Employment protection legislation and financial frictions: what drags Italian GDP down?

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Abstract

We augment a standard general equilibrium model of occupational choice with a size-dependent labour adjustment cost and a collateral constraint and calibrate it to the Italian economy to compare the aggregate effects of removing size-dependent labour adjustment costs and relaxing financial frictions. We find that, holding wages fixed, the elimination of downward labour adjustment costs induced by size-dependent firing restrictions boosts aggregate labour demand almost entirely because of the response of large firms already far away from the regulatory size threshold. The growth of firms just below the threshold contributes only negligibly to the increase in aggregate labour demand. However, higher labour demand is entirely offset by the wage increase it causes and total GDP is barely affected even accounting for the positive selection of firms determined by higher market wages. On the contrary, relaxing the collateral constraint causes GDP to increase by about 3% mostly because of the higher capital stock against stable employment, again due to an offsetting increase in wages. Because easier access to credit favours talent over internal funds, wealthy low productivity entrepreneurs shut down and higher productivity ones with lower wealth enter the market; average TFP increases by 1%. Our calibration does not suggest that the constraints exerted by labour adjustment costs may be negligible because stronger financial constraints prevent most firms to stay away from the relevant size threshold: eliminating size-dependent downward labour adjustment costs has always negligible aggregate effects for a wide range of values for the parameter regulating the financial friction.

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1 Introduction

Employment protection legislation (EPL) is often held responsible for the poor performance of the Italian economy at it prevents an efficient use of labor within the firm andits efficient allocation across businesses. This conclusion mostly relies on cross-country empirical studies that basically correlate a variety of measures of economic and labor market performance with indexes of EPL stringency (for example, OECD (1999), OECD (2010), OECD (2013), Bassanini, et al. (2009)). These cross-country results are however unable to account for the many aspects of country-specific EPL and their interactions with other institutional features (for example, the discussions in Boeri & Jimeno (2005) and Bertola & Rogerson (1997)). Empirical research has therefore moved on to exploring within-country variation in EPL to single out its effects on a variety of firms' outcome. The typical research design rests on comparisons of outcomes of similar firms that are exposed to different EPL, perhaps due to slight differences in their sizes or because of changes in regulation.

As to Italy, the most investigated feature of EPL is its size-dependent nature: firms with more than 15 employees are subject to different and stronger dismissal provisions than those below this threshold. The ensuing regulatory gap has been modified over time; two major reforms, in 2012 and then in 2014, have substantially reduced it.

In principle, size-dependent regulations are detrimental to firm growth, as firms bear higher costs as they expand. This carries a number of consequences: on the one hand, more productive firms remain smaller than they would be in a setting with less stringent regulation, thus leading to an inefficient allocation of inputs (Andrews & Cingano (2014)); on the other, smaller firms are associated with lower ability to access credit, innovate (Pagano & Schivardi (2003), Bugamelli, et al. (2012)), adopt new technologies (Bugamelli & Pagano (2004)) and enter foreign markets (Bugamelli & Infante (2003), Navaretti, et al. (2010)), as well as with lower likelihood of employing professional management (Bugamelli et al. (2012)) and higher likelihood of escaping tax obligations (Bobbio (2016)) further hindering their and the economy's growth potential. In practice,

however, empirical studies of the effect of the Italian size-dependent EPL on businesses' trajectories find only a very mild reduction in firms growth across the relevant size threshold and some evidence of a substitution of standard employment contracts with other more flexible work arrangements such as fixed-term contracts, apprenticeships, or free-lance collaborations leading to a somewhat higher turnover above the threshold (Schivardi & Torrini (2007), Garibaldi, et al. (2008), Hijzen, et al. (2013)); consistently, Sestito & Viviano (2016) find that the 2014 labor market reform that further reduced firing costs on new hires at firms larger than 15 employees had only a minor effect on gross hiring flows but contributed to stimulating the transformation of temporary contracts into open-end ones. One possible explanation is that wages at more regulated firms adjust so as to (partly) compensate for the larger expected costs. Indeed, Leonardi & Pica (2013) find that a 1990 reform that raised the stringency of EPL at firms with less than 15 employees brought about lower wages for newly hired workers. Yet, the size of the wage effect (within 1 and 2 percent) seems to suggest a small overall cost of EPL to firms or an altogether limited ability to shift its burden on workers wages.

An alternative explanation of the stark contrast between theoretical predictions and empirical evidence lies in the nature of these empirical assessments: results based on variation across regulatory thresholds quantify the effects *at the threshold* by comparing otherwise similar firms. These exercises are therefore silent about the possibility that the effect is shaped by the workings of other distortions and, more broadly, about the general equilibrium effects of the regulation. For example, credit market imperfections may prevent firms from growing in a more diffused way so that the few able to approach the relevant EPL threshold may only be mildly affected by it. Yet, these are ultimately the objects of interest of policy makers, especially when designing a comprehensive reform plan.

In this paper we explore the general equilibrium effects of EPL and whether these are shaped by the interplay with other institutional features of the Italian economy. Our investigation is based on an otherwise standard model of the span-of-control type (Lucas Jr (1978)) extended and calibrated so as to incorporate the main regulatory fea-

tures and other potential sources of allocative distortions specific to the Italian economy. We build on a growing literature that quantifies the size of allocative distortions deriving from institutional features or market imperfections within theoretical models of the economy characterized by heterogeneous plants. Guner, et al. (2008) and Restuccia & Rogerson (2008) have investigated the costs of policy distortions that alter the efficient allocation of resources across heterogeneous plants; Garicano, et al. (2016) and Gourio & Roys (2014) have explored the costs of French size-dependent regulation which implies a sharp rise in operational costs for firms above 50 employees; Braguinsky, et al. (2011) conduct a similar exercise for Portugal focusing on the role of employment protection legislation. All these studies find sizeable allocative effects of policy distortions, in particular those stemming from labor regulation.

All these studies describe distortions and regulations as (possibly size-dependent) wedges on input costs or output prices. As to inputs, this implies that larger firms pay, all else equal, higher unit costs for the inputs they use any period they are active. This representation is clearly unsuited to inform on the effects of EPL when it is designed as labor adjustment costs, as these are paid only when actually adjusting the level of employment; firms can hoard labor in response to a negative shock or not grow as much in response to a positive one, without obvious consequences on their average size (Bentolila & Saint-Paul (1994), Bertola (1992)). As described above, Italian EPL was historically similar to a size-dependent *downward adjustment* cost of labor as larger firms are subject to more stringent regulatory provisions when firing workers. We thus explicitly build this feature into the model. Differently from standard modeling choices, the downward adjustment cost of labor introduces a trade-off for firms between the benefit of growing towards their optimal scale and the cost of downsizing upon receiving a negative shock, where this downsizing cost is increasing in the size of the firm. This implies that eliminting the downward adjustment cost will have a proportionally stronger effect on larger firms, contrary to what happens if distorsions stem from a fixed wedge on labor cost whose elimination increases firm size proportionally irrespective of their size. Also, the additional shadow cost of employment implied by the adjustment cost

will depend, beyond the specific regulatory features, on a number of other characteristics of the model economy that play no role in alernative modelling setups. For example, all else equal, more persistent TFP innovations will likely induce firms suffering a negative shock to adjust downward and thus carry a higher shadow cost of employment. The general equilibrium effects of this kind of downward adjustment costs have been explored by Hopenhayn & Rogerson (1993) in a setting where all firms are subject to the same cost, independently of their size.

We differ from that paper in two other respects beyond the size-dendent aspect of EPL. First, we study how EPL interacts with other relevant frictions of the economy. In particular, we explore whether the limited empirical relevance of size-dependent dismissal restrictions stems from the interplay with other frictions that prevent firms from becoming sufficiently large to have to deal with EPL related issues. Specifically, we focus on the interplay between financial frictions and dismissal regulation. Cingano, et al. (2016) find, in a cross-country study, that financial constraints exacerbate the negative effects of EPL on capital deepening and productivity. Since Italian firms mostly resort to bank credit to fund their activity (di Patti & Russo (2017)), we model financial frictions as a limited commitment whereby individuals who choose to be entrepreneurs can borrow funds to finance current period productive capital only up to a multiple of their own wealth. Second, the model contains a meaningful employment choices between being a worker and an entrepreneur. In particular, Italy is characterised by an extraordinarily high number of small firms and self-employment (Torrini (2005), Criscuolo, et al. (2014)); the models allows us to appreciate how EPL shapes the employment choice and thus the composition of the pool of entrepreneurs.

We find that removing size-dependent EPL pushes up, ceteris paribus, labor and capital demand and firms' optimal sizes: labor demand of firms below the EPL threshold declines by 10 percent and that of firms above it increases by 15 percent; more than three quarters of the stronger overall labor demand comes from firms larger than 25 employees, far away from the threshold. However, the ensuing wage increase crowds out most of this increase. At the new equilibrium wages, firms below the threshold employ 14 percent

fewer workers while those beyond it employ 11 percent more workers. Importantly, employment at larger firms away from the threshold benefits of the EPL removal even once wages have adjusted: employment at firms larger than 25 is 3 percent higher, nearly offset by the 2 percent lower employment at smaller firms across the regulatroy threshold.

Higher wages following the elimination of EPL also tilt the trade-off between being a worker and setting up a business in an unexpected way: less productive individuals now find it optimal to become or remain employees; also, entrepreneurs with large firms who were shutting down upon a negative productivity shock now find it profitable to stay in business. On balance, upon removing EPL the population of entrepreneurs falls by 5 percent and average firm size increases by about 6 percent. The positive selection of entrepreneurs raises average TFP 0.6 percent and by nearly 1 percent if weighted by firm size. The weaker incentives to becoming an entrepreneur depress workers' savings; at the same time, because labour becomes cheaper once EPL is eliminated, firms substitute away capital and reduce their demand; on net, interest rates remain broadly constant but the aggregate capital-labour ratio drops by about 1.5 percent. In general equilibrium, the combined effect of lower capital intensity and higher employment and TFP following the elimination of size-dependent EPL is a broadly stable steady state GDP.

The negligible aggregate effect of firing costs is indirectly confirmed by another comparative static exercise the model allows to perform. Specifically, if firing costs did represent a major constraint to firm growth then policies that stimulate growth should have only negligible effects in the presence of strongly binding EPL. In our model, limited access to external funding also constraints firm growth. However, relaxing the collateral requirement to make credit more easily available while leaving firing costs in place does lead to a non negligible increase in GDP. Specifically, by increasing the relevant parameter to a level typically used to calibrate the US economy (e.g. Buera, et al. (2014)) GDP increases by about 3 percent; replicating the same thought experiment in the absence of EPL yields an increase in GDP only marginally larger.

Our model is clearly a simplified version of reality. Yet, it points out few importants

things. First, EPL does not seem to meaningfully constrain firm growth and overall employment; in this respect, financial frictions seem to play a greater role. Second, the wage compression effect of EPL favours the creation of inefficient firms. While in the current setup this is of little consequence, it is easy to argue that in a more complex model where economic growth is driven by innovation generated by heterogeneous firms, the weaker selection of entrants caused by EPL would eventually lead to slower growth (e.g. Klette & Kortum (2004)). Third, a mechanism that favours the entry of firms with little incentive to grow to start with may have consequences for public finances (Bobbio (2016)).

The paper is organized as follows. Section 2 presents some empirical facts on Italian firms. Section 3 presents the model. Section 4 gives details on how we calibrate the parameters of the model. In Section 5 results are presented and explained. Section 6 concludes.

2 EPL and firm size distribution in Italy

Italian EPL does not include automatic firing costs; it is instead based on the possibility for the dismissed worker of challenging the dismissal in court. If the dismissed employee goes to court and wins the case, he is entitled to reinstatement independently of firm size. However, if the dismissing firm employs at most 15 employees, the employer can substitute the reinstatement with the payment of a sum set by the judge within the upper bound of half a year wage established by law; on the contrary, if the dismissing firm is larger than the threshold it is the dismissed worker who has the option of giving up the right to reinstatement, thus being in a stronger bargaining position. This is why EPL is deemed to be stricter at larger Italian firms[1].

Whether the major shift of bargaining power over reinstatement rights across the 15

[1]Reforms in 2012 and 2014 have substantially reduced the differential treatment of dismissals, by retaining the possibility of reinstatement only in proven cases of discrimination and introducing a non-negotiable seniority-dependent monetary indemnisation for the worker if he wins the case.

employees threshold shapes firms' incentives to grow and the overall firm size distribution is still an open issue. Figure 1 displays the distribution of Italian firms by size in 2003-2007. Data are drawn from the Social security archive of employees' social security contributions paid by Italian private sector employers for at least one workday[2]; firm size is defined as the average number of employees over a given year. The effect of the regulatory discontinuity on the distribution at large is not immediately evident, however, as instead is the case in other institutional settings like for example France (Garicano et al., 2016). Schivardi & Torrini (2007) and Garibaldi et al. (2008) have focused their attention on *local* effects, namely differences in the behavior of firms just above and below the threshold. Figure 2 summarizes their results. While there is no clearcut evidence of firms heaping at just below the 15 employees threshold, looking more in detail at the share of firms of a given size that the next year have increased their employment level reveals a sizeable drop just below the threshold. Thus, as expected, firms are somewhat prevented from growing further as they approach the threshold. However, a mechanical extrapolation of the effects of this local "growth restraint" on the overall firm size distribution reveals it to be economically negligible.

This type of empirical assessment has at least two limitations. First, it cannot tell whether the absence of a significant aggregate effect is due to the fact that regulatory discontinuities are not that relevant or to the fact that, because of some other reason, the fraction of firms that actually ends up being exposed to such discontinuities is small relative to the underlying population, perhaps due to other frictions. Second, it can only trace the aggregate effect to an extrapolation of local differences. Yet, also firms far away from the threshold are likely to be affected by the regulation either directly or indirectly, through the effects that regulation potentially has on prices. These general equilibrum effects are in fact unaccountable by policy valuation exercises based on local regulatory discontinuities. As Figure 1 shows, nearly 90 percent of Italian firms employ less than 15 persons and the largest majority employs at most 5 persons; thus the population

[2]The original data cover the period 1990-2010; we restrict our attention to the 2003-2007 period so as to avoid biases due to the 2000 recession and to the current prolonged slump.

that is close enough to the regulatory discontinuity is overall small. Yet, roughly 80 per cent of employees are at firms larger than 15, affected by stricter EPL, and 50 per cent at firms larger than 50 employees, far away from the regulatory threshold; how stricter EPL affects their labor demand and input choices is likely to have strong indirect effects through prices on all firms. Figure 3 shows that smaller firms account for roughly one third of yearly labor shedding, mostly due to early mortality; on the other hand, firms above 30 employees account for about half of total employment destruction [and one-third of employment turnover]. Therefore, assessing the extent to which size-dependent employment regulation is detrimental to growh and prevents an efficient allocation of production inputs cannot neglect the response of firms farther away from the threshold.

3 Model

We base our analysis of the general equilibrium effects of EPL on an extended version of the span-of-control framework of Lucas Jr (1978) that allows for capital market frictions and size-dependent firing costs.

The population of the model economy is of unitary size. Individuals receive utility over their consumption streams according to:

$$U = \sum_{t=0}^{\infty} E\left\{u(c_t)\right\} \tag{1}$$

where

$$u(c) = \frac{c^{(1-\sigma)}}{1-\sigma} \tag{2}$$

and where β is the discount factor and σ the coefficient of risk aversion.

Agents are heterogeneous along their endogenous wealth (a) and exogenous stochastic entrepreneurial productivity (z). Every period they choose whether to work for a wage (w) or become entrepreneurs based on their wealth, their current entrepreneurial productivity and the size of their firm in the previous period (n_{-1}) which, in case they were employees, is simply nil. Enrtepreneurs have access to borrowing through a col-

lateral constraint on their wealth and produce according to a production function with decreasing returns to scale:

$$y = zf(k, n) = zk^{\alpha}n^{\theta} \tag{3}$$

where z is their idiosyncratic observed entrepreneurial productivity, k and n are capital and labor and $\alpha + \theta < 1$.

Entrepreneurial productivity evolves stochastically: with probability ψ it is retained from one period to the next; with probability $1 - \psi$ it is newly drawn from the unconditional distribution of entrepreneurial talent $\pi(z)$. Notice that the stochastic process of productivity implies a larger probability of suffering a productivity drop for larger more productive firms, thus gearing the model towards finding strong effects of downward labor adjustment costs as more productive larger firms are also more likely to have to downsize one period ahead.

Entrepreneurs rent productive capital k through collateralized borrowing up to a proportion λ of their wealth, $k \leq \lambda a$ with $\lambda \geq 1$. λ is a measure of credit market frictions: with $\lambda = 1$ entrepreneurs can only rely on their internal funds; with $\lambda \to \infty$ they have access to perfect credit markets.

We depart from most of the literature that models regulatory burdens as a tax on inputs[3] by explicitly introducing size-dependent downward labor adjustment costs. We summarize the institutional details described in the previous section by positing that entrepreneurs are subject to a labor adjustment cost FC defined as:

$$FC = \begin{cases} 0 & if \quad n >= n_{-1} \\ 0 & if \quad n < n_{-1} \quad \& \quad n_{-1} <= 15 \\ \tau_l(n_{-1} - n)w & if \quad n < n_{-1} \quad \& \quad n_{-1} > 15 \end{cases} \tag{4}$$

In short, only firms larger than 15 pay a downsizing cost proportional to the overall wage bill of the dismissed workforce.

The model endogenously determines the steady-state distribution of assets and the corresponding size distribution of firms. Wage and the interest rate in equilibrium clear

[3]See Guner et al. (2008), Garicano et al. (2016).

the labor and capital markets.

3.1 Recursive Problem

The state-space of an individual consists of three variables: her accumulated wealth a, her current entrepreneurial productivity z and the number of employees in the previous period $n_{-1} \geq 0$, where an individual with no employees is simply a worker. At the beginning of the period an agent can choose whether to become an entrepreneur ($n > 0$), which yields utility $V^E(a, z, n_{-1})$, or a worker ($n = 0$), which yields utility $V^W(a, z, n_{-1})$. Therefore the value of being an agent with state (a, z, n_{-1}) is:

$$V(a, z, n_{-1}) = \max \left\{ V^W(a, z, n_{-1}), V^E(a, z, n_{-1}) \right\} \tag{5}$$

A worker chooses consumption and next period assets to maximize the value function

$$V^W(a, z, n_{-1}) = \max_{c, a' \geq 0} u(c) + \beta E_{z'/z} \left\{ V(a', z', 0) \right\} \tag{6}$$

subject to the budget constraint:

$$c + a' = w + (1 + r)a - I \left\{ n_{-1} > 15 \right\} \tau_l w n_{-1} \tag{7}$$

where the last term reflects the assumption that an entrepreneur with more than 15 employees that closes the business has to pay dismissal costs as well.

Entrepreneurs choose consumption c and saving a' together with capital k and labor n to maximize the value function

$$V^E(a, z, n_{-1}) = \max_{c, k, n, a'} u(c) + \beta E_{z'/z} \left\{ V(a', z', n) \right\} \tag{8}$$

subject to the budget constraint

$$c + a = z k^{\alpha} n^{\theta} - wn - (r + \delta)k + (1 + r)a - I \left\{ n_{-1} > 15 \right\} \tau_l w \max \left\{ 0, n_{-1} - n \right\} \tag{9}$$

and the collateral constraint

$$k \leq \lambda a \tag{10}$$

Notice that current employees and entrepreneurs with at most 15 employees make the same occupational choices as given by equation (5); this is because for neiher group the value of entrepreneurship V^E depends on past employment, n_{-1}.

3.2 Stationary Equilibrium

Denote by $\eta = (a, z, n_{-1})$ the vector of states for an individual, where a is the amount of assets, z the entrepreneurial productivity and n_{-1} the number of previous period workers. The solution of the optimal decisions of the agents yields the optimal policy functions: $O(\eta) \in \{0, 1\}$ is the occupational choice, a dummy variable equal to one if the agents choose to become entrepreneurs; $N(\eta)$ and $K(\eta)$ are the optimal input demand (equal to zero for entrepreneurs); $A(\eta)$ is the optimal saving decision. The optimal choices of future assets $A(\eta)$ and of current labor $N(\eta)$, together with the exogenous stochastic process for entrepreneurial productivity, generate a transition matrix T that maps current period distribution over the individual state space, $\mu(\eta)$, into next period one: $\mu'(\eta) = T\mu(\eta)$. A stationary equilibrium is the fixed point of the mapping $\mu^\star(\eta) = T\mu^\star(\eta)$ such that input prices w and r clear the labor and capital markets.

Labor market clearing is given by the following equation:

$$\int_\eta O(\eta) N(\eta) \mu^*(\eta) d\eta = \int_\eta (1 - O(\eta)) \mu^*(\eta) d\eta \tag{11}$$

where the left hand side is the aggregate labor demand from entrepreneurs and on the right hand side we have labor supply coming from workers. To clear the capital market, demand coming from entrepreneurs must be equal in equilibrium to the amount of savings in the economy:

$$\int_\eta O(\eta) K(\eta) \mu^*(\eta) d\eta = \int_\eta A(\eta) \mu^*(\eta) d\eta \tag{12}$$

The model has no analytical solution and is solved numerically.

4 Calibration

The model contains nine parameters: two preference parameters (the discount factor β and the coefficient of relative risk aversion σ), three technology parameters (θ, α and δ), two parameters describing the two main frictions in the economy (the one determining dismissal costs τ_l and the one describing the intensity of credit market frictions λ) and two parameters regulating the stochastic process of productivity. Following a standard practice in the literature entrepreneurial productivity z is drawn from a Pareto distribution with cumulative density $\pi(z) = 1 - z^{-\eta}$ for $z \geq 1$; each period an individual retains his productivity with probability ψ and draws a new level with probability $1 - \psi$.

To calibrate these parameters we follow a parsimonious approach and choose as many parameters as possible from the literature. Specifically, we set the coefficient of relative risk aversion to $\sigma = 1.5$ and the technology parameters to $\alpha = 0.272$, $\theta = 0.544$ and $\delta = 0.06$.[4]

The remaining parameters are chosen so as that the steady state of the model with dismissal costs replicates some features of the Italian firm size distribution and firm dynamics as well as a real interest rate of about 2 percent. Tables 1 and 2 report, respectively, the calibrated parameters and the calibration targets along with the model performance.

The model seems to perform rather well against the targets. The percentage of firms with at most 15 employees generated by the model is 90%, against 92% in the data; these firms account for 37% of total employment in the data and about 44% in the model economy; the firms' exit probability is 9.1% in the model economy and 10.6% in the data. The final target, that pins down the labor adjustment cost parameter τ_l, is

[4]These parameters are broadly consistent with the findings of Cingano & Schivardi (2004) who estimates production functions for several productive sectors of the Italian economy. In particular they estimate values of α ranging from 0.26 to 0.44 (0.32 on average) and of θ from 0.56 to 0.74 (0.68 on average). In general our parameter choice implies rather smaller degree of decreasing return to scale than what it is reported by Cingano & Schivardi (2004): 0.81, against an average of 0.99 and a minimum value of 0.93.

the percentage of firms between 10 and 15 employees that do not grow beyond the 15 employees threshold after one period, 65% in the data and 66% in the model.

As to the parameters regulating the two main frictions, the calibration yields a degree of credit availability against a given level of internal funds which is about 60 percent of what turns out to be the corresponding value for the US economy (e.g.Buera et al. (2014)). The dismissal cost is such that firms expect to pay about 7.5% of a worker's yearly wage for each downward adjustment.

Notice that the calibration procedure does non require the model to match the whole firm size distribution. As shown in Figure (4) there are indeed some differences between the firm size distribution in the model and in the data. Two differences stand out. First, although the model rather correctly captures the overall share of firms with at most 15 employees, it largely underestimates the fraction of micro firms (1-2 employees). Second, contrary to the evidence, it generates strong bunching just below the 15 employees threshold and almost no firms with 16 and 20 employees (see figure 5). This is not an unusal feature in these models. For example, Garicano et al. (2016) also find the model is unable to generate a smoother and realistic distribution across the relevant regulatory threshold and, for estimation purposes, augment the model with measurement error in establishment-level employment[5].

The model also has fails to capture the larger share of employment accounted for by very large firms present in the data as it is not able to generate firms large enough as in the economy. This is clear in figure 6 where we plot the unconditional distribution of employment across firm size bins and the correspondent distribution conditional on firms having at most 100 employees.

To further gauge the quality of the calibration we compare other non calibrated statistics generated by the model with their empirical counterparts. Specifically, the model generates a ratio of external funding to productive capital of about 0.6, substan-

[5]In an auxiliary exercise not reported for the sake of clarity, we augment the model with measuremet error and experiment with alternative variances to find that even a modest dispersion is able to sensibly smooth out the kink produced by the model.

tially in line with the ratio of liabilities to equipment and non-residential real estate of non financial corporations prevailing before the global financial crisis[6]. Also, the model generates a share of entrepreneurs of about 8 percent; while it is difficult to come up with an adequate empirical counterpart since the model only allows for sole proprietorships, it is interesting to note that in the data the ratio of the number of employers to the sum of employees and employers is not too far off, at 11 percent. As to the distribution of labor adjustments across firm sizes, the model implies that large firms above 30 employees account for half of total job destruction, not far off from the 45 percent recorded in the data, and one third of total job creation, somewhat short of the nearly 40 percent recorded in the data. Finally, both in the model and in the data the size of new entrants is about one fourth of the average firm size[7].

5 Results

We start by comparing the optimal labor demand of firms with and without the downward labor adjustment cost, to illustrate the main qualitative features of the firm decision. We then discuss the general equilibrium effects of removing EPL and how EPL interacts with financial frictions. Finally, we discuss some robustness exercises.

[6]The ratio is computed combining information from the financial and real accounts of non financial corporations: the numerator includes short- and long-term loans and bonds; the denominator includes all non financial assets net of residential real estate and non reproducible assets.

[7] However, as a consequence of the inability to replicate the large share of micro-enterprises seen in the data, the calibration fails to replicate the average size of firms, which turns out to be almost twice the one prevailing in the data; also, it yields a distribution of asset holdings in the population very different from plausible empirical counterparts. Including these statistics in the set of calibration targets the model is able to reproduce them quite closely, although it falls slightly off some other targets. Yet, even in this extended calibration the qualitative results of the policy experiments we perform are unchanged. We therefore decided to stick to the more parsimonious calibration.

5.1 Firms' labor demand

The effect of downward adjustment costs on firms' average labor demand is not straightforward. On the one hand, upon a negative shock firms dismiss less employees thus remaining, all else equal, larger than in the absence of such downward adjustment costs; on the other, anticipating future layoff costs in case of negative shocks, they hire less upon positive shocks thus growing less than absent those costs. In turn, which effect prevails for which firms will shape aggregate labor demand and ensuing wage pressures from the removal of adjustment costs.

A graphic representation of firm labor demand is complicated by the dimensionality of the state space (internal funds, productivity, previous employment). Figure 7 displays in the top panels the labor demand of firms that enter the period with a low productivity draw and in the bottom panels that of firms starting the period with high productivity; panels on the left represent firms entering the new period with employment below the 15 employees regulatory threshold (10 employees) while panels on the right those of firms with employment above the threshold (30 employees). All four panels display the labor demand-internal funds schedule in the baseline case with adjustment costs and in the counterfactual one without them; labor demands are drawn for the same underlying level of wages and interest rates[8].

In an economy without labor adjusmtent costs the optimal size of a low productivity and financially unconstrained firm is 6 employees; financially constrained firms are smaller. In an economy with labor adjustment costs, the labor demand of firms with initially at most 15 employees exempt from EPL equals that of the no-EPL case; as the optimal unconstrained size is also below the threshold it is costless to achieve it. On the contrary, firms larger than 15 employees with currently low productivity have to reduce their labor force to reach their new optimal size which equals 8 employees if financially unconstrained and less if the constraint binds. Since downsizing is costly, this firm will

[8]Note that because firms below 16 employees are not subject to adjustment costs, their demand functions are identical irrespective of their initial size (provided it is below 16 employees) and thus are identical to those depicted in the left panel of the figure.

shed - for any level of internal funds - less employment than in the no-EPL case thus remaining larger in size.

If current productivity is high, financial constraints are stonger: the optimal financially unconstrained size is 65 employees. Small firms not subject to EPL will behave as in the no-EPL case if their internal funds are not sufficient to push them beyond the 15 employee threshold after which EPL binds. If, on the other hand, internal funds are high enough to push the firm beyond 15 employees in the absence of EPL, the entrepreneur will cluster at 15 employees and trespass the threshold only for much larger values of internal funds and, even in that case, firm size will be smaller than the one achieved absent EPL because of the discounted expected cost of downward adjustment. Large firms subject to EPL will again grow less than in the no-EPL case if they have sufficient internal funds; if they have to downsize, they adjust less than in the no-EPL case and also adjust less frequently, preferring to hoard labor when the desidered adjustment is small enough.

5.2 The policy experiment

Table 3 reports the main quantitative results of the paper. The main policy experiment consists in removing size-dependent dismissal costs from a baseline economy featuring costly layoffs.

Comparing columns (1) and (2) in Table 3, that is removing EPL given the level of financial frictions, causes the share of small firms and that of their employment to decline. However, the overall employment increase is rather negligible; firms become less capital intensive while increasing their use of external funds. The overall effect of output is basically nil, a result of nearly unchanged employment and lower capital stock compensated for by the higher average TFP induced by the better selection of entrepreneurs.

The model allows to understand the reasons behind the absence of sizeable general equilibrium effects of EPL removal by focussing on a partial equilibrium analysis which

only entails the removal of EPL while the wage and the interest rate are kept constant at their initial level. Abstracting from price adjustments, size-dependent EPL removal leads to a 4 percent higher labor demand while the number of entrepreneurs is constant (table 4). This highlights a first important distinction: EPL removal stimulates firms' labor demand but does not tilt entrepreneurial choices in significant ways as they are mainly shaped by the ongoing wage rate; in the constant prices partial equilibrium the number of firms is constant. This is not obvious. The occupational choice reflects both the continuation value of entering the next period as an entrepreneur and the current costs of downsizing business. The choices of smaller firms exempt from EPL and of employees are only affected through the change in continuation value due to removing EPL; those of larger firms exposed to EPL relfect both the change in continuation value and the fact that removing EPL also shapes *current* costs in case of downsizing. Two opposite effects are at work: removing dismissal costs allows some entrepreneurs that wanted to shut down their business but were prevented from doing so by the high costs of shedding labor, to actually close their plant; on the contrary, firms that in a world with dismissal costs would find it profitable to close their business and become workers, once dismissal costs are removed remain entrepreneurs. In our calibration these two forces balance in partial equilibrium and an unchanged pool of entrepreneurs implies that average TFP in constant.

The size distribution of firms does change, however, and one third of firms just below the regulatory threshold grows just above it, while no sizeable changes happen farther away from it. Labor demand redistributes accordingly around the threshold, with an overall increase, at firms between 10 and 20 employees, of about 4 percent. However, this increase contributes only for one fourth to the overall increase in labor demand as in the baseline economy firms in this size bracket only account for just above 10 percent of total employment. The overall increase is largely shaped by labor demand from firms farther away from the threshold: those with more than 25 employees, which represent about half of total employment, increase their labor demand by about 6 percent.

The change in the size distribution of firms has, in partial equilibrium, an effect

on the average TFP of firms belonging to different size classes mostly around the 15 employees threshold. The most productive firms just below the threshold find profitable, absent EPL, to become larger thus leading to a lower average TFP of firms remaining in the 10-15 bin. However, their TFP is lower than that of firms that, with EPL, chose to grow beyond the threshold so that the average TFP of firms just above the threshold decreases.

The partial equilibrium results are largely analogous to those attainable in a framework in which wages are pinned down by a perfectly elastic labor supply. In this case the stronger labor demand would be met by an adequate supply and lead to an increase in output. In the present model the excess labor demand stemming from lifting size-dependent EPL has to be met with a less-than-perfectly elastic labor supply stemming from optimal entrepreneurial choices. Faced with higher wages, agents that with EPL are marginally better off as small entrepreneurs not subject to regulation prefer to supply labor to firms. This also implies that the average TFP of remaining entrepreneurs is higher by nearly 1 percent. The population of entrepreneurs falls by 5 percent and their share in the population goes from 8 to 7.6 percent; this is also the (absolute) additional employment left after wages adjust to the new no-EPL equilibrium, a negligible increase of around half a percentage point (col. 2 in table 3). Although total employment is basically unchanged by removing size-dependent EPL, the average firm size increases. At the new equilibrium the aggregate capital-labor ratio is lower as labor becomes relatively cheaper. On balance, removing EPL has no significant effects on total output once prices have fully adjusted to accomodate the initially higher labor demand. Note this lack of a sizeable effect crucially depends on the shape of the labor supply; the more elastic it is the less wages have to increase to accomodate a higher labor demand.

A substantial lack of general equilibrium effects from the elimination of distorsions is not unusual. For example, Garicano et al. (2016) only find sizeable results from eliminating the wage tax imposed to firms above 50 employees in France when wages are held fixed at the initial level, a thought experiment they interpret as the interplay between labor demand distorsions and wage rigidities.

5.3 Credit constraints and labor regulation

The evidence above suggests a limited role for size-dependent EPL once one allow for wages to adjust to the stronger labor demand induced by its removal. The model allows both to compare the effects of removing size-dependent EPL with a relaxation of credit constraints and to investigate the interactions between the two frictions (see, for example, Petrosky-Nadeau & Wasmer (2013)).

The first experiment we run consists in raising the parameter regulating firms' leverage λ from its baseline value to a level typically used to calibrate the US economy (e.g. Buera et al. (2014)). The effect can be seen comparing columns 1 and 3 in table 3. Output increase by 3 percent basically because of the higher capital stock achieved through a higher leverage; employment remains constant and wages increase by nearly 2 percent. Importantly, because internal funds exert less of a constraint productive agents with low wealth can now become entrepreneurs; at the same time, wealthier agents with low productivity are more likely to become employees thanks to the higher wage. This recomposition in the pool of entrepreneurs leads to an increase of average TFP higher than 1 percent. The fact that with EPL in place a relaxation of credit constraints has sizeable effects on output is consistent with the fact that the baseline calibration does not imply major constraints stemming from EPL. If this was the case, more easisly accessible credit would have had only subdued effects on the equilibrium allocation.

Thsi is further confirmed by a second thought experiment that consists in asking whether removing size-dependent EPL in a baseline scenario with weaker financial frictions has stronger effects than those detected in our main policy experiment. If this was the case we would conclude that absence of similar effects in the baseline scenario reflected the fact that credit constraints were substantially constraining the population that could benefit from EPL removal. In other words, financial frictions constraint firms so much that size-dependent EPL is not a major concern. The thought experiment is visible comapring columns 3 and 4 of tabel 3. The comparison shows that qualitatively all previous conclusions on the elimination of EPL hold also in a looser financial set up: employment and output change only marginally, capital stock decreases and average

TFP increases compensating the drop in capital.

6 Conclusion

The extent of resource misallocation caused by distorsions in relevant markets attracts a lot of attention; it provides to policy makers an easy to understand channel through which economic growth may be boosted, perhaps more easily and quickly than through other channels based on accumulation and innovation decisions.

We have tailored an otherwise standard model of occupational choice and heterogenoeus firms to the Italian economy to provide a quantitative assessment of the general equilibrium effects of removing size-dependent EPL and of relaxing firms' financial constraints. Our paper complements the vast empirical literature that has tried to assess the economic burden of Italian EPL by exploiting regulatory discontinuities and extrapolating local effects.

We find that the general equilibrium effects of removing size-dependent downward labor adjustment costs are rather negligible: employment only slightly increases, firms substitute for (now cheaper) labor thus reducing capital intensity and total GDP is unchanged. This result is basically due to the response of wages to increased labor demand following the elimination of EPL that offsets most of it. While our quantitative results depends clearly on our calibration choices, they highlight the major role played by the elasticity of labor supply in assessing the overall effects of dropping EPL. Our analysis also highlights an important and somewhat unexpected distorsion played by size-dependent EPL: by depressing wages, it makes profitable for low productivity entrepreneurs to start up a small business thus draining resources from more productive uses and posing a drag to aggregate TFP. Removing EPL leads these entrepreneurs to opt for supplying labor instead. As a consequence, average TFP increases, the more so if weighted by firm size.

The negligible effects of removing size-dependent EPL compare with rather sizeable effects of relaxing financial constraints to the US level. Even with size-dependent EPL

still in place, this causes GDP to increase by 3 percent with stable employment, essentially due to a higher capital stock. While the absolute number of entrepreneurs is unchanged, the pool of entrepreneurs is better selected, leading to higher avrage TFP, because easier access to credit favours talent over funds.

We also find that removing EPL in a looser financial setting still has no sizeaeble effects on GDP suggesting that lack thereof in the baseline exercise is not due to strongly binding financial constraints that prevent firms from extensively suffering from such regulation.

We conclude that a rather standard general equilibrium model calibrated to the Italian economy taking into account specific institutional features that accounts for the possibility that large firms away from the threshold that accout for most of the labor demand do respond to the regulation suggests a limited role of size-dependent EPL if distorting resource allocation. The model is clearly a highly sketchy representation of reality, though more adequate to the Italian economy than available studies. It represents nonetheless a guide to assess and compare in a common framework the effects of alternative policies aimed at removing distorsions. A first natural extension is a more realistic representation of starting up and closing down businesses that would enrich the model with other potential sources of distorsion. Also, the model clearly points to the role played by labor supply in shaping the general equilibrium effects of any policy that boosts labor demand; therefore, a broader assessment fo the results against alternative assumptions on labor supply is warranted.

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Table 1: Parameters

Panel A: Fixed Parameters

Parameter	**Symbol**	**Value**
CRRA	σ	1.5
Capital coefficient in production function	α	0.272
Labor coefficient in production function	θ	0.544
Depreciation rate	δ	0.06

Panel B: Calibrated parameters

Parameter	**Symbol**	**Value**
Pareto coefficient	η	6.0
Productivity shock probability	ψ	0.894
Discount factor	β	0.935
Intensity of credit market frictions (collateral constraint)	λ	4.5
Fraction of dismissed workers wages the firms expect to pay	τ_l	0.075

Table 2: Calibration

	Italian Data	**Model**
Real Interest Rate	2%	2%
Share of firms with 15 or less employees	92.2%	89.7%
Employment share of firms with 15 or less employees	37.3%	43.7%
Share of firms with 10-15 employees not growing above 15	65%	66%
Establishment exit rate	10.6%	9.1%

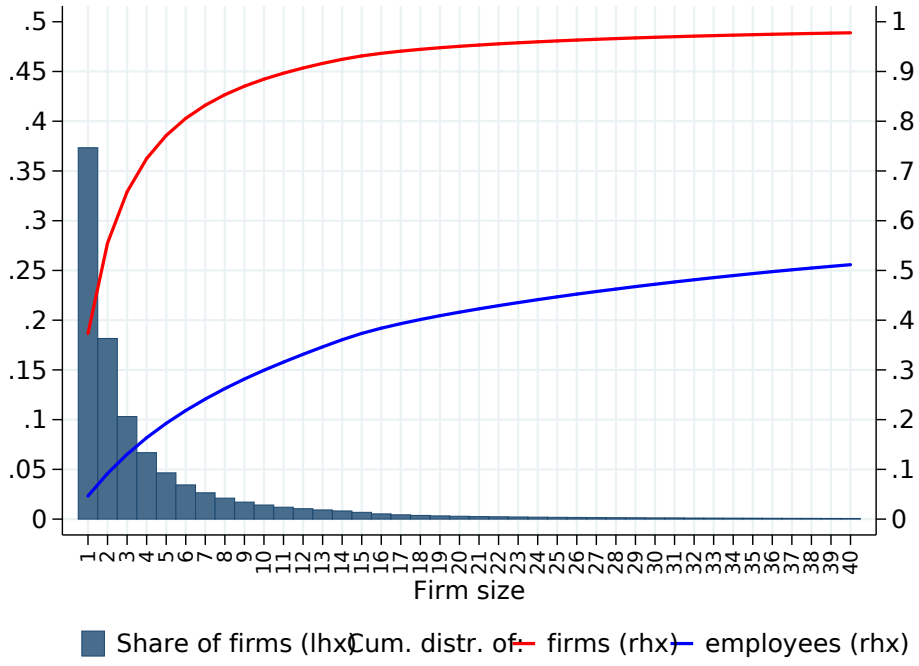
Table 3: Main results

	$\lambda = 4.5$		$\lambda = 7.5$	
	EPL	**NO EPL**	**EPL**	**NO EPL**
	(1)	(2)	(3)	(4)
Share firms ≤ 15	0.897	0.859	0.898	0.861
Share employment at firms ≤ 15	0.437	0.376	0.457	0.395
Total employment	0.920	0.924	0.921	0.924
Capital stock	1.034	1.025	1.068	1.055
Debt/Capital	0.591	0.598	0.650	0.659
Average TFP	0.567	0.571	0.573	0.576
Output	0.362	0.361	0.373	0.371
Interest rate	0.021	0.021	0.026	0.027
Wage	0.212	0.213	0.217	0.219
Labor adjustment cost	0.075	0.000	0.075	0.000
Collateral constraint	4.5	4.5	7.5	7.5

Table 4: Partial equilibrium effects

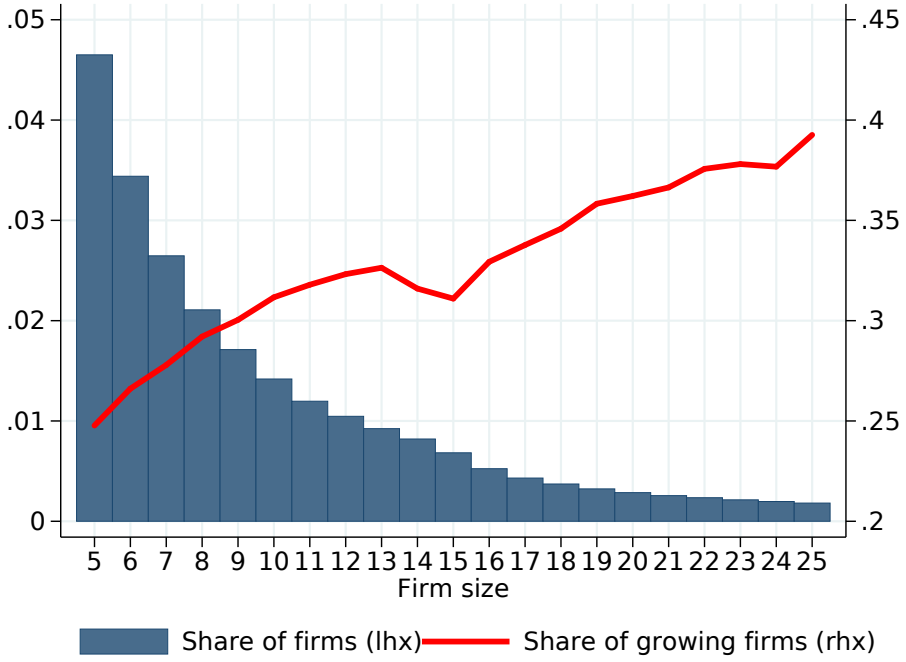
	Labor demand		Number of firms		Average TFP	
	Baseline	PE	Baseline	PE	Baseline	PE
1-10	0.284	0.284	0.063	0.063	0.531	0.531
11-15	0.118	0.078	0.009	0.006	0.628	0.618
16-20	0.007	0.051	0.000	0.003	0.686	0.655
21-25	0.041	0.043	0.002	0.002	0.681	0.678
26+	0.470	0.498	0.006	0.006	0.808	0.807
Total	0.919	0.955	0.080	0.080	0.567	0.567

Figure 1: Firm size distribution, 2003-2007



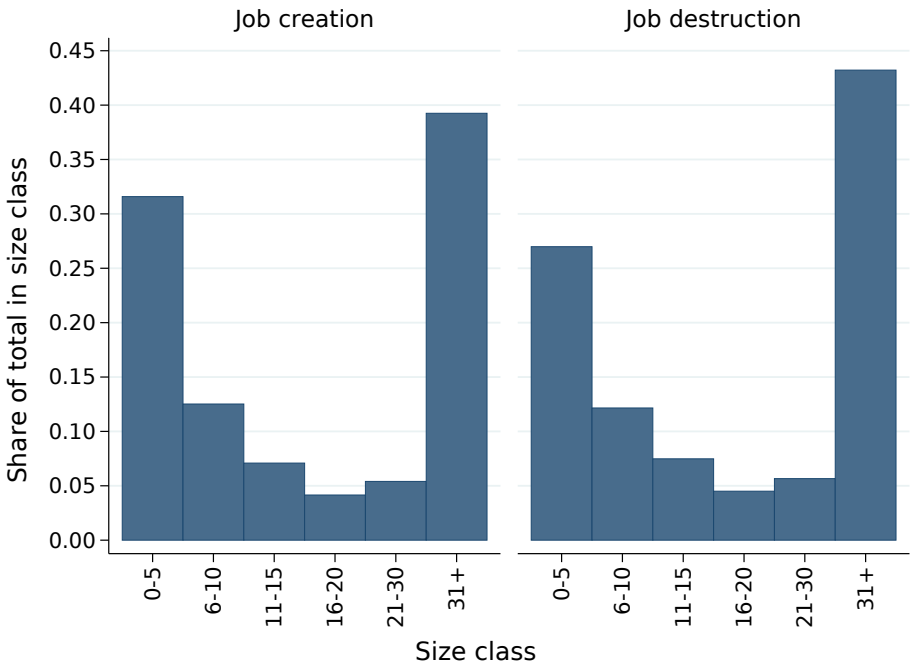
Source: own elaborations on Inps data.

Figure 2: Firm size distribution and firm dynamics, 2003-2007



Source: own elaborations on Inps data.

Figure 3: Job creation and job destruction by size class, 2003-2007



Source: own elaborations on Inps data.

Figure 4: Cumulative distributions of firms and employment by firm size.

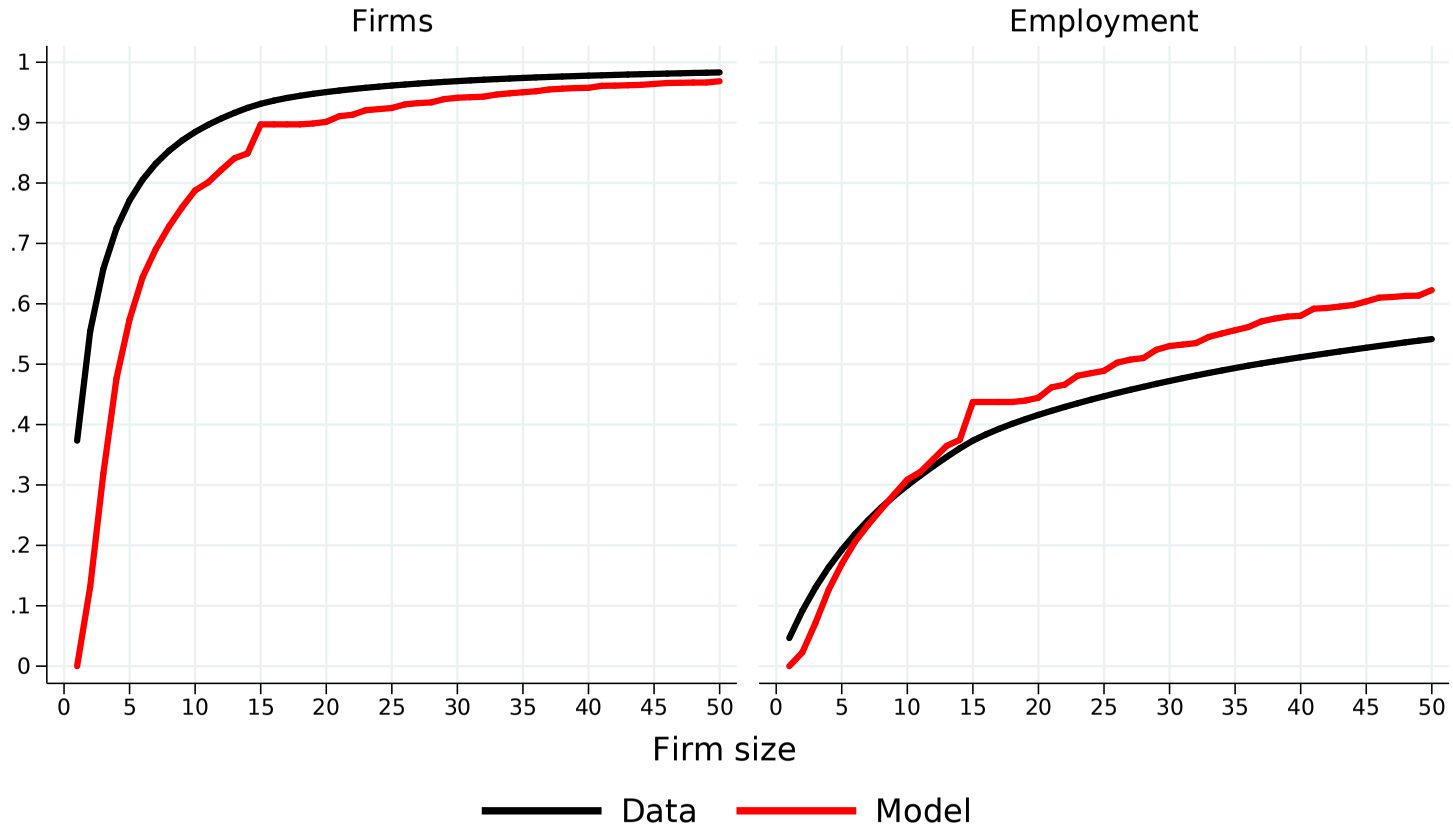


Figure 5: Firm density by size.

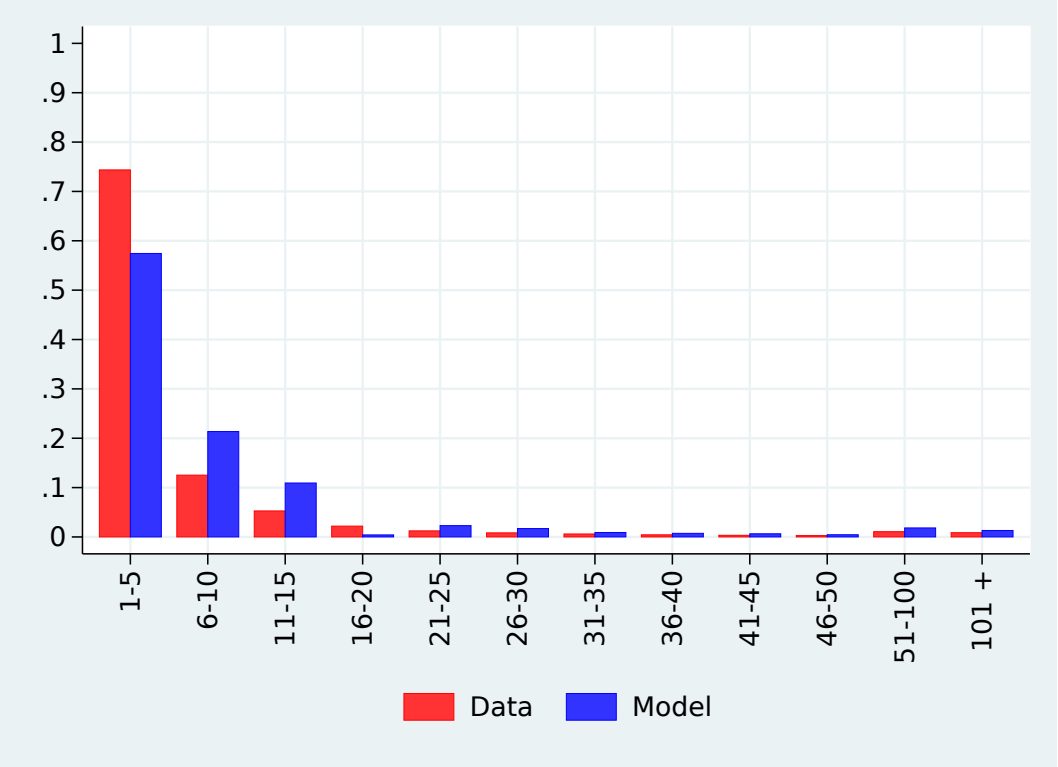


Figure 6: Employment by firm size (data and model)

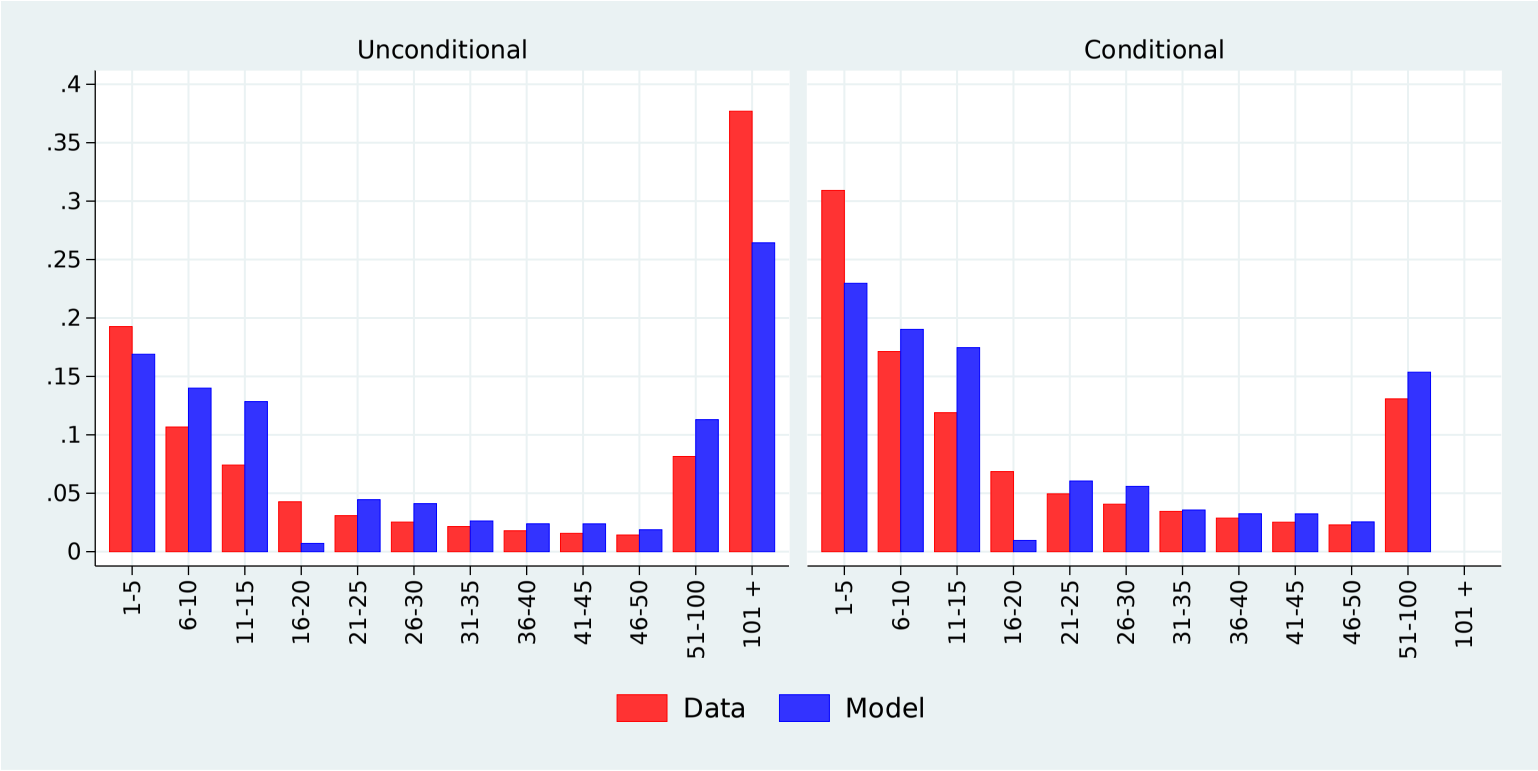


Figure 7: Labor demand