Limited Enforceability of Employment Protection Legislation

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Abstract

In this paper I show that the effects of employment protection depend on its enforcement. For this purpose, I capture evasion of employment protection via market exit in a setting of monopolistic competition. I find that the possibility to evade firing costs can lead to an increase in the number of firms that enter the market ex-ante, whereas this number is independent of firing costs in the case of perfect enforcement. Furthermore, I find that the possibility to circumvent firing restrictions by exiting the market mitigates the adverse effects on efficiency associated with employment protection in the applied setup.

Keywords: employment protection, evasion, market entry, market exit, monopolistic competition

JEL: J63, J65, L13

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1 Introduction

To get a proper understanding of the effects of regulations and other interventions by public authorities, it is necessary to also include possibilities to circumvent such rules into the analysis. To give an example in this line, a voluminous literature has developed investigating the effects of tax evasion, starting with the seminal contribution by Allingham and Sandmo (1972). Labor markets, especially in continental Europe, are often characterized by substantial regulations. In this paper, I investigate one of these regulations, namely employment protection legislation. Employment protection restricts the employers freedom to reduce the workforce of her firm or at least increases costs for such a downward adjustment. In most parts of the literature on employment protection it is (implicitly) assumed, that the corresponding regulations can be perfectly enforced. However, this may not always be warranted. As employment protection is normally associated with additional costs for the employer, an incentive exists to circumvent these regulations. Further, the probability that employment protection rules are a binding constraint for the firm is higher in the event that the firm faces unfavorable business conditions. Therefore, the employer may simply not be able to afford the expenses associated with the regulations. These possibilities should be taken into account, when assessing the presumed effects of employment protection legislation.

In this paper, I capture only limited enforceability of employment protection legislation, modeled as linear firing costs, by allowing firms to avoid payment of firing costs by leaving the market. Market exit costs can fall short of individual firing costs, first, because firms may simply not be able to afford the required payments as they do not earn any profit. Second, in the case of market exit, incentives to default on firing costs (like, e.g., severance payments) may be enhanced, because penalties cannot be imposed. Third, if market exit is considered a collective dismissal the effective costs for the redundancies may be reduced.[1] For the present analysis I assume market exit costs equal zero if evasion of employment protection rules is possible. That is, according to this assumption, firms cannot be forced to bear any losses.

To incorporate market exit as a decision made by firms in a meaningful manner, I use a partial equilibrium model of imperfect competition on product markets, allowing for an

[1] See Belviso (2003). A differentiation between individual and collective dismissal costs can be found, for example, in Goerke (2002).

endogenous number of competitors. I choose a model of monopolistic competition in the manner of Dixit and Stiglitz (1977) drawing on the specification already used in the paper Baumann (2007): *"Product Market Competition in the Presence of Firing Costs"* (in the following referred to as *PMC* for short). Whereas aggregate shocks are looked at in *PMC*, I assume idiosyncratic shocks in the actual setting, such that firms are homogenous ex-ante but heterogenous ex-post as in Melitz (2003). Doing this, a clear-cut threshold for market exit of single firms can be derived. The reason for market exit being a profitable strategy is that firing costs add a fixed costs component to firms operative profits, which the firm can save on by leaving the market.

One of the main findings is that the result of firing costs being neutral with respect to market entry does no longer hold if, first, evasion of firing costs is allowed for, and, second, market power of firms depends on the number of firms active in the market. Furthermore, in a simulation I find - as one might expect - that the possibility to evade firing costs by market exit mitigates the effects of employment protection on hirings and dismissals. As I did not incorporate an obvious justification for the existence of employment protection, the possibility to evade firing costs also attenuates the adverse effects of firing costs with respect to efficiency of the market equilibrium.

Literature.[2] Although most contributions on employment protection assume perfect enforcement of the corresponding regulations, some authors allow for noncompliance with existing rules. Belviso (2003) investigates a search- and matching model with severance payments and firing costs but allows firms to declare bankruptcy in the occurrence of a negative shock. Bankruptcy frees firms from their obligations. As a consequence of the assumption of each firm employing only one worker, firms always declare bankruptcy if realizing low productivity, and firing costs only affect wage bargaining, whereas they have no direct effect on the decision to dismiss an employee. The possibility of limited assets of firms hampering the intended effects of employment protection, is also discussed in Blanchard and Tirole (2004). In their discussion on optimal firing taxes for financing unemployment benefits, "shallow pockets" of firms constitute an additional constraint for the optimization problem of the benevolent planner. This necessitates a decrease in optimal firing taxes

[2] In the following, I concentrate on circumvention of employment protection regulations. For a discussion of the literature on imperfect competition and firing costs the reader is referred to the literature review in *PMC*.

because otherwise, as results in the model presented here, firms are driven out of the market.

Although not directly related to the paper presented here, for completeness, two other reasons for limited enforceability of employment protection may be mentioned: asymmetric information and the use of alternative adjustment margins other than market exit. Asymmetric information can lead to imperfect enforceability of employment protection if a third party, like labor courts, is either not able to assess the true reason of a dismissal or who initiated the separation. In this line, Martin et al. (2004) assume that employers may default on severance payments by claiming that the separation was initiated by the worker. Similarly, as discussed in the literature on efficiency wages, in the event of a redundancy the employer has an incentive to claim that the worker did not provide required effort and is dismissed for behavioral reasons if this allows for a saving on firing costs (see Galdon-Sanchez and Güell 2003). Furthermore, as pointed out by Fella (2000b), an employer and her worker can share the interest to rename a redundancy as a quit if this allows to save on administrative costs. The gain can be shared between the two parties. Finally, concerning the use of alternative adjustment margins, the most prominent alternatives for the use of regular employment contracts are the use of fixed-term contracts (see, e.g., Blanchard and Landier 2002) or temporary work agency employment (see, e.g., Neugart and Storrie 2006), as far as these atypical contracts are associated with less stringent regulations.[3]

The rest of the paper is organized as follows. In Section 2 the model is described and two main results are derived. However, as the model does not allow for a closed-form solution, I present a simulation in Section 3 to provide more insights. I conclude in Section 4.

2 The model

2.1 Description

I investigate a model with a continuum of goods produced and consumed. The basic setup is related to the one in *PMC*. In this section, I first derive the demand functions for the goods

[3] Wasmer (2006) discusses, if employers may react to strong employment protection by more intense worker monitoring, a worsening of the working environment or harassment of workers as alternative adjustment margins.

produced. After that, I describe the production sector. The equilibrium is established in Section 2.2.

Demand. In the economy, the representative consumer's preferences are given by a CES utility function over a continuum of differentiated consumption goods, which I index by j,

$$U = \left[\int_0^{\bar{n}} a_j \left(x_j\right)^{1-\alpha} dj \right]^{\frac{1}{1-\alpha}} \tag{1}$$

where x_j is the amount of good j consumed and $\alpha \in (0,1)$ equals the inverse of the elasticity of substitution between goods. As in Blanchard and Giavazzi (2003) the value of α may depend on the number of competitors active in the market, n, with $\alpha'(n) \leq 0$.[4] The higher the elasticity of substitution between goods, the lower market power of each single firms is. $\bar{n}$ depicts the number of varieties of the consumption good for which a blueprint exists and is determined by market entry decisions of firms in the production sector, where each firm is able to produce one variety of the consumption good. Because market exit is allowed for, the number of firms active in the market can differ from the number of blueprints available, $n \leq \bar{n}$. Furthermore, a_j is a stochastic preference parameter which is distributed in the interval $[0, \overline{a}]$, $\overline{a} > 0$, according to the cumulative distribution function $G(a_j)$ which is common for every commodity j. The corresponding density function is labeled $g(a)$. With Y as total spending on consumption goods, the inverse demand function for a variety i is given by[5]

$$p_i = \frac{a_i}{\Omega} x_i^{-\alpha} \tag{2}$$

where p_i is the price of commodity i and

$$\begin{aligned} \Omega &= \left[\int_0^{\bar{n}} a_j \left(x_j\right)^{1-\alpha} dj \right] Y^{-1} \\ &= \frac{\bar{n}}{Y} \left[\int_0^{\overline{a}} a \left(x(a)\right)^{1-\alpha} dG(a) \right] \end{aligned} \tag{3}$$

is a measure relating effective output to overall spending for consumption goods. In the following, for convenience and as Y is exogenous, I refer to Ω as effective output. The last

[4] See also Ebell and Haefke (2003).

[5] For calculations see Appendix A.

equality sign in equation (3) follows from the common distribution of the preference parameter for all commodities j. Residual demand for firm i is higher, the lower the value of effective output and the higher the own preference parameter a_i are.

Production sector. The production sector is characterized by monopolistic competition on good markets. A continuum of firms exists. Each firm is endowed with a blueprint to produce one variety of the consumption good and uses the same production technology with labor as the only input. Each worker employed produces one unit of the commodity. I restrict attention to a two period setting. The time structure is described in Figure 1.

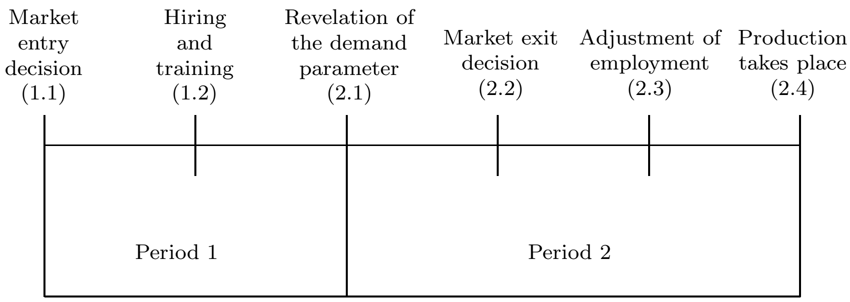

Figure 1: Time-structure of the model

As in Melitz (2003), I investigate a setting in which firms are homogenous ex-ante (period 1) but heterogenous ex-post (period 2). The realization of the demand parameter is not revealed before the beginning of the second period.[6] At the beginning of period 1, firms decide whether to enter the market, which involves the development of a new blueprint for a variety of the consumption good. Entry is associated with fixed market entry costs C, which are sunk. For production to take place in period 2, firms already have to hire and train workers in period 1, determining the number of initially employed workers per firm $\bar{x}_i$. The consideration underlying this assumption is that workers need firm-specific knowledge for production, and firm-specific training to be time-consuming. Training is associated with costs h per worker. The decisions with respect to market entry and hiring are therefore based only on the knowledge of the distribution for the preference parameter a. After the

[6]In Melitz (2003) productivity is revealed only after the market entry decision, but it is also pointed out, that uncertainty about productivity could be due to uncertainty about the consumer's valuation of goods.

realization of the demand parameters for the commodities at the beginning of period 2, each firm can decide whether to stay or to exit the market. Firms that stay in the market may adjust their employment level. However, as a consequence of the assumption of time consuming training, only a downward adjustment of initial employment is possible. Costs per worker employed in period 2 are given by the wage w whereas for each worker laid off the firm has to pay firing costs $T < w$.[7] With respect to the market exit decision, I distinguish two scenarios. In the first one, henceforth scenario A, market exit does not allow for a saving on firing costs. Market exit corresponds to employment of zero in period 2 and accordingly market exit costs are given by $T\bar{x}_i$. In this case, given the specification of the model, market exit is never a profitable strategy. In the second scenario, scenario B, in the event of market exit employment protection rules cannot be enforced and market exit costs equal zero. Consequently, all firms that would otherwise incur losses close down. Scenario A turns out to be equivalent to the setting with aggregate shocks and (ex-ante and ex-post) symmetric firms as described in *PMC*. The nouveau component of the model is scenario B, capturing the effects of incomplete enforceability of employment protection.

2.2 Equilibrium

The model is solved by backward induction. I start with the decision on ex-post employment of a firm staying in the market (stage (2.3)), determine market exit decisions (stage (2.2)), describe the optimal hiring policy (stage (1.2)) and finally point out the number of firms entering the market (stage (1.1)). Because firms can be readily described by the realization of the respective demand parameter a_i in period 2 and are symmetric in period 1, in what follows I skip the subscript for firms.

Adjustment of employment. Firms that stay in the market in period 2 decide whether to keep employment at the level of initial hirings $\bar{x}$ or to lay off some of their employees. In choosing employment, firms maximize operative profits $\pi(a)$ subject to the constraint

[7] I assume firing costs T to fall short of the wage w as otherwise it would be profitable for firms to keep workers idle instead of dismissing them. The assumption of a constant wage is discussed in the concluding remarks.

$x(a) \leq \bar{x}$. Operative profits are given by

$$\begin{aligned} \pi(a) &= p(a)x(a) - wx(a) - T\left[\bar{x} - x(a)\right] \\ &= \frac{a}{\Omega}x(a)^{1-\alpha} - (w-T)\,x(a) - T\bar{x}. \end{aligned} \tag{4}$$

Firing costs change the cost structure of firms because effective marginal costs of output and employment, $(w - T)$, decline in firing costs whereas a fixed cost component, $T\bar{x}$, is added.[8] From maximization of operative profits one finds a threshold value for the demand parameter a, a^k, such that optimal employment is restricted by initial hirings $\bar{x}$ for $a > a^k$, whereas for lower values of the demand parameter a firm that stays in the market lays off part of its workforce, where

$$a^k = \frac{w-T}{1-\alpha}\Omega\bar{x}^{\alpha}. \tag{5}$$

The optimal employment-price combination for an active firm is given by[9]

$$(x^*(a); p^*(a)) = \begin{cases} \left(\frac{1-\alpha}{w-T}\frac{a}{\Omega}\right)^{\frac{1}{\alpha}}; & \frac{w-T}{1-\alpha}; \quad a \leq a^k \\ \bar{x}; & \frac{a}{\Omega}\bar{x}^{\alpha}; \quad a > a^k. \end{cases} \tag{6}$$

Market exit. A firm leaves the market if maximized operational profits fall short of market exit costs. As marginal profits become infinite for employment approaching zero, market exit (that is zero employment) can only be profitable if it allows for a saving on the fixed costs component of operative costs.[10] Accordingly, in scenario A, market exit is never a profitable strategy as it does not allow for a saving on firing costs. In contrast, in scenario B, one finds a second threshold for the demand parameter, a_B^b, such that $\pi\left(a_B^b\right) = 0$ and firms who realize a preference parameter $a < a^b$ exit the market. Inserting equation (6) into equation (4), a_B^b is described by

$$a_B^b = \begin{cases} \left(\frac{w-T}{1-\alpha}\right)^{1-\alpha}\left(\frac{T}{\alpha}\right)^{\alpha}\Omega\bar{x}^{\alpha}; & T \leq \alpha w \\ w\Omega\bar{x}^{\alpha}; & T > \alpha w. \end{cases} \tag{7}$$

[8] See also Kessing (2006).

[9] See *PMC* for a discussion of the outcomes.

[10] See also Melitz (2003). Melitz incorporates to types of fixed costs, fixed entry costs and fixed production costs. In the setting used here, the fixed costs of production are endogenous as firms choose the number of initial employment $\bar{x}$.

The threshold value for market exit increases in effective output Ω as residual demand for each single firm decreases. Furthermore, a_B^b increases in initial employment $\bar{x}$ because of the higher fixed costs. Finally, with respect to firing costs, the threshold value a_B^b equals zero for $T = 0$ but is positive for positive values of firing costs. *Ceteris paribus*, the threshold value increases with firing costs for $T < \alpha w$ to reach a maximum at $T = \alpha w$. The critical value for firing costs, αw, comes out of the fact that individual dismissals cannot be profitable for higher values of firing costs, as the optimal price in case of a downward adjustment in employment, $\frac{w-T}{1-\alpha}$, would fall short of production costs per unit output, given by the wage w. Accordingly, firms either exit or stay in the market and keep employment at $\bar{x}$ but never lay off workers individually in the case of $T > \alpha w$.[11] As a consequence, a further increase in firing costs does not affect profits of the firm any longer, and the threshold value a_B^b is solely determined by a comparison of the price the firm can charge keeping its employment at $\bar{x}$ and wage costs per unit produced.

With $G\left(a_l^b\right)$ as the probability of exit for each firm, the number of firms in the market in period 2 equals $n = \bar{n}\left(1 - G\left(a_l^B\right)\right)$, with $l = A, B$, denoting the scenario under consideration. In scenario A, $n = \bar{n}$ always holds ($a_A^b = 0$). Taking the option of market exit into account, operative profits are described by

$$\pi(a) = \begin{cases} 0; & a < a_l^b \\ \alpha\left(\frac{1-\alpha}{w-T}\right)^{\frac{1-\alpha}{\alpha}}\left(\frac{a}{\Omega}\right)^{\frac{1}{\alpha}} - T\bar{x}; & a_l^b < a < a^k \\ \frac{a}{\Omega}\bar{x}^{1-\alpha} - w\bar{x}; & a > a^k, \end{cases} \tag{8}$$

$l = A, B$. In scenario B, for $T > \alpha w$, $a^k < a_B^b$ and operative profits are described by the first and the last line in equation (8) only, with a^k being replaced by a_B^b.

Initial employment. In period 1, after having entered the market, each firm must decide about the number of workers to hire, $\bar{x}$. Firms choose initial employment in order to maximize the ex-ante expected operative profits net of training costs,

$$\Pi = \int_0^{\overline{a}} \pi(a)dG(a) - h\bar{x}. \tag{9}$$

[11]Note that for $T = \alpha w$, the two threshold values for the demand parameter coincide, $a^k = a_B^b$.

From equations (8) and (9) optimal initial employment is determined by

$$\frac{1-\alpha}{\Omega\bar{x}^{\alpha}}\int_{a^k}^{\overline{a}} adG(a) - w\left[1-G\left(a^k\right)\right] - T\left[G\left(a^k\right)-G\left(a_l^b\right)\right] - h = 0, \tag{10}$$

$l = A, B$, for scenario A (in this case $G\left(a_A^b\right) = 0$) and for scenario B for $T < \alpha w$. For $T > \alpha w$ in scenario B, a^k has to be replaced by a_B^b and the actual level of firing costs does not affect the number of workers to hire. Equation (10) states that, in equilibrium, the first term, namely expected marginal revenue of the last worker hired, equals marginal costs. Beside training costs h, the latter comprise the wage w in case the (last) worker remains employed after the realization of the demand parameter is known and firing costs T in the event of an individual dismissal. In the event of market exit in scenario B, firing costs are reduced to zero. With respect to the second order condition, marginal revenue decreases as initial employment increases, however, marginal costs decrease in scenario B for $T < \alpha w$ as well. Marginal costs decrease because higher initial employment increases the fixed costs component and thereby raises the probability of market exit, in which case firing costs are saved. In what follows, I assume the second order condition for a profit maximum to be fulfilled, that is for scenario B and $T < \alpha w$

$$-\frac{\alpha(1-\alpha)}{\Omega\bar{x}^{1+\alpha}}\int_{a^k}^{\overline{a}} adG(a) + g\left(a_B^b\right)\alpha T\left(\frac{w-T}{1-\alpha}\right)^{1-\alpha}\left(\frac{T}{\alpha}\right)^{\alpha}\Omega\bar{x}^{\alpha-1} < 0 \tag{11}$$

is assumed to hold.

Market entry. Firms enter the market as long as expected operative profits less costs of training exceed the fixed market entry costs C. Integrating equation (8), subtracting training costs and taking into account the first-order condition for initial employment, equation (10), the market entry condition is given by[12]

$$\Pi = \frac{\alpha Y}{\bar{n}} = C \tag{12}$$

for both scenarios A and B. The number of firms entering the market is determined by overall demand Y, the elasticity of individual demand α, also indicating market power of firms, and entry costs C.

[12]For calculations see Appendix B.

2.3 The effects of an increase in firing costs

Market entry and the number of competitors in the market. With the number of firms entering the market determined by equation (12), this number is independent of firing costs for both scenarios A and B for $\alpha'(n) = 0$, where $n = \bar{n}\left(1 - G\left(a_l^b\right)\right)$, $l = A, B$. In contrast, allowing for the elasticity of substitution between products to increase in the number of varieties actually produced as in Blanchard and Giavazzi (2003), i.e. $\alpha'(n) < 0$, the results differ according to the scenario considered. Without the possibility to evade firing costs by market exit, scenario A, the firing costs are still neutral with respect to market entry of firms. This corresponds to the results derived in *PMC*. Otherwise, with evasion of firing costs by market exit, the probability of market exit is positive for $T > 0$ and zero for $T = 0$. Accordingly, in the first case, i.e. $T > 0$, the number of varieties offered in period 2 falls short of the number of firms entering the market, $n < \bar{n}$, and the neutrality result can no longer hold. Instead, to keep expected profits constant and equal to market entry costs, the number of blueprints available must exceed the number in the event of firing costs being zero, $\bar{n}_{T>0} > \bar{n}_{T=0}$. Otherwise the higher market power for active firms as a result of market exit of competitors would raise profits above market entry costs. At the same time, whereas $\bar{n}$ is higher for positive firing costs, the number of firms active in the market must decline. To see this, assume $n_{T>0} \geq n_{T=0} = \bar{n}_{T=0}$. This would imply $\alpha_{T>0} \leq \alpha_{T=0}$, and the number of firms entering the market would have to be equal or fall short of $\bar{n}_{T=0}$ to assure equality in equation (12), contrary to what has been established above. Therefore, one has

Result 1: *Assuming market power of firms to decrease with the number of firms active in the market in period 2 and allowing for evasion of firing costs by market exit, more firms enter the market for positive firing costs than in the absence of firing costs. However, taking market exit into account, the number of firms active in the market is lower for positive firing costs than for firing costs equal to zero. Finally, if evasion of firing costs is not possible or market power of firms is independent of the number of competitors, the number of firms entering the market is independent of the existence or the level of firing costs.*

Having established this result, in the following, for reasons of tractability, I restrict the analysis to the case $\alpha' = 0$, that is market power of firms is exogenous and as a result the number of firms entering the market is always independent of the level of firing costs.

Effective output and utility of the representative consumer. Firing costs represent additional labor costs for firms. As a consequence of an increase in firing costs, to reestablish the market entry condition, these higher costs must be compensated by higher profits according to a shift in residual demand faced by each single firm. This must be achieved by a decrease of effective output Ω, see equation (2). Indeed, the change in effective output when firing costs are increased is given by[13]

$$\frac{d\Omega}{dT} = -\frac{\bar{n}\Omega}{Y} \int_{a_l^b}^{a^k} \left[\bar{x} - x^*(a)\right] dG(a) \leq 0, \tag{13}$$

$l = A, B$. The integral term is the number of expected dismissals and corresponds to the direct effect firing costs have on profits. Effective output must decrease with firing costs and only in scenario B for $T \geq \alpha w$, Ω will no longer be affected by a further increase in firing costs as no individual dismissals take place. From equation (1), the representatives consumer's utility unambiguously depends positive on effective output for a given elasticity of substitution α^{-1}. As will become clear in the discussions to follow, the reduction in utility is mainly due to an inefficient production structure in the presence of firing costs, reducing the number of consumption goods with a high realization of the preference parameter a. In contrast, the reduction in utility is not due to market exit taking place, although the representative consumer's utility function exhibits love of variety.

Result 2: *Effective output generally decreases in firing costs. Only if evasion of firing costs by market exit is possible and no individual dismissals take place, a further increase in firing costs is not associated with a decrease in effective output. The decline in effective output translates into a reduced utility level the representative consumer achieves in equilibrium.*

Initial employment and market exit. Before turning to the simulation in the next section, I report the results of the comparative static analysis with respect to initial employment, $\bar{x}$, and the threshold value for market exit, a_B^b.[14] For the change in the probability of

[13] For calculations see Appendix C.

[14] The calculations can be retraced in Appendix D.

market exit in scenario B (for $T < \alpha w$) one obtains

$$\begin{aligned} \frac{dG\left(a_B^b\right)}{dT} &= g\left(a_B^b\right)a_B^b\left[\frac{\alpha w - T}{(w-T)T} + \frac{\alpha}{\bar{x}}\frac{d\bar{x}}{dT} + \frac{1}{\Omega}\frac{d\Omega}{dT}\right] \\ &= g\left(a_B^b\right)a_B^b\frac{G\left(a^k\right) - G\left(a_B^b\right) - \frac{1-\alpha}{\Omega\bar{x}^\alpha}\int_{a^k}^{\overline{a}} adG(a)\frac{\alpha w - T}{(w-T)T}}{\bar{x}^\alpha\Delta} \end{aligned} \tag{14}$$

with

$$\Delta = -\frac{1-\alpha}{\Omega\bar{x}^{2\alpha}}\int_{a^k}^{\overline{a}} adG(a) + Tg\left(a_B^b\right)\frac{a_B^b}{\bar{x}^\alpha} < 0. \tag{15}$$

$\Delta < 0$ holds according to the assumption of the second-order condition for a maximum of profits being fulfilled. The direct effect of firing costs is to increase the threshold value a_B^b. However, this effect may be counteracted by the reduction in effective output Ω or a decrease in initial employment $\bar{x}$. Whereas from equation (14) the sign of the change in the probability of market exit cannot be unambiguously predicted, the direct effect always dominates in the simulations presented in Section 3, meaning that a_B^b increases with firing costs for $T < \alpha w$. In scenario A or for firing costs exceeding αT an increase in firing costs has no (additional) effect on the probability of market exit.

Concluding this section, for the change in the number of workers hired in period 1 one finds

$$\frac{d\bar{x}}{dT} = \bar{x}^{1-\alpha}\frac{G\left(a^k\right) - G\left(a_l^b\right) - a_l^b g\left(a_l^b\right)\frac{\alpha w - T}{w-T}}{\alpha\Delta} - \frac{\bar{x}}{\alpha\Omega}\frac{d\Omega}{dT}, \tag{16}$$

$l = A, B$. The direct effect of firing costs is to increase marginal costs of labor according to the probability of an individual dismissal $\left(G\left(a^k\right) - G\left(a_l^b\right)\right)$, reducing the optimal number of workers to hire. However, an increase in the probability of market exit diminishes marginal costs and an increase in effective output increases marginal revenue. From equation (16), whether initial employment increases or decreases with firing costs in scenario B cannot be predicted. In contrast, in scenario A, as in *PMC*, initial employment always decreases in firing costs. In this case, from equations (3) and (6), as optimal employment in period 2 increases with firing costs for all $a < a^k$, the decrease in Ω can only be achieved by a decrease in employment for $a > a^k$, that is lower initial employment $\bar{x}$.[15] However, as presented in the simulation for scenario B in the next section, I also find initial employment to decrease with firing costs in this setting despite market exit taking place.

[15] Note that $a_A^b = 0$.

3 Simulation

In this section I perform simulations for two different values of the elasticity of substitution between consumption goods, which can also be interpreted as a measure of market power of firms. The purpose of the simulation approach is first, to exemplify the change in initial employment and the probability of market exit, for which no unambiguous results are found in the comparative static analysis. Furthermore, I investigate in this section the number of dismissals and overall employment in period 2 as well as the distribution of employment with respect to the preference parameter a.

Parameter values and functions used for the simulation. The parameter values (and functions) used are summarized in Table 1. For the preference parameter a I assume a

Parameter/Function	Value(s)
w	1
h	1
Y	100
C	2
$G(a)$	$\frac{a}{10}$
α	$\{0.25, 0.5\}$

Table 1: Parameter values and functions used in the simulation

uniform distribution in the interval $[0, 10]$ as indicated by $G(a)$ in Table 1. Market power of firms increases with the value of the parameter α, which, again, is assumed to be independent of the number of firms in the market.

Number of firms. Whereas, as stated in **Result 1**, for α being independent of the number of firms in the market, the number of firms that initially enter the market $\bar{n}$ is independent of firing costs, the number of firms active in period 2 depends on the probability of market exit, $G\left(a_l^b\right)$, and therefore on the threshold value for the demand parameter a_l^b, $l = A, B$. In the comparative static analysis no clear cut results could be derived for the change of a_l^b with respect to firing costs for scenario B. However, in the simulations the direct effect of firing costs increasing the threshold value always dominates. That is, the probability of market exit increases with firing costs, reducing the number of firms in the market as illustrated in Figures 2 and 3, where I report the number of firms active, n, as a share of $\bar{n}$. In the simulations, the number of firms that initially enter amounts to 12.5 for $\alpha = 0.25$ and 25 for $\alpha = 0.5$.

The horizontal axis gives firing costs as a percentage share of wages.[16] The dashed line depicts the number of firms active in period 2 if no evasion of firing costs is possible, scenario A, in which case no market exit takes place. In contrast, for scenario B, the share of firms active in period 2, $\left(1 - \left(G_B^b\right)\right)$, is represented by the solid line. In scenario B, an increase in firing costs always raises the probability of market exit in the simulations until the critical value of $T = \alpha w$ is reached. The number of firms active for $T = \alpha w$ equals $n = 10.001$ for $\alpha = 0.25$ and $n = 21.713$ for $\alpha = 0.5$ implying a probability of market exit of 19.99 respectively 13.15 per cent. For firing costs higher than the critical value, a further increase has no additional effect on the probability of market exit. The relative decrease in the number of firms active in the market is more pronounced for the lower value of market power, $\alpha = 0.25$. The lower market power of firms is associated with a lower level of profits. Therefore, the possibility to avoid the (fixed) costs $T\bar{x}$ in period 2 is more relevant for firms for the lower value of α.

[16] Note that in the following figures due to the different values for critical firing costs αw, for $\alpha = 0.25$, I depict firing costs up to 49.75 per cent of wages, whereas for $\alpha = 0.5$ the range of firing costs is up to 97.5 per cent of wages.

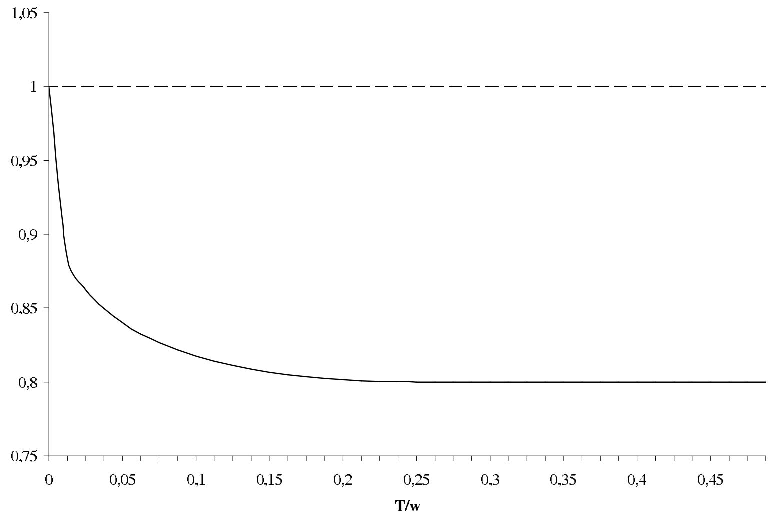

Figure 2: $\alpha = \frac{1}{4}$: Active firms in period 2

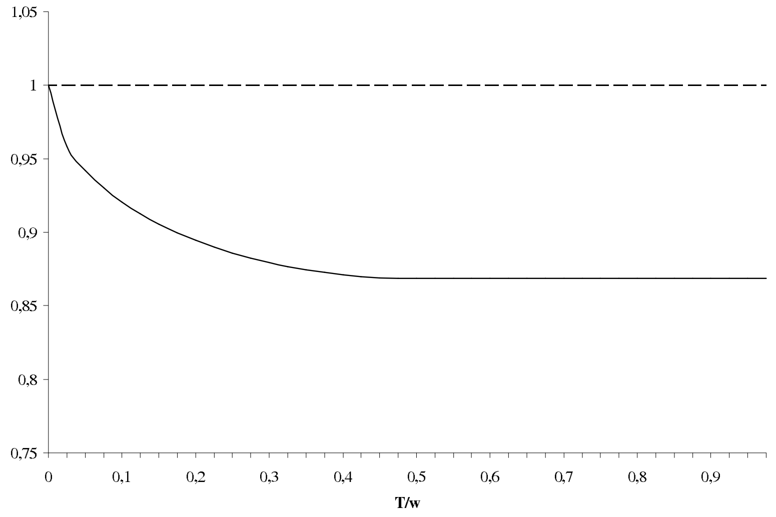

Figure 3: $\alpha = \frac{1}{2}$: Active firms in period 2

Initial employment. Figures 4 and 5 depict the number of workers hired in period 1 as share of initial hirings in the absence of firing costs for the two scenarios A and B. Again the horizontal axis corresponds to the ratio of firing costs to wages. Without firing costs, initial employment per firm amounts to $\bar{x} = 3.360$ for $\alpha = 0.25$ and $\bar{x} = 1.098$ for $\alpha = 0.5$.[17] Again, the dashed (solid) line gives initial hirings for scenario A (B). In the simulations initial hirings always decrease in firing costs even if evasion of these costs by market exit is allowed for. However, the effect of an increase in firing costs on initial hirings is mitigated when possibilities of evasion are taken into account. Furthermore, whereas the decrease in the number of firms active in period 2 is more pronounced for the lower value of $\alpha = 0.25$, the opposite results in the simulation for initial hirings. As the option of market exit is more important in the case of low market power of firms, individual dismissals are carried out more rarely. An increase in the costs for individual dismissals affects marginal labor costs by less than for higher market power of firms. Accordingly, the decrease in initial employment when firing costs are increased is relatively small. Again, after having reached a level equal to αw, a further increase in firing costs does not affect initial employment any more in scenario B.

[17] That is, the overall number of initial hirings decreases with market power of firms. $\bar{n}\bar{x}$ equals 42.002 for $\alpha = 0.25$, whereas only 27.452 for $\alpha = 0.5$.

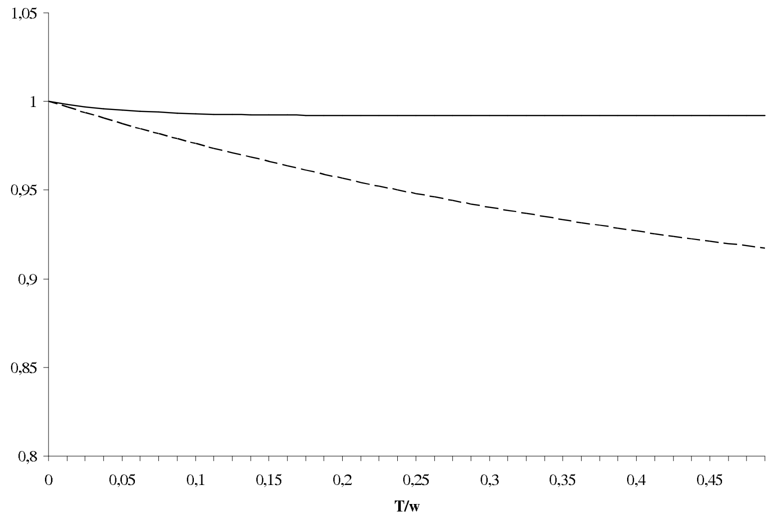

Figure 4: $\alpha = \frac{1}{4}$: Employment period 1

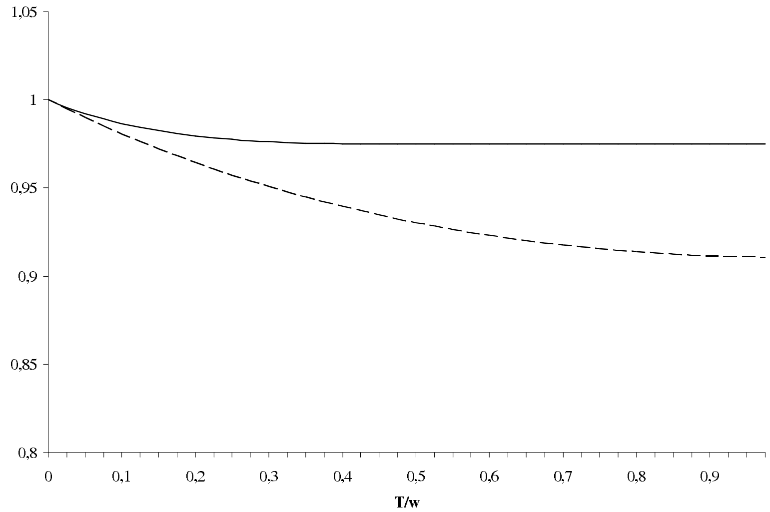

Figure 5: $\alpha = \frac{1}{2}$: Employment period 1

Dismissals. There are mainly three different ways in which firing costs alter the number of dismissals. First, for firms active in period 2, labor demand increases for low levels of the demand parameter a due to the decrease in effective marginal costs.[18] Second, as shown above, initial hirings decrease in firing costs in the simulation for every scenario. These two effects translate into fewer dismissals taking place. However, there is a countervailing third effect if market exit allows for evasion of firing costs. The increase in the probability of market exit, associated with employment of zero in period 2, *ceteris paribus* raises the number of dismissals taking place in scenario B. In the simulations presented in this section, the first two effects dominate the third effect also for scenario B, that is the number of dismissals is found to decrease with firing costs, see Figures 6 and 7 for $\alpha = 0.25$ respectively $\alpha = 0.5$. The dashed (solid) line gives the number of dismissals relative to the number of dismissals for $T = 0$ for scenario A (B).[19] As with respect to the number of workers hired in period 1, the possibility to evade firing costs dampens the effect firing costs exert on the number of dismissals. Furthermore, decomposing the number of dismissals, it could be shown in the simulations, that for scenario B and $T < \alpha w$ the number of dismissals due to market exit of firms increases with firing costs, whereas this effect is more than offset by the decrease in the number of individual dismissals. For $T > \alpha w$ in scenario B, all dismissals are due to market exit.

Employment in Period 2. The number of workers hired in period 1 together with the decision on dismissals determine employment in period 2. As both the number of workers hired as well as the number of workers dismissed are generally decreasing with firing costs in the simulations, the sign of the change in employment is at first ambiguous. In the simulations employment increases with firing costs, see Figures 8 and 9 for $\alpha = 0.25$ and $\alpha = 0.5$. The lines are drawn with the same conventions applied as in the other figures with the solid (dashed) line representing the outcome in scenario B (A).

[18] Additionally, optimal employment in this case is also affected by the change in effective output Ω. The decrease in Ω further increases optimal employment.

[19] Remember that in the figure for $\alpha = 0.25$, T only rises up to $T = 0.4975$, whereas for $\alpha = 0.5$, the maximum number depicted for T on the horizontal axis equals $T = 0.975$.

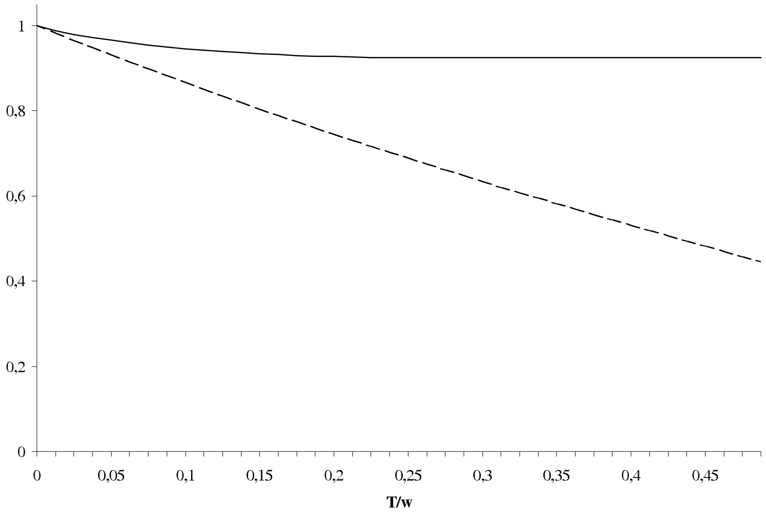

Figure 6: $\alpha = \frac{1}{4}$: Dismissals

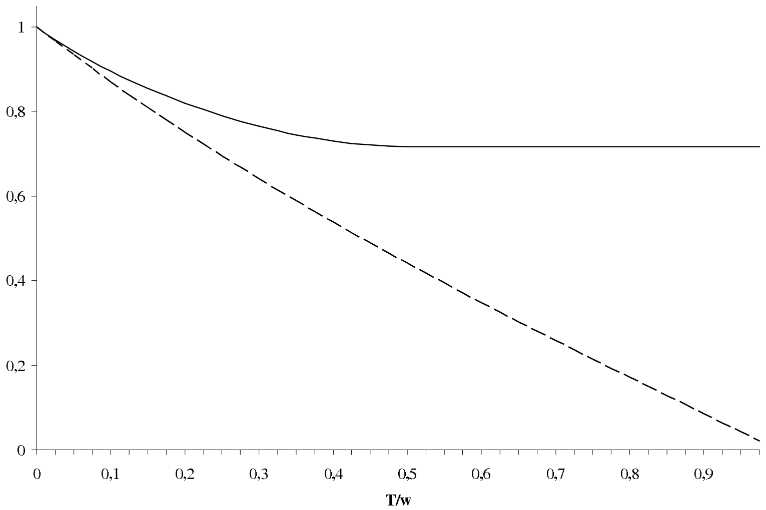

Figure 7: $\alpha = \frac{1}{2}$: Dismissals

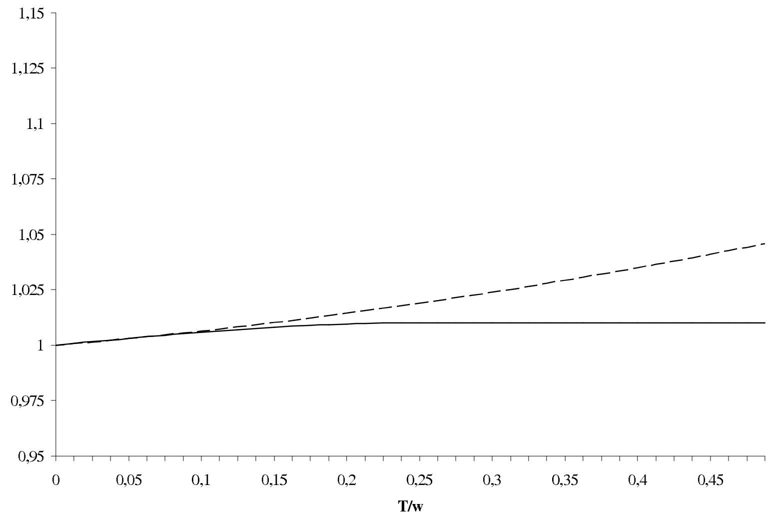

Figure 8: $\alpha = \frac{1}{4}$: Employment period 2

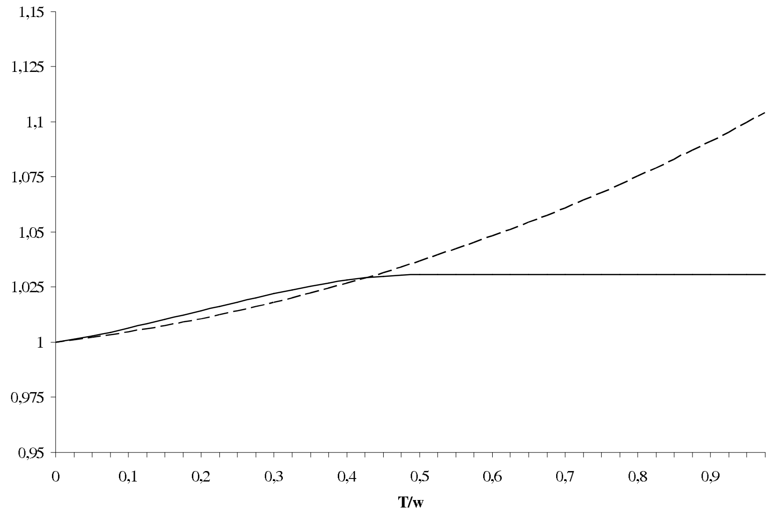

Figure 9: $\alpha = \frac{1}{2}$: Employment period 2

In the simulations, for low levels of firing costs relative to wages the net effect of the possibility to avoid firing costs on employment in period 2 is not uniquely signed. Whereas employment is slightly higher in scenario B than in scenario A for low values of firing costs, this relation is eventually reversed. For values of firing costs exceeding αw a further increase in firing costs only affects employment in scenario A, making the difference in employment more pronounced. In scenario B the increase in employment is limited to about one (three) per cent for $\alpha = 0.25$ ($\alpha = 0.5$). Note however, that an increase in employment is not directly associated with a more efficient allocation as utility depends on effective output.

Effective output. As has been already established in **Result 2**, an increase in firing costs is associated with a decrease in effective output as long as individual dismissals take place. In contrast to employment in period 2, for the calculation of effective output, employment is weighted by the respective realizations of the demand parameter and further manipulated according to the elasticity of substitution between goods, see equation (3). As illustrated in Figures 10 and 11 for $\alpha = 0.25$ and $\alpha = 0.5$, I find in the simulations that the possibility to evade firing costs mitigates the negative effect of firing costs on effective output. Again, the solid lines depict scenario B, whereas the dashed lines represent the outcome in scenario A without market exit.

As the utility level achieved by the representative consumer is positively related to effective output, the possibility to circumvent employment protection is associated with a gain in efficiency in the model. However, one should point to the fact, that in the setting used there is no justification for the existence of employment protection rules.[20] As in the general equilibrium model of Hopenhayn and Rogerson (1993), who find employment protection to distort efficiency of the market equilibrium by hampering an efficient allocation of labor, the (partial) equilibrium model used here can only provide an assessment of costs associated with employment protection regulations.

[20] Also distributive issues, which may help to explain the existence of employment protection are not addressed in the model (for this see, e.g., Saint-Paul 2000).

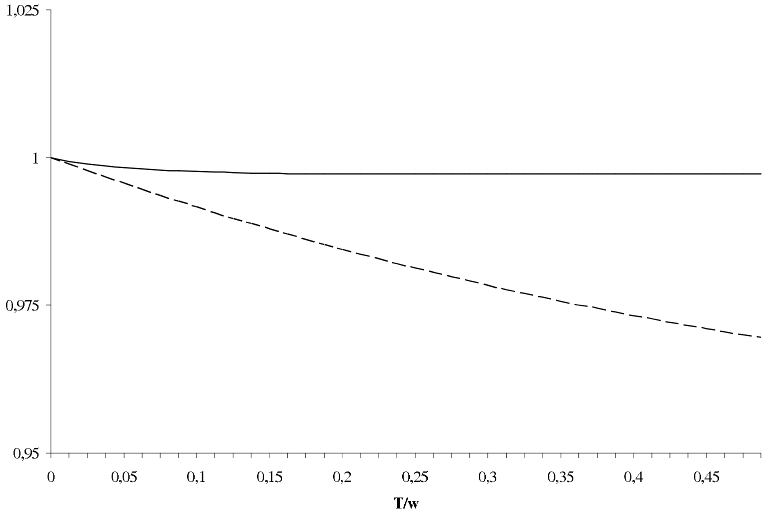

Figure 10: $\alpha = \frac{1}{4}$: Effective output

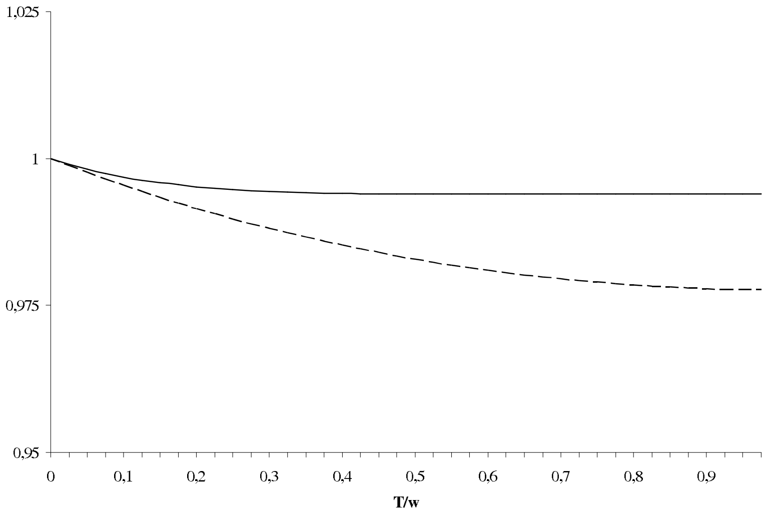

Figure 11: $\alpha = \frac{1}{2}$: Effective output

Figure 12 provides a comparison for employment in period 2 as a function of the demand parameter a for $\alpha = 0.5$ and two levels of firing costs, $T = 0.25$ and $T = 0.5$. Due to market exit, employment is zero for low realizations of the demand parameter in scenario B, represented by the solid lines. In contrast, without the possibility of evading firing costs, employment is positive also for low values of a, see the dashed curves. Conversely, for high realizations, as a consequence of hiring decisions in period 1, employment is higher in scenario B than in scenario A. For $T = 0.25$, for intermediate values of a, employment nearly coincides in the two scenarios and only differs due to the difference in effective output Ω (see equation (6)). For $T = 0.5$ no individual dismissals take place in scenario B. In this case, firms either leave the market or stay but do not adjust employment. Whereas overall

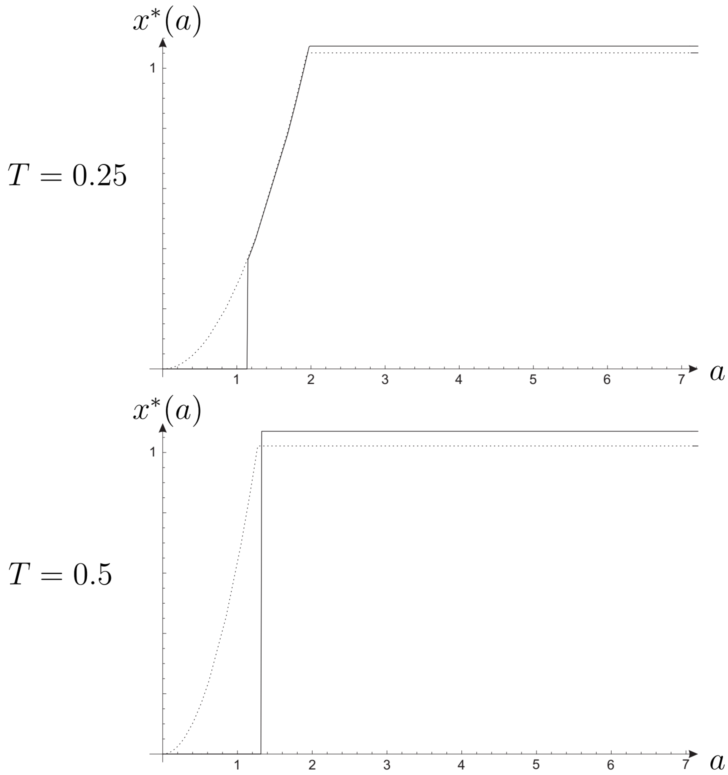

Figure 12: $\alpha = \frac{1}{2}$: Employment $x(a)$

employment is higher and the number of varieties produced is larger in scenario A than in scenario B, the representative consumer achieves a higher utility level with evasion of firing costs. The higher output of the goods most wanted (high values of a) more than outweighs overall lower output and the lower number of varieties available.

4 Conclusion

The impact of labor market regulations depends on their enforcement. In this paper, I offer a first approach to capture only limited enforceability of employment protection legislation by allowing firms to circumvent regulations by market exit. For this, I build on the framework developed in *PMC* of imperfect competition in product markets combined with firing costs, incorporating a second scenario with the additional assumptions that firms cannot be forced to bear any losses. Market exit may allow for evasion of firing costs either because firms are simply not able to pay the additional costs or because in the event of market exit they have an incentive to default on their obligations. If market power of firms depends on the number of firms active in the market, I find that the neutrality result of firing costs with respect to market entry does not apply anymore. In this case the number of firms initially entering the market is higher for positive firing costs than in the absence of firing costs. A second result is that, in the setup used and for given market power of firms, firing costs always reduce efficiency of the market equilibrium measured in terms of the representative consumer's utility. Using a simulation approach, I show that the negative effects of firing costs on efficiency can be mitigated if evasion of firing costs by market exit is allowed for.

As a last remark, let me discuss one of the assumptions made for the analysis, namely, wages do not depend on employment or the level of firing costs. As is well known from the literature on employment protection, the effects of such regulations depend a great deal on the effects firing costs have on wages.[21] On the one hand, if firing costs reduce the probability of a dismissal for each employee, an increase in firing costs may actually result in a decrease in wages. The decrease in wages can be due to an insurance argument (see Pissarides 2001) but also can be found in the case of risk-neutral agents, for example in efficiency-wage models (see Saint-Paul 1995, or Fella 2000a). Likewise, in the sense of Lazear (1990) severance payments as a specific form of firing costs may be accompanied by a offsetting decrease in wages. On the other hand, an increase in firing costs may also result in an increase in wages if they enhance the bargaining power of employed insiders for instance (see Lindbeck and Snower 1988) or in an efficiency-wage model, if shirking workers cannot be excluded from receiving severance payments (see Staffolani 2002 or Goerke 2002). Empiric analyses suggest

[21] For a more extensive discussion of the topic, see Garibaldi and Violante (2005).

a decrease in starting wages, whereas wages of incumbent workers may increase (see, e.g., Friesen 1996). In the paper presented here, the main concern is to provide a first attempt for the incorporation of only limited enforcement of employment protection. For this, I take wages as exogenous. As becomes clear from the discussion above, the results concerning employment could be altered either way, depending on the specific assumptions as to how wages are determined. However, it would clearly be interesting to incorporate repercussions on wages, as this may also allow for a rationalization of the presence of firing restrictions. In turn, this could lead to a different evaluation of the effects firing costs exert on the efficiency of the market equilibrium.

Appendix

A Derivation of equation (2)

The representative consumer maximizes utility U by choosing consumption quantities x_j subject to her budget constraint. The respective Lagrangian is given by

$$\mathscr{L} = \left[\int_0^{\bar{n}} a_j \left(x_j\right)^{1-\alpha} dj\right]^{\frac{1}{1-\alpha}} - \lambda \left[Y - \int_0^{\bar{n}} p_j x_j dj\right] \tag{17}$$

with λ as the Lagrange multiplier. This yields the first-order conditions for the most preferred consumption bundle

$$\left[\int_0^{\bar{n}} a_j \left(x_j\right)^{1-\alpha} dj\right]^{\frac{\alpha}{1-\alpha}} a_i x_i^{-\alpha} + \lambda p_i = 0 \tag{18}$$

for all $i \in [0, \bar{n}]$. Multiplying equation (18) with x_i, integrating the outcome over the varieties of the consumption good and solving for the Lagrange multiplier λ, one gets

$$\lambda = -\frac{\left[\int_0^{\bar{n}} a_j \left(x_j\right)^{1-\alpha} dj\right]^{\frac{1}{1-\alpha}}}{Y} \tag{19}$$

Inserting equation (19) into equation (18) one obtains equation (2) in the main text.

B Derivation of equation (12)

Assume that $T \leq \alpha w$ or that evasion of firing costs is not possible. Ex-ante expected operative profits less hiring costs are given by equation (9). Using equation (8) in conjunction with (6), noting that for $a < a_l^b$, $l = A, B$, firms leave the market, equation (9) can be transformed to

$$\begin{aligned} \Pi &= \frac{\alpha}{\Omega} \int_{a_l^b}^{a^k} a x^*(a)^{1-\alpha} dG(a) - T\bar{x}\left[G\left(a^k\right) - G\left(a_l^b\right)\right] \\ &+ \frac{1}{\Omega} \int_{a^k}^{\overline{a}} a\bar{x}^{1-\alpha} dG(a) - w\left[1 - G\left(a^k\right)\right] - h\bar{x}. \end{aligned} \tag{20}$$

Multiplying the first order condition for initial employment, equation (10), with $\bar{x}$ and substituting for $h\bar{x}$ in equation (20) one gets

$$\begin{aligned} \Pi &= \frac{\alpha}{\Omega} \int_{a_l^b}^{a^k} a x^*(a)^{1-\alpha} dG(a) + \frac{\alpha}{\Omega} \int_{a^k}^{\overline{a}} a\bar{x}^{1-\alpha} dG(a) \\ &= \frac{\alpha}{\Omega} \int_{a_l^b}^{\overline{a}} a x^*(a)^{1-\alpha} dG(a). \end{aligned} \tag{21}$$

Recognizing the definition of Ω in equation (3), equation (21) can be directly transformed to equation (12) in the main text. For $T > \alpha w$ in scenario B, the market entry condition can be derived in a similar manner.

C Derivation of equation (13)

From the profit equation, equation (4), and for optimal employment $x^*(a)$ the partial derivatives of operative profits with respect to firing costs and with respect to effective output calculate as

$$\frac{\partial \pi(a)}{\partial T} = -\left[\bar{x} - x^*(a)\right] \tag{22}$$

and

$$\frac{\partial \pi(a)}{\partial \Omega} = -\frac{a}{\Omega^2}\left(x^*(a)\right)^{1-\alpha}. \tag{23}$$

Integrating these terms and recognizing the definition of Ω, equation (3), the change in effective output necessary to keep ex-ante expected profits equal to market entry costs is given by[22]

$$\frac{d\Omega}{dT} = -\frac{\frac{\partial \Pi}{\partial T}}{\frac{\partial \Pi}{\partial \Omega}} = -\frac{\int_{a_l^b}^{a^k}\left[\bar{x} - x^*(a)\right] dG(a)}{\frac{1}{\Omega^2}\int_{a_l^b}^{\overline{a}} a x^*(a)^{1-\alpha} dG(a)} = \frac{-\int_{a_l^b}^{a^k}\left[\bar{x} - x^*(a)\right] dG(a)}{\frac{Y}{\Omega \bar{n}}}, \tag{24}$$

$l = A, B$, yielding equation (13).

D Comparative static analysis - Derivation of equations (14) and (16)

From equations (5), (7), (10) and assuming $\alpha' = 0$, I formulate the following system for the respective changes in the values of a^k, a_l^B $(l = A, B)$, and $\bar{x}^\alpha$ for $T < \alpha w$:

[22] Note that in equilibrium $\frac{\partial \Pi}{\partial \bar{x}} = \frac{\partial \Pi}{\partial x(a)} = \frac{\partial \Pi}{\partial a_l^b} = \frac{\partial \Pi}{\partial a^k} = 0$.

$$\underbrace{\begin{bmatrix} 1 & 0 & -\frac{w-T}{1-\alpha}\Omega \\ 0 & 1 & -\frac{a_l^b}{\bar{x}^\alpha} \\ 0 & Tg\left(a_l^B\right) & -\frac{1-\alpha}{\Omega\bar{x}^{2\alpha}}\int_{a^k}^{\overline{a}} adG(a) \end{bmatrix}}_{Z} \begin{bmatrix} da^k \\ da_l^b \\ d\bar{x}^\alpha \end{bmatrix}$$

$$= \begin{bmatrix} -\frac{\bar{x}^\alpha\Omega}{1-\alpha} & \frac{w-T}{1-\alpha}\bar{x}^\alpha \\ a_l^b\frac{\alpha w-T}{(w-T)T} & \frac{a_l^b}{\Omega} \\ G\left(a^k\right)-G\left(a_l^b\right) & \frac{1-\alpha}{\Omega^2\bar{x}^\alpha}\int_{a^k}^{\overline{a}} adG(a) \end{bmatrix} \begin{bmatrix} dT \\ d\Omega \end{bmatrix}. \tag{25}$$

With $\det(Z)=\Delta$, applying Cramer's rule yields

$$da_l^B = a_l^B\frac{G\left(a^k\right)-G\left(a_l^B\right)-\frac{1-\alpha}{\Omega\bar{x}^\alpha}\int_{a^k}^{\overline{a}} adG(a)}{\bar{x}^\alpha\Delta}dT+\frac{0}{\Delta}d\Omega \tag{26}$$

and

$$d\bar{x}^\alpha = \frac{G\left(a^k\right)-G\left(a_l^b\right)-a_l^b g\left(a_l^b\right)\frac{\alpha w-T}{w-T}}{\Delta}dT-\frac{\bar{x}^\alpha\Delta}{\Omega\Delta}d\Omega. \tag{27}$$

Recognizing that $dG\left(a_l^b\right)=g\left(a_l^b\right)da_l^b$ and $d\bar{x}=\frac{1}{\alpha}\bar{x}^{1-\alpha}d\bar{x}^\alpha$ the last two equations can be transformed into the equations (14) and (16) in the main text.

References

Allingham, M. G., Sandmo, A., 1972. Income tax ecasion: A theoretical analysis. Journal of Puplic Economics 1 (3-4), 323 – 338.

Baumann, F., 2007. Product market competition in the presence of firing costs. Manuscript, Eberhard Karls University Tübingen .

Belviso, F., 2003. Firing costs and unemployment: Considering bankruptcy in a matching model. Paper Presented at the 2003 EEA Annual Congress .

Blanchard, O., Giavazzi, F., 2003. Macroeconomic effects of regulation and deregulation in goods and labor markets. Quarterly Journal of Economics 118 (3), 879 – 907.

Blanchard, O., Landier, A., 2002. The perverse effects of partial labour market reform: Fixed-term contracts in france. Economic Journal 112 (480), F214 – F244.

Blanchard, O., Tirole, J., 2004. The optimal design of unemployment insurance and employment protection. NBER Working Paper 10443.

Dixit, A. K., Stiglitz, J. E., 1977. Monopolistic competition and optimum product diversity. American Economic Review 67 (3), 297 – 308.

Ebell, M., Haefke, C., 2003. Product market deregulation and labor market outcomes. IZA Discussion Paper 957.

Fella, G., 2000a. Efficiency wage and efficient redundancy pay. European Economic Review 44 (8), 1473 – 1490.

Fella, G., 2000b. When do firing costs matter? Working Paper, Queen Mary University .

Friesen, J., 1996. The response of wages to protective labor regulation: Evidence from Canada. Industrial and Labor Relations Review 49 (2), 243 – 255.

Galdon-Sanchez, J. E., Güell, M., 2003. Dismissal conflicts and unemployment. European Economic Review 47 (2), 323 – 335.

Garibaldi, P., Violante, G. L., 2005. The employment effects of severance payments with wage rigidities. Economic Journal 115 (506), 799 – 832.

Goerke, L., 2002. On dismissal pay. Labour Economics 9 (4), 497 – 512.

Hopenhayn, H., Rogerson, R., 1993. Job turnover and policy evaluation: A general equilibrium analysis. Journal of Political Economy 101 (5), 915 – 938.

Kessing, S. G., 2006. Employment protection and product market competition. Scandinavian Journal of Economics 108 (2), 339 – 352.

Lazear, E. P., 1990. Job security provisions and employment. Quarterly Journal of Economics 105 (3), 699 – 726.

Lindbeck, A., Snower, D. J., 1988. The Insider-Outsider Theory of Employment and Unemployment. Cambridge, Mass.

Martin, R., Mongrain, S., Parkinson, S., 2004. Severance payment and unemployment insurance: A commitment issue. Journal of Public Economic Theory 6 (4), 593 – 606.

Melitz, M. J., 2003. The impact of trade on intra-industry reallocations and aggregate industry productivity. Econometrica 71 (6), 1695 – 1725.

Neugart, M., Storrie, D., 2006. The emergence of temporary work agencies. Oxford Economic Papers 58 (1), 137 – 156.

Pissarides, C. A., 2001. Employment protection. Labour Economics 8 (2), 131 – 159.

Saint-Paul, G., 1995. Efficiency wage, commitment and hysteresis. Annales d'Économie et de Statistique 37/38, 39 – 53.

Saint-Paul, G., 2000. The Political Economy of Labour Market Institutions. Oxford University Press, Oxford.

Staffolani, S., 2002. Firing costs, efficiency wages and unemployment. Labour 16 (4), 803–830.

Wasmer, E., 2006. The economics of Prozac: Do employees really gain from strong employment protection? IZA Discussion Paper 2460.