Contribution of Prevalence of Fixed-Term Contracts to Italian Youth Unemployment

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Abstract

In this paper, I build a job search and matching model based on baseline DMP, augmented along three dimensions: An aggregate productivity shock, presence of two types of contracts, fixed-term and permanent which brings about labor market rigidity due to firing costs associated with the permanent contracts and presence of two cohorts of workers, young and old who are treated differentially due to the information asymmetry on the part of the firms on worker quality when they face a young worker. Due to this information asymmetry and firing costs, young workers can only get fixed-term contracts(FTC). While the presence of FTCs facilitate their entry into labor market, the unemployment in their cohort reacts more to the aggregate productivity shocks since prevalence of FTCs require more frequent job-to job transitions and these transitions take longer time in aggregate downtruns. Model serves to explain the prevalence of fixed-term contracts among the youth and sharper sensitivity of youth unemployment in contrast to overall unemployment. Model is taken to Italian data and it is able to generate the unemployment patterns in Italy after 2008 financial crisis pretty well.

1 Introduction

Overall impact of the presence of fixed-term contracts on labor market has been a subject of debate in the economic literature. At one side, it is argued that in countries where the permanent jobs are protected with stringent legislation, it facilitates the entry of prospective workers to the labor market.[1] On

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[1]See Picchio (2008)[19] for the Italian case

the contrary, it has been argued that FTCs create labor market segmentation and trap workers in a recurrent sequnce of fixed-term jobs and unemployment spells [2] which brings about significant welfare costs[3] and increases employment vulnerability.[4]

The main aim of this study is to address this debate in the context of youth unemployment. Substantial evidence in the literature shows that youth unemployment is much more sensitive to the aggregate downturns than the overall unemployment[5] and fixed-term contracts prevail among the youth.[6] I will try to address two questions: Why do FTCs prevail among the youth and whether this prevalence is causal in the sharper intensity of the youth unemployment to aggregate downturns.

To that aim, I build a job search and matching model following Kugler and Saint-Paul (2004)[13] and Cahuc et.al (2016)[7]. I build the market structure on the former while borrow the contract structure from the latter. On top of a baseline Diamond-Mortensen-Pissarides (DMP) model, the model features an aggregate productivity shock, labor market rigidity in the form of presence of two types of jobs, fixed-term and permanent, and permanent jobs being protected by dismissal costs and differential treatment of two cohorts of workers, young and old, due to information asymmetry on worker quality on the part of employers, when faced with a young worker.

When young workers enter the labor market, their quality cannot be observed by the employers. In the presence of firing costs, if the probability of a young worker to be of low quality is high enough, the value employers expect to get from offering a permanent contract to a young worker drops below zero. However since there are no firing costs in offering a fixed-term contract to any type of worker, the expected value from FTCs never drop below zero. As long

[2] Boeri (2011)[4]

[3] Blanchard and Landier (2002)[3]

[4] Alvarez and Veracierto (2012)[1]

[5] Junankar (2015)[12] for Australian case, Lopez-Martin et.al (2015)[16], Choudhry, Marelli, Signorelli (2010)[8]

[6] Franchescin (2020)[9], Leonardi and Pica (2015)[14]. See also Figure 8-10 in Appendix.

as firms hire as much labor as they like, they can hire young workers only through FTCs. In such a context, presence of FTCs, facilitate the entry of young people to the labor market.

However, prevalence of FTCs is marked by more frequent job-to-job transitions for those whose FTC was not converted to a permanent contract. In the event of an aggregate downturn, those transitions take longer time making the increase in unemployment in the cohort where the FTCs prevail much sharper. Therefore one would expect that in recessions, youth unemployment would rise more compared to the overall unemployment.

FTCs serve as a blind for the real problem though: employers assigning low probability to young being high quality. In simulations of the model with different parameter values, we see that as the probability of young being high quality increases, youth unemployment rises less in the very same recession. That tells us that, if the ones that enter the labor market become more skilled or their skill sets match the employers' needs better, FTCs serve as a stepping stone for the youth to secure permanent jobs. However as the reverse happens, FTCs become a trap for them to stay in short emloyment and long unemployment spells which would hurt their future employment prospects.

The main contribution of the paper to the labor economics literature is the analysis of the employment protection and as a result emergence of fixed-term contracts to youth unemployment. As stressed above evidence in both theoretical and empirical literature is inconclusive. Cahuc et. al (2016)[7] provides an explanation for the emergence of FTCs comparing the surpluses of FTCs and permanent contracts in a world where the idiosyncratic shock arrival rate differs by the jobs. About its effects, a strand of literature argues that FTCs serve as the stepping stone to secure permanent jobs. Picchio (2008)[19] using data from Bank of Italy's Survey of Household Income and Wealth (SHIW), finds that having a temporary job increases the probability of finding a permanent job 2 years later by 13.5 to 16 per cent. Gagliarducci (2005) [10]

finds that it is not the FTCs per se but the unemployment spells between the fixed-term jobs that harm a worker's future employment prospects.

There are also those who paint a bleak picture. Alvarez and Veracierto (2012),[1] using an islands framework a la Lucas and Prescott (1974)[17] shows that FTCs increase employment vulnerability. Cabrales and Hopenhayn (1997)[6] and Bentolila et. al (2011)[2] show the same effect for the Spanish context. My model will be a synthesis of these two views and will argue that under some conditions both effects may come to pass.

2 Model

2.1 Time and Workers

Economy is endowed with a continuous time $t \in [0, \infty)$ and a unit-measure of risk-neutral workers. The workers can be of two types of age: young and old. Regardless of their age, they can be of two types of quality: high or low. Their productivity is η_H when they are of high type and η_L when they are of low type with $\eta_H > \eta_L$. They do not engage in on-the-job search.

2.2 Information Structure

All workers know their own quality. However when a firm meets a young worker, it cannot observe the worker's quality. It is common knowledge that probability of a young worker to be of high type is z_H. Intuitively, one can think of z_H as the employers' perception of the quality of the education system or overall degree of skill mismatch. Low levels of z_H together with high firing costs makes offering permanent contracts to young workers suboptimal.[7] When a young worker is hired, workers' quality can be observed by the hiring firm but not by the other firms. Firms can observe each other's firing and

[7] I will assume parameter values that make the value of offering a permanent contract to a low type worker negative.

hiring decision but they cannot observe the underlying reason benhind those decisions. When a young worker gets old, worker's quality become common knowledge.

2.3 Firms and Productivity Shocks

Firm productivity per unit of time is given by $y + m + \eta$. y is the aggregate productivity. It is exogenous, common to all firms and they can observe it before they make their firing and hiring decisions. It follows the following Ornstein-Uhlenbeck process:

$$dy_t = \nu(\xi - y_t)dt + \sigma dW_t \tag{1}$$

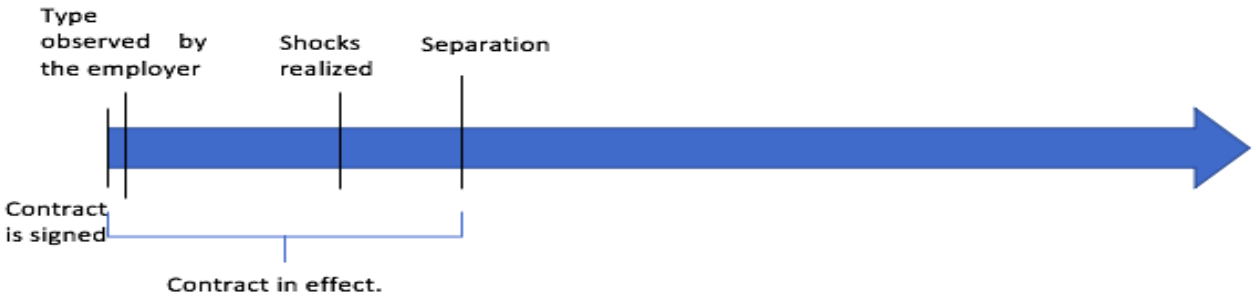
where $\nu > 0$ is mean-reversion parameter, ξ is a constant, $\sigma > 0$ is volatility parameter and W_t is the standard Wiener process. m is the idiosyncratic, match-specific component. $m = \bar{m}$ whenever a match is formed. However, after the formation of the match, idiosyncratic productivity is hit by a shock with Poisson arrival rate γ per unit of time. As in Mortensen and Pissarides (1994),[18] idiosyncratic shocks do not strike productivity down to zero, but after they hit, a new value for the idiosyncratic productivity is drawn from a distribution with cumulative distribution function $G(.)$, with support over $[\tilde{m}, \bar{m}]$. η denotes the worker productivity that can be either η_H or η_L depending on the worker quality.

2.4 Contract Structure

Once firms meet a worker, they can offer either fixed-term or permanent contracts. Permanent contracts are protected by firing cost F that is paid to a third party so that it is a pure waste. Fixed-term contracts, on the contrary, do not feature such a cost. I assume that their duration, Δ, is

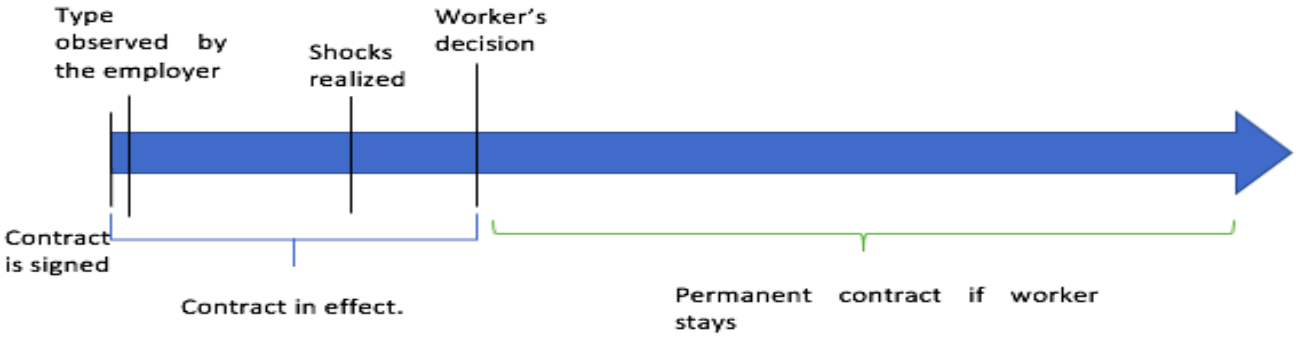
fixed.[8] Once they expire, FTCs can either be terminated with no costs or be converted into a permanent contract if the worker is revealed to be of high type, the idiosyncratic productivity level stays above the threshold that triggers dismissal for permanent contracts and the worker does not choose to separate. We can visualize the timeline for FTCs for low type workers and high type workers who are hit by severe enough idiosyncratic shock with the following diagram:

Figure 1: Timeline for FTCs



For high type workers who were not hit by a severe enough shock:

Figure 2: Timeline for FTCs

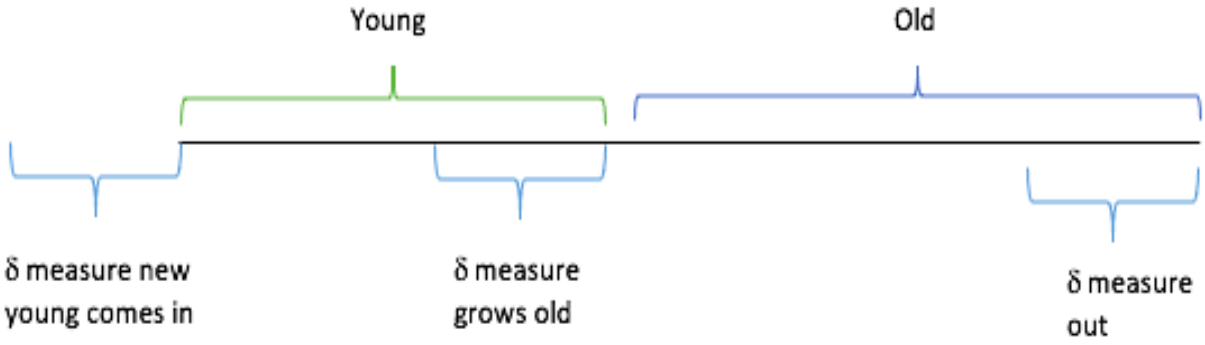


[8] As in Cahuc et. al (2016)[7] I could have endogenized the duration so that firms would decide on the duration to maximize the value, only to complicate the model.

2.5 Demographics

Per unit of time, measure δ of old workers die and they are replaced with measure δ of young workers. Measure δ of young workers get old. These are assumed so that proportion of young and old workers in the entire workforce remains the same over time. We can visualize the demographic dynamics as such:

Figure 3: Demographic Dynamics



Therefore, the effective discount rate for different types of workers is:

$$\phi = \begin{cases} r & \text{if worker is young} \\ \rho = r + \delta & \text{if worker is old} \end{cases} \tag{2}$$

2.6 Matching

As in the baseline DMP, workers and firms are matched through a Cobb-Douglas matching function $\varphi(u, v) = u^{\mu} v^{1-\mu}$ where u is the unemployment measure and v is the vacancy measure. Unemployment and vacancy measures will be different for fixed-term and permanent jobs in each cohort. As in the standard case, I can define $q(\theta) = \frac{\varphi(u,v)}{v}$ as the instantaneous probability of filling a vacancy and $\theta q(\theta) = \frac{\varphi(u,v)}{u}$ instantaneous probability of matching with

a vacancy where $\theta = \frac{v}{u}$ is the labor market tightness indicator. As stressed above this indicator will be different for fixed-term and permanent jobs in each cohort.

2.7 Wages

To simplify the model instead of a Nash bargaining, I assume that wages are equal to some base level $\bar{w}$ plus a constant fraction α of the output:

$$w(y, m, \eta) = \alpha(y + m + n) + (1 - \alpha)\bar{w} \tag{3}$$

In booms, more productive times workers get higher wages. More productive workers get higher wages. One drawback of this simplification is that it gives the same wage to FTCs and permanent contracts. I am aware of substantial evidence suggesting fixed-term jobs pay less than permanent jobs,[9] I abstain from that in this analysis for the sake of simplification.

2.8 Values

For the ease of notation, for all of the Bellman equations below, I suppress the time dependence. For different cohorts I will write different value functions due to difference in continuation values. Value of offering an old worker with productivity η a permanent contract, while aggregate productivity is y and idiosyncratic productivity is m, is:

[9] Booth, Francesconi, Serrano (1997)[5] finds that in Britain men working with a FTC earn 8.9 percent less than men working with a permanent contract. Hagen (2002)[11] in German case, finds this gap as 23 percent.

$$\rho J_{PO}(y,m,\eta) = \overbrace{(1-\alpha)(y+m+\eta-\bar{w})}^{\text{Firm's profit}} +$$
$$\gamma[\underbrace{\int_{m_c(\eta,y)}^{\bar{m}} J_{PO}(y,m,\eta)dG(m)}_{\text{Change of value due to shock}} - \underbrace{G(m_c(\eta,y))F}_{\text{Firing cost}} - J_{PO}(y,m,\eta)] \tag{4}$$
$$+ \dot{J}_{PO}(y,m,\eta)$$

Firm takes into account its flow profit, expected change in value due to aggregate and idiosyncratic shocks and firing costs in the event that idiosyncratic shock drops the match-specific productivity to the firing threshold denoted by $m_c(\eta, y)$. All the Bellman equations that I will write will include the time derivative since I am focusing on business cycle. A steady state analysis would be irrelevant here. $m_c(\eta, y)$ solves $J_{PO}(y, m_c(\eta, y), \eta) = -F$. Once rearranged:

$$J_{PO}(y,m,\eta) = \frac{(1-\alpha)(y+m+\eta-\bar{w}) + \gamma\hat{J}(\eta) + \dot{J}_{PO}(y,m,\eta)}{\rho+\gamma} \tag{5}$$

where $\hat{J}(y,\eta) = \int_{m_c(\eta,y)}^{\bar{m}} J_{PO}(m,\eta)dG(m) - G(m_c(\eta,y))F$. Then:

$$m_c(\eta,y) = \frac{-F(\rho+\gamma) - (1-\alpha)(y+\eta-\bar{w}) - \gamma\hat{J}(\eta) + \dot{J}_{PO}(y,m,\eta)}{1-\alpha} \tag{6}$$

Comparative statics exercises show that $\frac{\partial m_c}{\partial F} < 0$, $\frac{\partial m_c}{\partial y} < 0$, $\frac{\partial m_c}{\partial \eta} < 0$. As firing costs get higher, firms have to tolerate lower levels of idiosyncratic productivity. As aggregate productivity gets higher firms can tolerate lower levels of idiosyncratic productivity. Finally firms can tolerate lower levels of productivity for high type workers since they can compensate it via higher human capital of the worker.

The value of offering a young worker a permanent contract is:

$$
\begin{aligned}
rJ_{PY}(y,m,\eta) &= \overbrace{(1-\alpha)(y+m+\eta-\bar{w})}^{\text{Firm's profit}} + \\
&\gamma[\underbrace{\int_{m_c(\eta,y)}^{\bar{m}} J_{PY}(y,m,\eta)dG(m)}_{\text{Change of value due to shock}} - \underbrace{G(m_c(\eta),y)F}_{\text{Firing cost}} - J_{PY}(y,m,\eta)] \\
&+ \underbrace{\delta(J_{PO}(y,m,\eta) - J_{PY}(y,m,\eta))}_{\text{Change of value due to aging}} + \dot{J}_{PY}(y,m,\eta)
\end{aligned}
\tag{7}
$$

Apart from the discount rate, there is one major difference between (4) and (7).[10] With instantaneous rate δ a young worker gets old and value of the contract changes. Due to the difference in continuation values I have to take into account the change of value when the worker gets old. One can solve for the firing threshold as before.

The value of offering a FTC to an old worker is:

$$
\begin{aligned}
&\rho J_{FO}(y,m,\eta) = \\
&\underbrace{(1-\alpha)\int_0^{\Delta}[(e^{-\gamma\tau}\bar{m} + (1-e^{-\gamma\tau})\int_{\tilde{m}}^{\bar{m}} m dG(m) + (y+\eta-\bar{w}))e^{-\rho\tau}]d\tau}_{\text{Flow profit during the contract}} \\
&+ (1-\theta_{LO}q(\theta_{LO}))(e^{-(\rho+\gamma)\Delta}max[J_{PO}(y,\bar{m},\eta),0] \\
&\underbrace{+(1-e^{-\gamma})e^{-\rho\Delta}\int_{m_c(\eta)}^{\bar{m}} max[J_{PO}(y,m,\eta),0]dG(m))}_{\text{PDV of converting to permanent contract}} \\
&\underbrace{+\theta_{LO}q(\theta_{LO})V_{PO}e^{-\rho\Delta}}_{\text{PDV of posting vacancy if the worker separates}} + \dot{J}_{FO}(y,m,\eta)
\end{aligned}
\tag{8}
$$

In the second line in (8), with probability $e^{-\gamma\tau}$, no idiosyncratic shock will hit and and idiosyncratic productivity will stay at $\bar{m}$. With probability

[10] I assume low enough η_L and high enough F so that value of offering permanent contract to a low type worker regardless of cohort is negative.

$1-e^{-\gamma\tau}$ an idiosyncratic shock will hit and new value will be drawn for m from a distribution with cumulative distribution function $G(.)$. This time it can be any value from $\tilde{m}$ to $\bar{m}$.[11] Firm will get $y+\eta$ and pay $\bar{w}$ anyway. In lines (3)-(4), we have present discounted value (PDV) of conversion to permanent contract in case the worker is not matched with another permanent job and stays which happens with probability $(1-\theta_{LO}q(\theta_{LO}))$ where $\theta_{LO}q(\theta_{LO})$ is instantaneous probability of matching with a permanent vacancy for the old. This permanent job is left intact as long as its value stays above 0. In the final line we have the value of posting a permanent vacancy in case the worker is matched with another permanent job and separates. Value of offering a FTC to a young worker with productivity η is:

$$
\begin{aligned}
&rJ_{FY}(y,m,\eta) = \\
&\underbrace{(1-\alpha)\int_0^{\Delta}[(e^{-\gamma\tau}\bar{m}+(1-e^{-\gamma\tau})\int_{\tilde{m}}^{\bar{m}} mdG(m)+(y+\eta-w))e^{-r\tau}]d\tau}_{\text{Flow profit during the contract}} \\
&+e^{-(r+\gamma)\Delta}max[J_{PY}(y,\bar{m},\eta),0] \\
&\underbrace{+(1-e^{-\gamma\Delta})e^{-r\Delta}\int_{m_c(\eta,y)}^{\bar{m}} max[J_{PY}(y,m,\eta),0]dG(m)}_{\text{PDV of converting to permanent contract}} \\
&+\dot{J}_{FY}(y,m,\eta)
\end{aligned}
\tag{9}
$$

(9) is similar to (8) but lines (3)-(4) are different. Young people do not have luxury to be matched with another permanent job because their quality will still remain unknown to the other employers. Since firms cannot observe each others' firing reason, when the young worker is revealed to be of high type and the young worker turns down the offer to convert the contract to a

[11] According to the legislation FTCs can be terminated before the expiry date only if a fradulent behavior on the part of the employee can be proved. In a context where the bureaucracy is too slow this can be impossible within the short duration of the contract. Therefore, it is safe to assume that m can take any value.

permanent contract, the only option for the young worker is to get another fixed-term job which is not a credible threat on the part of the young worker.

Firms make their hiring decision based on expected present discounted value of the contract they are going to offer. Firms can hire as much labor as they like therefore as long as this value is greater than 0, firm hires the worker. Since the quality of the old workers can be perfectly observed, the value of offering a contract to an old worker is equal to the outputs of the respective value functions. However, for the young workers, firms need to calculate expected present discounted value. Value of offering a permanent contract to a young worker is:

$$\Pi_{PY} = z_H J_{PY}(y, \bar{m}, \eta_H) + (1 - z_H) J_{PY}(y, \bar{m}, \eta_L) \tag{10}$$

and[12] the value of offering a FTC to a young worker is:

$$\Pi_{FY} = z_H J_{FY}(y, \bar{m}, \eta_H) + (1 - z_H) J_{FY}(y, \bar{m}, \eta_L) \tag{11}$$

Finally, we have to define the values of posting vacancies. As stressed above, we have to define different values for different types of contracts offered to different cohorts of workers. Value of posting a fixed-term vacancy to an old worker is:

$$\rho V_{FO} = -\kappa + q(\theta_{FO})(J_{FO}(y, m, \eta) - V_{FO}) + \dot{V}_{FO} \tag{12}$$

where κ denotes the cost of posting a vacancy which is assumed to be same for all types of contracts. θ_{FO} is the labor market tightness for fixed-term jobs for old people. Value of posting a permanent vacancy to an old worker is:

$$\rho V_{PO} = -\kappa + q(\theta_{LO})(J_{PO}(y, m, \eta) - V_{PO}) + \dot{V}_{PO} \tag{13}$$

Similarly θ_{LO} is the labor market tightness for permanent jobs for the old

[12] I assume low enough z_H such that $\Pi_{PY} < 0$.

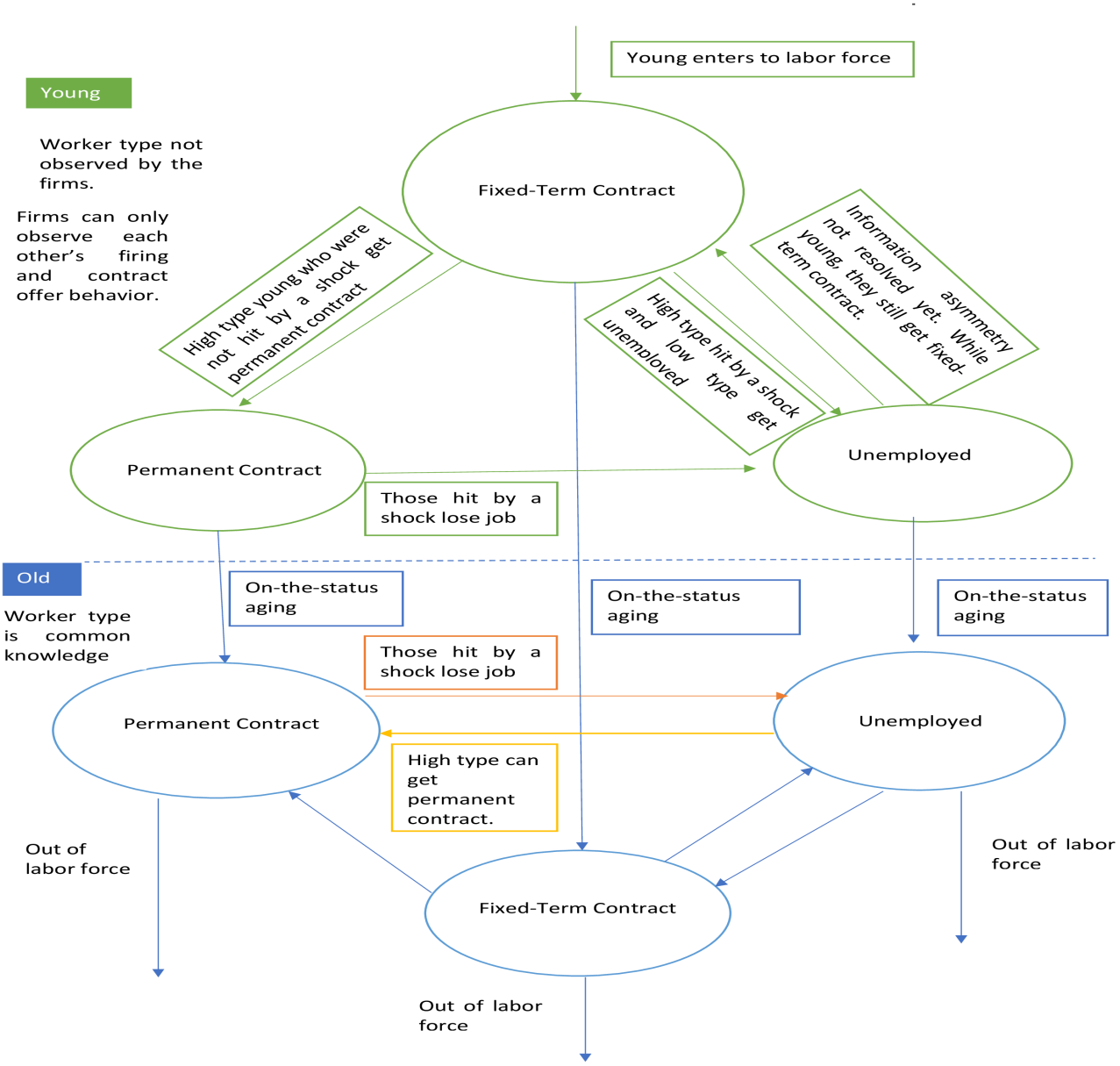
people. Value of posting a vacancy to a young worker is:

$$rV_Y = -\kappa + q(\theta_Y)(\Pi_{FY} - V_Y) + \dot{V}_Y \tag{14}$$

2.9 State Space

After setting the stage for model, I can move on to description of states that summarize it and characterization of their inflows and outflows per unit of time which will be crucial for the analysis of the sensitivity of youth and old unemployment to an aggregate downturn. This economy can be summarized by the vector $\psi = (y, u, g)$. y is aggregate productivity as before. $u = (u_O, u_Y)$ is the unemployment vector where u_O and u_Y denote the masses of unemployed old and young workers respectively. $g = (s_Y, s_O, l_Y, l_O)$ is the employment vector. s and l denote the masses of fixed-term and permanent jobs respectively while the subscript Y and O denote the young and old cohorts respectively as usual. Before moving on to writing down laws of motion for each state, it would be useful to characterize them with a tree featuring a worker's lifespan and his/her career paths:

Figure 4: Inflows and Outflows



In the light of this diagram we can move on to laws of motion:

$$\dot{u}_Y = \underbrace{\delta z_H \gamma G(m_c(\eta_H, y))}_{\text{High type new-comers}} + \underbrace{\delta(1-z_H)}_{\text{Low type new-comers}} - \underbrace{u_Y \theta_Y q(\theta_Y)}_{\text{Unemployed young get new FTC}}$$
$$+ \underbrace{\frac{(s_Y-\delta) z_H \gamma G(m_c(\eta_H, y)) + (s_Y-\delta)(1-z_H)}{\Delta}}_{\text{FTC ends}} - \underbrace{u_Y \delta}_{\text{Unemployed young get old}} \tag{15}$$
$$+ \underbrace{l_Y \gamma G(m_c(\eta_H, y))}_{\text{Losing job due to shocks}}$$

Per unit of time δ new measure of young workers come in and with probability z_H they are of high type. If they are of high type their idiosyncratic productvity drops below the firing threshold at rate $\gamma G(m_c(\eta_H, y))$. Low type new-comers move to unemployment since their contracts are not converted into a permanent one. However while still young and unemployed, they can get a new FTC at rate $\theta_Y q(\theta_Y)$. From those non-new comer young workers whose measure is $s_{FY} - \delta$, high types' contract can end due to idiosyncratic shocks and low types move to unemployment at the end of the contract anyway. Therefore the mass of young workers who move to unemployment due to the expiry of their contract is given by the first-term in the second line. Young get old at rate δ constituting an outflow. Similarly those who get a permanent contract lose their jobs due to idiosyncratic shocks at rate $\gamma G(m_c(\eta_H, y))$.

$$\dot{u}_O = \underbrace{l_O \gamma G(m_c(\eta_H, y))}_{\text{Permanent job lost}} - \underbrace{\frac{s_O z_H \gamma G(m_c(\eta_H, y)) + s_O(1-z_H)}{\Delta}}_{\text{FTC ends}}$$
$$+ \underbrace{u_Y \delta}_{\text{Unemployed young getting old}} - \underbrace{u_O q(\theta_{FO}) \theta_{FO}}_{\text{Old getting FTC}} - \underbrace{u_O z_H q(\theta_{LO}) \theta_{LO}}_{\text{Old getting PC}} - \underbrace{\delta u_O}_{\text{Out of labor force}} \tag{16}$$

We can provide similar explanations for this law of motion. Differently from (15), since their quality can be perfectly observed, high-type old can get a permanent contract while unemployed. Old workers get out of the

labor force at rate δ constituting another outflow from the old unemployment. Young workers who get old while unemployed is a new inflow to the old unemployment.

$$\begin{aligned}\dot{s}_Y = & \underbrace{\delta}_{\text{New-coming young}} + \underbrace{u_Y \theta_Y q(\theta_Y)}_{\text{Unemployed young get new FTC}} \\ & - \underbrace{(s_Y - \delta)\delta}_{\text{Non-new-comer young get old}} - \underbrace{\delta z_H \gamma G(m_c(\eta_H, y))}_{\text{High type new-comers hit by shocks}} \\ & - \underbrace{\delta(1 - z_H)}_{\text{Low type new-comers}} - \underbrace{\frac{s_Y(1 - z_H) + s_Y z_H \gamma G(m_c(\eta_H, y))}{\Delta}}_{\text{FTC ends}}\end{aligned} \tag{17}$$

$$\begin{aligned}\dot{s}_O = & \underbrace{(s_{FY} - \delta)\delta}_{\text{Non-new-comer young get old}} + \underbrace{u_O q(\theta_{FO})\theta_{FO}}_{\text{Unemployed old get FTC}} - \underbrace{s_O z_H (1 - \gamma G(m_c(\eta_H), y))}_{\text{FTC converted to PC}} \\ & - \underbrace{\frac{s_O z_H \gamma G(m_c(\eta_H), y) + s_O(1 - z_H)}{\Delta}}_{\text{FTC ends}} - \underbrace{\delta s_O}_{\text{Out of labor force}}\end{aligned} \tag{18}$$

(17)-(18) are similar but differently from young, high type old can get FTCs converted to permanent contracts if their idiosyncratic productivity does not drop to firing threshold. This happens with probability $(1 - \gamma G(m_c(\eta_H), y))$.

$$\begin{aligned}\dot{l}_Y = & \underbrace{\delta z_H (1 - \gamma G(m_c(\eta_H), y))}_{\text{High type new-comers not hit by severe shock}} \\ & \underbrace{-\delta l_Y}_{\text{On-the-job aging}} - \underbrace{l_Y \gamma G(m_c(\eta_H), y)}_{\text{Losing job due to shocks}}\end{aligned} \tag{19}$$

$$\begin{aligned}\dot{l}_O = & \underbrace{\delta l_Y}_{\text{On-the-job aging}} + \underbrace{s_O z_H (1 - \gamma G(m_c(\eta_H, y)))}_{\text{FTC converted to PC}} + \underbrace{u_O z_H q(\theta_{LO})\theta_{LO}}_{\text{High type unemployed old get PC}} \\ & - \underbrace{\delta l_O}_{\text{Out of labor force}} - \underbrace{l_O \gamma G(m_c(\eta_H), y)}_{\text{Losing jobs due to shocks}}\end{aligned} \tag{20}$$

2.10 Equilibrium

Equilibrium in this economy consists of value functions J_{PO},J_{PY}, J_{FO},J_{FY}, V_{PO}, V_{FO}, V_Y, tightness vector $\Theta = (\theta_{FO}, \theta_{LO}, \theta_Y)$ and state space ψ such that:

1. J_{PO},J_{PY} satisfy (4)-(7) respectively.
2. J_{FO}, J_{FY} satisfy (8)-(9).
3. u and g satisfy (15)-(20).
4. Free-entry condition is satisfied: $V_{PO} = V_{FO} = V_Y = 0$

3 Calibration

To calibrate the model, I first discretize it and set the unit of time to be equal to 6 months. My primary aim in the calibration is to generate the mean and standard deviation of unemployment and share of fixed-term jobs in each cohort in Italy between 2008-2014 and the impulse response of the youth and old unemployment to 2008 financial crisis. I benefit greatly from the recent job market paper Franceschin (2020) which studies a subject very similar to this paper. I borrow some of my parameters from this paper. For the impulse responses I first estimate the parameters of (1) via a maximum-likelihood estimation using Italian Industrial Production Index (IPI) data. After that, I simulate a 12-period y using (1) with the parameters estimated to cover 6 years. For each value of y, I calculate the firing threshold for each type using (6). I take $G(.)$ as cumulative distribution function of a uniform distribution with support over $[\tilde{m}, \bar{m}]$. Then I look at how masses evolve in response to changes in y using (15)-(20).

3.1 Targets vs. Model

As stressed above, I target the mean and standard deviation of the unemployment and share of fixed-term jobs in each cohort. In Table 1, I report the parameters that I estimated or borrowed from literature in that endeavor.

Table 1: Calibrated Parameters

Parameter	Estimate	Source
ν	0.012	
ξ	112.74	
σ	1.77	
z_H	0.037	
F	54.67	
$\bar{m}$	100	
$\tilde{m}$	0	
$\bar{w}$	15.13	
η_H	57.34	
η_L	0	
r	0.976	%5 annual discount rate
δ	0.03	Franceschin (2020) [9]
γ	0.0221	Franceschin (2020)[9]
μ	0.72	Shimer (2005)[20]
α	0.5	Kugler and Saint-Paul (2004) [13]
κ	5.58	Franceschin (2020)[9]
Δ	1.33	Lilla and Staffolani (2012)[15]

In Table 2, I compare the the moments in the data and the moments that the model predicts:

Table 2: Calibrated Moments

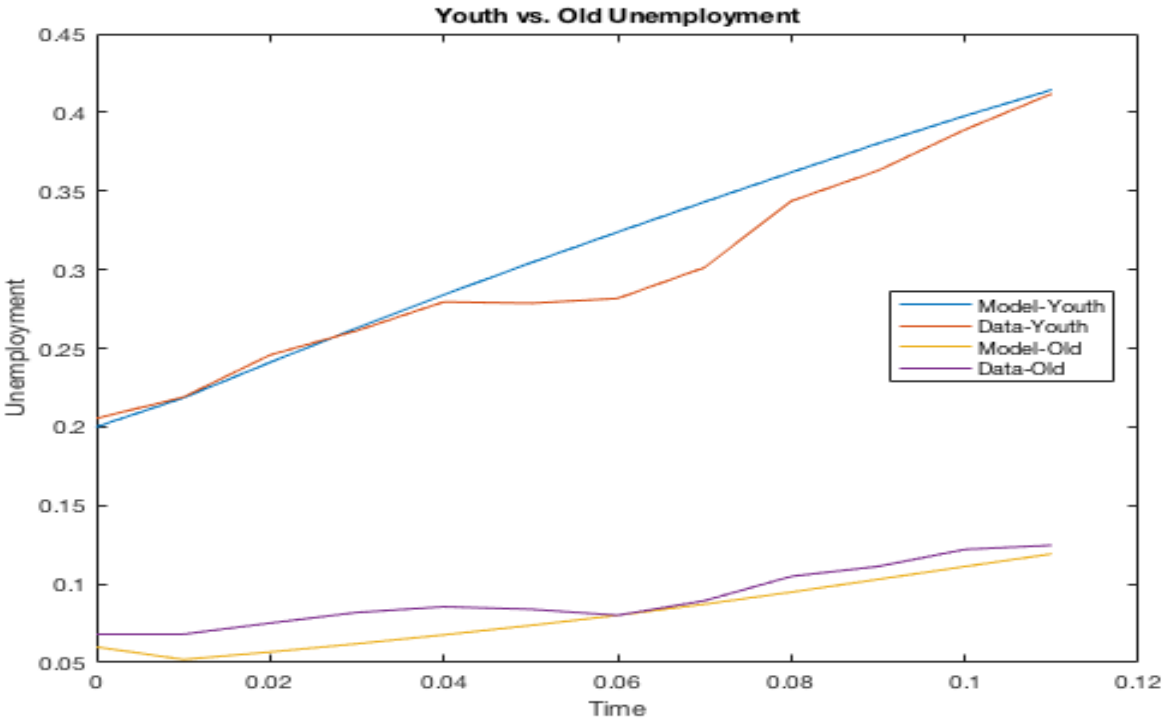
Name	Target-Mean	Model-Mean	Target-Std	Model-Std
Youth Unemployment	0.29	0.3	0.0625	0.0674
Old Unemployment	0.097	0.096	0.018	0.029
Share of FTC for the young	0.356	0.356	0.047	0.028
Share of FTC for the old	0.097	0.131	0.004	0.016

Target values for unemployment were calculated using data from Istat. Target values for share of FTCs were calculated using Eurostat data.

3.2 Impulse Responses

In the graph below, I present the response of the youth and old unemployment to an aggregate shock that was realized in (1):

Figure 5: Impulse Response



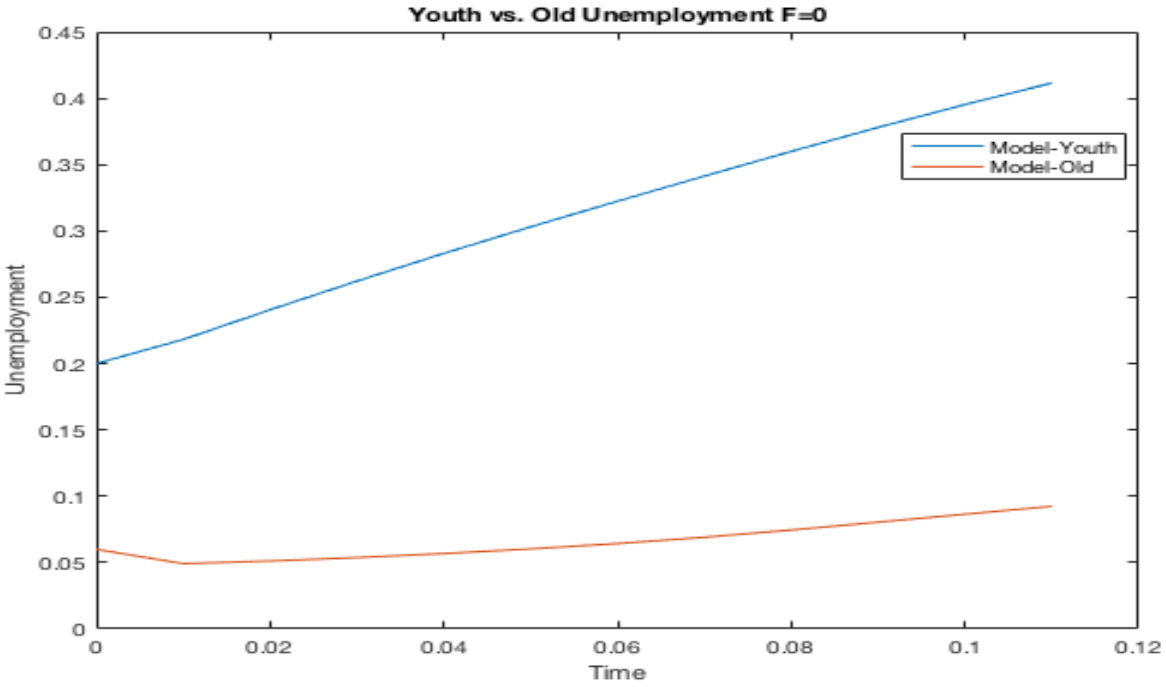
At time 0, I simulate the productivity shock as a result of the 2008 financial crisis then analyze the response of both youth and old unemployment. It seems that model is able to reproduce the unemployment trends pretty well. As in the data, there is a sharper increase in the youth unemployment following a downturn and it persists for a long time.

3.3 Some Counterfactuals

3.3.1 $F = 0$?

What if there were no employment protection and FTCs were literally the same as permanent contracts? Would youth unemployment be as sensitive as the old unemployment in that case, so that we would blame the stringent employment protection as the main driver behind the sharper sensitivitiy of the youth unemployment? The answer seems to be no. In a world with adverse selection against the youth and where youth is believed to be of low type with very high probability, making permanent contracts more attractive does not help to make youth unemployment less sensitive. Even if offering permanent contracts to youth yields a positive value for the employers, they still prefer offering FTCs. Therefore in the event of an aggregate downturn, youth unemployment rises as much as it does in the baseline case:

Figure 6: Impulse Response

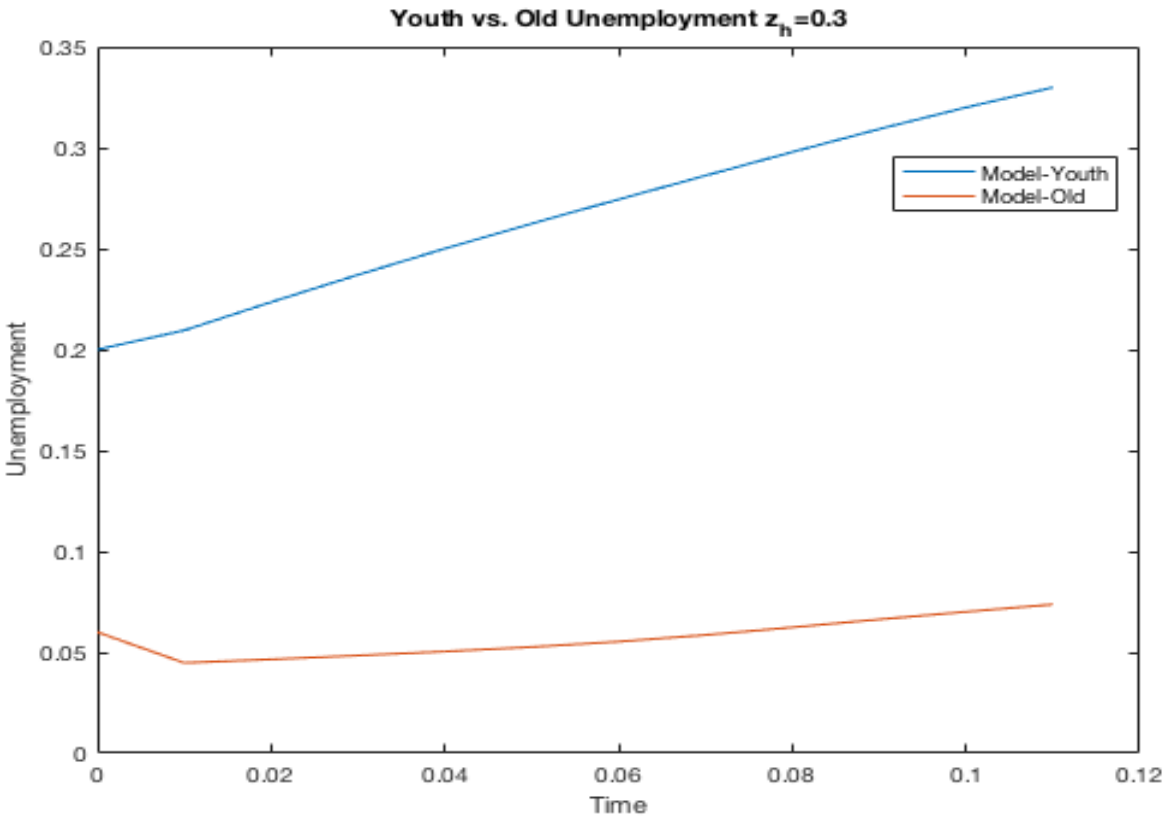


It helps to make old unemployment less sensitive though. It facilitates hiring of those whose quality is already known.

3.3.2 $z_H = 0.3$?

The real problem lies in the quality of the youth. As I stressed, this parameter can be thought as the employers' perception of the quality of the education system or the overall degree of the skill mismatch in the labor force. The main argument in favor of the FTCs is that due to youth being unable to signal their own quality due to lack of experience and the presence of firing costs, if an employer offers a young worker a permanent contract and if that worker is revealed to be a low type after the contract is signed, employer would be screwed. Therefore, when hiring a young worker, it is best for the employer to offer a FTC. If young workforce is believed to be more qualified or their skill set is thought to be more fit to the employer's needs, their likelihood of getting a permanent contract increases. As more and more young worker get permanent contract, since the permanent contracts are protected with firing costs, youth unemployment becomes less sensitive to the aggregate downturns as can be seen from the impulse response graph below:

Figure 7: Impulse Response



As can be noticed, after the very same aggregate downturn above, youth unemployment has risen only to 0.32 while it has risen to 0.42 in the previous case. I should note that F is at its baseline value here.

4 Discussion and Conclusion

In this study I tried to adress the debate on the impact of presence and prevalence of FTCs to youth unemployment. In this context, prevalence is not given but a consequence of differential treatment of the youth due to adverse selection problem. When there is a strong concern regarding the youth's quality due to concerns about the quality of education system that

make employers think that the young has not obtained the necessary skills for their needs, without the FTCs no young worker would be able to enter the labor market. In such a world, FTCs serve as their stepping stone to the labor market.

However when things turn sour in the entire economy, if the great majority of youth moves to unemployment after their first FTC they will have to find another fixed-term job which would take much longer time than it would in a boom. Had the greater portion of them were able to get their FTCs converted to a permanent contract, youth unemployment would rise less. In this case FTCs serve as their trap preventing them from securing a permanent job and jeopardizing their employment security.

The policy that can help making youth unemployment less sensitive to the aggregate downturns is investing in human capital that would make the prospective workers gain the necessary skills that employers need. Decreasing firing costs alone does not improve the labor market outcomes for the youth as long as the employers regard them to be unfit for their position.

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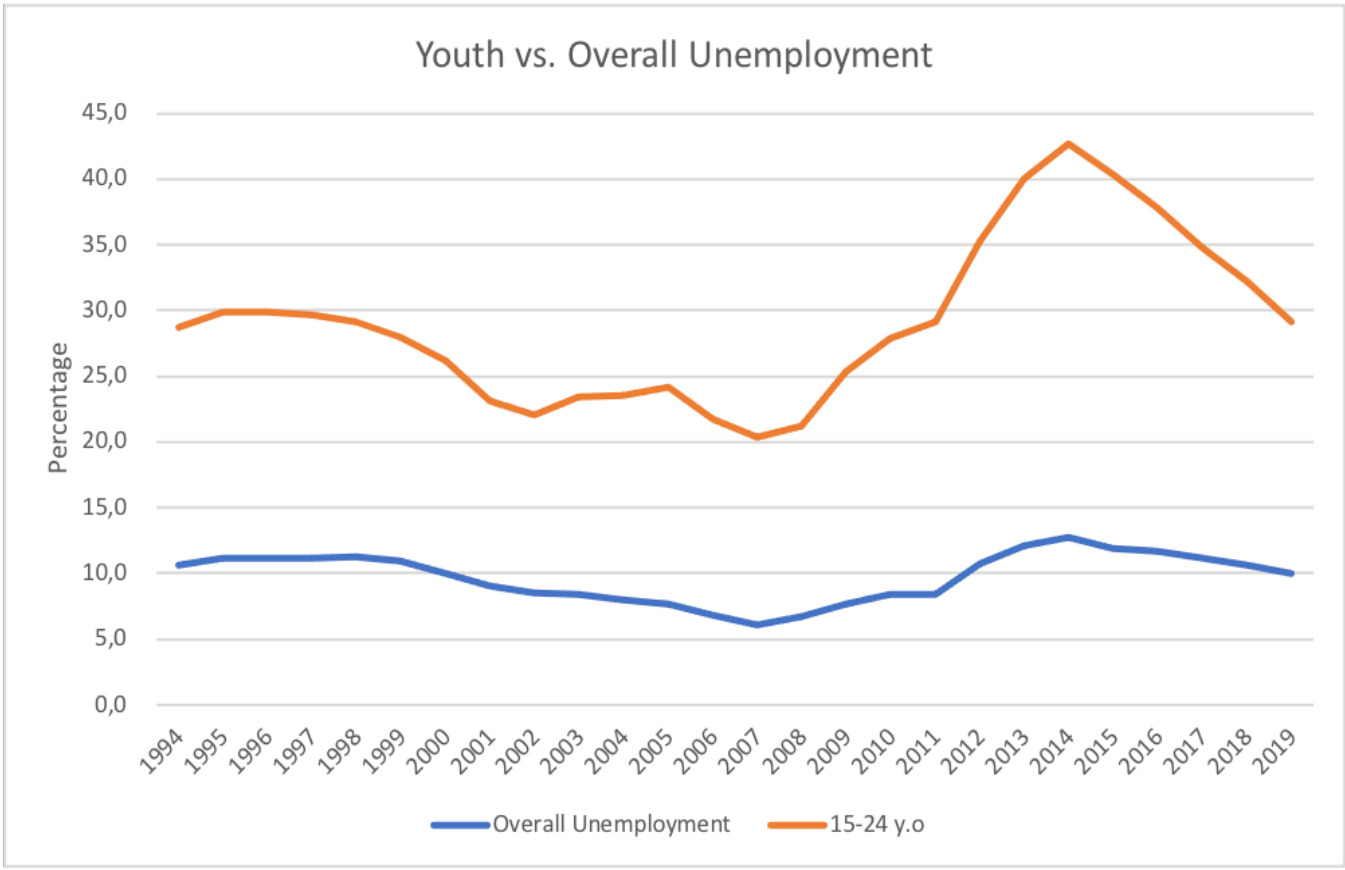
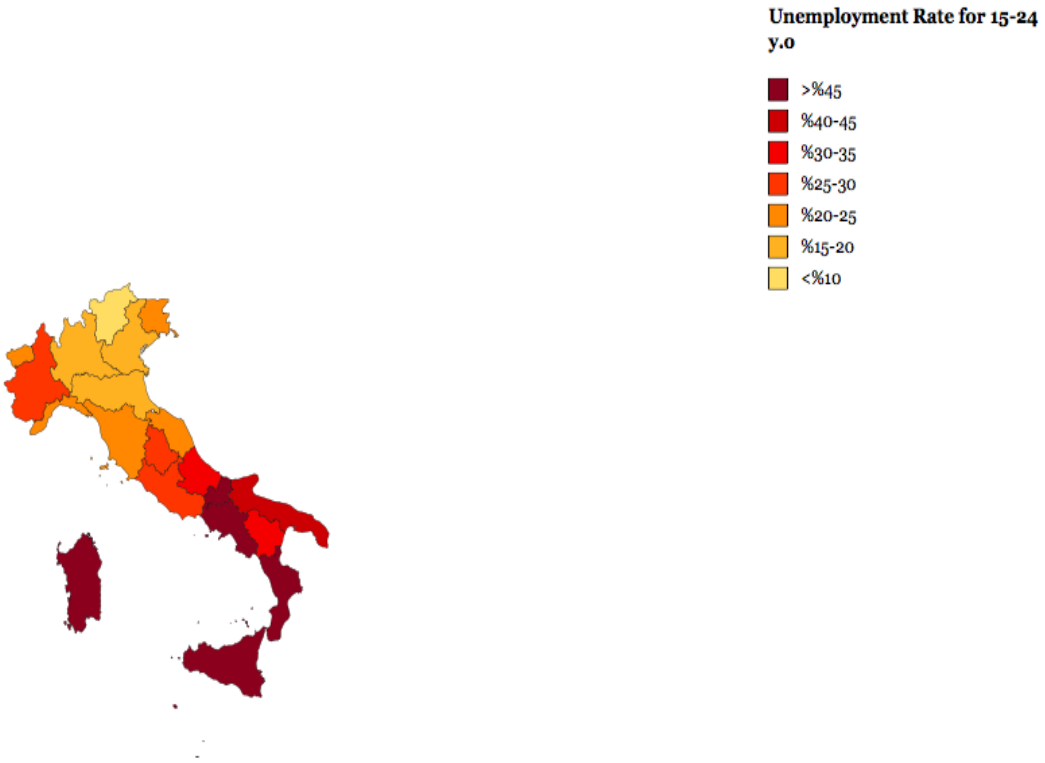
5 Appendix

Figure 8: Youth vs. Overall Unemployment in Italy 1994-2019



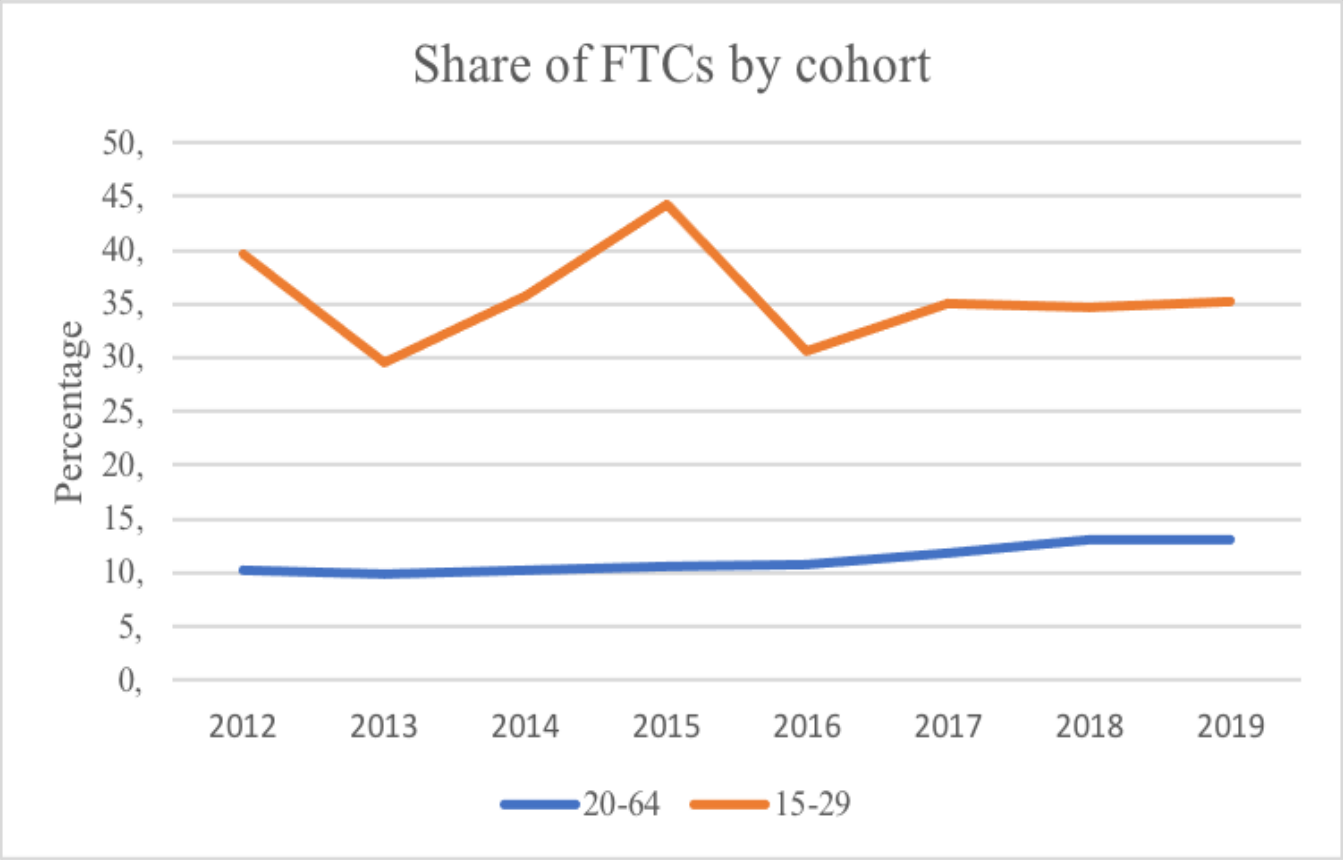
Source: Istat

Figure 9: Youth Unemployment by Region



Source: Istat

Figure 10: Share of FTCs by cohort in Italy



Source: Eurostat

Table 3: Probit-Logit with Controls Interacted: Permanent

VARIABLES	(1) Probit	(2) Probit	(3) Probit	(4) Logit	(5) Logit	(6) Logit
Young×Post	-0.0524***	-0.0656***	-0.0733***	-0.0512***	-0.0641***	-0.0715***
	(0.0174)	(0.0193)	(0.0209)	(0.0173)	(0.0189)	(0.0204)
Mid-School×Post	0.00696	0.0111	-0.0211	0.00624	0.0104	-0.0214
	(0.0221)	(0.0281)	(0.0275)	(0.0221)	(0.0281)	(0.0274)
Vocational School×Post	0.0159	0.0307	0.0418	0.0155	0.0301	0.0412
	(0.0229)	(0.0289)	(0.0282)	(0.0229)	(0.0288)	(0.0282)
Secondary School×Post	0.0232	0.0556*	0.0317	0.0233	0.0549*	0.0312
	(0.0259)	(0.0327)	(0.0314)	(0.0258)	(0.0328)	(0.0315)
University+×Post	0.145*	0.280***	0.306***	0.152*	0.300***	0.331***
	(0.0754)	(0.0981)	(0.0972)	(0.0799)	(0.116)	(0.118)
Head of HH ×Post	0.00139	-0.00172	0.0308**	0.00188	-0.00183	0.0307**
	(0.0110)	(0.0128)	(0.0136)	(0.0110)	(0.0128)	(0.0137)
Sex×Post	-0.00560	-0.0124	-0.00990	-0.00523	-0.0119	-0.00918
	(0.0112)	(0.0138)	(0.0129)	(0.0112)	(0.0138)	(0.0129)
Observations	9,940	9,940	9,940	9,940	9,940	9,940
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Correlation	RE	PA- AR(1)	PA-I	RE	PA- AR(1)	PA-I

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Probit-Logit with Controls Interacted: Unemployed

VARIABLES	(1) Probit	(2) Probit	(3) Probit	(4) Logit	(5) Logit	(6) Logit
Young×Post	0.0220	0.0544***	0.283***	0.0208	0.0556***	0.302***
	(0.0188)	(0.0195)	(0.0272)	(0.0183)	(0.0198)	(0.0291)
Mid-school×Post	0.116***	0.112***	0.222***	0.113***	0.114***	0.227***
	(0.0246)	(0.0291)	(0.0331)	(0.0242)	(0.0297)	(0.0346)
Vocational school×Post	0.0167	0.0154	0.0192	0.0152	0.0152	0.0139
	(0.0253)	(0.0298)	(0.0337)	(0.0248)	(0.0304)	(0.0351)
Secondary ×Post	-0.00872	0.00919	0.0537	-0.0101	0.00604	0.0472
	(0.0289)	(0.0337)	(0.0376)	(0.0284)	(0.0344)	(0.0391)
University+ ×Post	-0.121	-0.0769	-0.304***	-0.113	-0.0824	-0.312**
	(0.0763)	(0.0811)	(0.110)	(0.0756)	(0.0852)	(0.124)
Head of HH×Post	-0.169***	-0.217***	-0.417***	-0.165***	-0.223***	-0.436***
	(0.0139)	(0.0129)	(0.0167)	(0.0140)	(0.0133)	(0.0178)
Sex×Post	0.0390***	0.0493***	0.0509***	0.0386***	0.0497***	0.0525***
	(0.0127)	(0.0143)	(0.0157)	(0.0124)	(0.0146)	(0.0165)
Observations	9,940	9,940	9,940	9,940	9,940	9,940
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Correlation	RE	PA- AR(1)	PA- I	RE	PA- AR(1)	PA- I

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Probit and logit specifications for the likelihood of youth to become unemployed or get a permanent contract after 2008 crisis. Post is a dummy variable that is 1 for the period after 2008. It is interacted with other dummies for worker characteristics. Data comes from Bank of Italy's SHIW waves 2004-2012. Tables report the marginal effects. They show that the youth has become at least 5 percentage points less likely to get a permanent contract and 8 percentage points more likely to get unemployed than old workers. The significance of this effect is robust to the within correlation structure assumed. Whether we assume random effects or variants of population average models, the effects are significant at %1 level.