_{t+1}}{(1-m_t)l^d_t\bar{R}}w_{t+1}}{Q_{1,t}}=0$. By replacing lifetime income, the following equation will give the optimal level of private transfers: $\frac{w_t((1-\tau-\theta_u-\theta_q)w_t+\theta_q\frac{l^d_{t+1}}{(1-m_t)l^d_t\bar{R}}w_{t+1}+\frac{\bar{g}_{T,t+1}}{\bar{R}})}{(-w_t+\frac{l^d_{t+1}}{(1-m_t)l^d_t\bar{R}}w_{t+1})((1-\tau-\theta_u-\theta_q)w_t+(\theta_u+\tau_w)\frac{m_t l^d_{t+1}w_{t+1}}{m_{t+1}l^d_t w_t\bar{R}}w_t)}=\frac{f}{1-f}$. $\theta^{1,e}_{q,t}=\frac{(\frac{-1}{1-f}+\frac{f}{1-f}\frac{l^d_{t+1}\gamma_{t+1}}{(1-m_t)l^d_t\bar{R}})(1-\tau-\theta_u)+\frac{f}{1-f}(-1+\frac{l^d_{t+1}\gamma_{t+1}}{(1-m_t)l^d_t\bar{R}})\frac{(\theta_u+\tau_w)m_t l^d_{t+1}\gamma_{t+1}}{m_{t+1}l^d_t\bar{R}}-\frac{\chi_T\gamma_{t+1}}{\bar{R}}}{\frac{1}{1-f}(\frac{l^d_{t+1}\gamma_{t+1}}{(1-m_t)l^d_t\bar{R}}-1)}$ where γ_{t+1} is wage growth. Note that we have determined an optimal level through the choice of informal agents. The formal agents will choose $\theta^{2,e}_{q,t}=0$ as these transfers decrease only income when young and do not generate any effect on lifetime utility and income when retired.

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