Increasing Returns, Monopolistic Competition, and Optimal Unemployment

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Abstract

I generalize the canonical Dixit and Stiglitz (1977) model of monopolistic competition and non-CES preferences to include a labor market characterized by matching frictions and directed search. First, I demonstrate that the directed search does no longer imply an optimal unemployment level if the labor market is embedded in a general equilibrium framework with monopolistic competition. The reason is the incomplete appropriability distortion, present even under CES preferences, which propagates from the product market and creates a wedge between social and private benefits of employment. Second, when preferences are non-CES, product market deregulation and firm competition can decrease the price index and boost employment, which is in line with empirical evidence. Third, I revisit the original Dixit-Stiglitz question of quantity versus diversity and unveil a novel trade-off between product market efficiency and employment: while firm licensing can correct the excessive entry distortion in the product market, it comes at the cost of reducing employment in the labor market. Nevertheless, much of the negative trade-off effect can be mitigated by a complementary labor market deregulation policy. This calls for harmonization between product and labor market regulations.

Keywords: monopolistic competition, variable markups, matching frictions, unemployment.

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1 Introduction

Models of variable elasticity of substitution (VES) preferences proved useful in providing a broad variety of realistic predictions in the theory of imperfect competition, industrial organization, and international trade. In contrast to the models of constant elasticity of substitution (CES) preferences, prices, firm size, and markups are no longer independent from firm entry and market size, and so they better fit empirical evidence. This allowed researchers to analyze many pertinent questions, such as variety-vs-quantity trade-off, incomplete pass-through, and pro-competitive effects of market integration.

Yet, the implications of these product market effects for the labor market remained relatively unexplored. For instance, the canonic Dixit and Stiglitz (1977) result in monopolistic competition literature states that, when preferences are non-CES, firm entry and firm-level output are inefficient. Then, if firm entry is excessive, a policymaker can restore product market efficiency by introducing firm licensing fees: "with scale economies, resources can be saved by producing fewer goods and larger quantities of each." However, such entry regulation would have a profound effect on the labor market because any change in the competition among firms affects worker productivity. Specifically, under a concave revenue function, a bigger firm size means a lower marginal product of labor and a subsequent lower nominal wage. These two mechanisms act in the opposite direction, so that the overall effect on the *real* wage is ambiguous and employment can rise or fall.

These labor market considerations are important but are rarely taken into account in the formulation of the optimal product or labor market policies. To design a comprehensive policy, one needs to understand how the two markets interact with each other; how production allocative efficiency is related to employment; and what are the arising trade-offs. These are the main questions examined in this paper.

To approach this problem, Section 2 starts with the classical Dixit and Stiglitz (1977) model of monopolistic competition and *arbitrary* separably additive VES preferences. The novelty is to depart from the assumption of full employment and, instead, to assume a labor market characterized by search and matching frictions. The size of a firm is set in the goods market, while *directed search* in the labor market determines the equilibrium wage and unemployment rate.

The contribution of the paper is threefold.

The first result characterizes the equilibrium and compares it to the social optimum. I prove that the unemployment level generated under monopolistic competition is *always* inefficiently high due to the incomplete appropriability distortion, i.e. the fact that each firm internalizes only a fraction of the consumer surplus in its revenue. This distortion, intrinsic to any monopolistic competition framework, propagates onto the labor market and reduces the marginal product of labor. As a result, it creates a wedge between private (firms') and social (workers') benefits of employment, leading to under-employment by firms.

Such an under-employment effect is present even under CES preferences, when the product market is efficient. The reason is that socially optimal allocation does not imply undistorted markets. Under CES preferences, the product market equilibrium leads to optimal firm size because the incomplete appropriability distortion (which discourages firm entry) is exactly compensated by the business-stealing distortion, i.e. firms not internalizing their competitive downward pressure on others (which encourages firm entry). In a similar fashion, the labor market exhibits a positive and a negative externality of vacancy posting for workers and firms respectively. Under directed search, the two externalities are usually balanced and the endogeneous split of the surplus between a worker and a firm is efficient (Hosios condition holds, see Rogerson et al., 2005). However, in the presence of monopolistic competition, the proportion of the surplus received by a firm is *further* reduced by the incomplete appropriability factor, which causes a socially excessive level of unemployment. This effect is channeled via the *endogenously* determined price index in a general equilibrium framework. This explains why directed search models that assume partial equilibrium analysis often overlook such a result.

The second result of the paper connects the theoretical predictions with empirics. Lower barriers of entry and tougher competition in the product market are often associated with a higher employment rate (see Nicoletti and Scarpetta (2005) for an overview). I show that VES preferences are crucial to explaining this regularity. Specifically, market deregulation in the form of lower entry costs does invite additional entry and tougher competition among firms. However, only under VES preferences, increased competition alters the price index and the related appropriability distortion, which is formally expressed through the elasticity of the utility function. The price index changes the value of the job search and the slope of the wage curve. Then, the market employment grows (falls) if and only if the elasticity of utility is decreasing (increasing) in consumption. This is in contrast to CES preferences, where employment would be constant. Interestingly, the employment level depends primarily on the elasticity of utility and not on the elasticity of demand, which is responsible for pro-competitive effects and variable markups in the product market.

The third result unveils a trade-off between product market efficiency and the employment level. I find that, while firm licensing corrects the excessive entry distortion on the product market, it is detrimental to employment in the labor market. This is a novel implication of the product market policy standard to the theory of monopolistic competition. Quantitatively, a calibration of the model for the US economy indicates that the drop in employment due to correction of the Dixit-Stiglitz distortion can be large enough to completely offset any welfare benefits of improved production efficiency. To alleviate this trade-off, a social planner can redistribute tax revenue from firm licensing towards employment subsidies for firms and workers. Such a two-market policy can boost the employment rate by 0.3 percentage points, instead of reducing it. Therefore, the product and labor market regulations have to be viewed in conjunction to account for the labor market repercussions.

Related literature.

The economic environment I study relates to two main strands of the literature. The first one is based on monopolistic competition and preferences with variable elasticity of substitution. In the influential paper, Dixit and Stiglitz (1977) show that depending on the behavior of the elasticity of utility, firm entry can be socially excessive or insufficient. The reason is economies of scale which are under- or over-exploited in market equilibrium. Behrens et al. (2020) demonstrate that the distortions generated by VES preferences are important and account for about 9% of GDP in the US. Mankiw and Whinston (1986) and Vives (1999) discuss the two main market distortions responsible for this gap between equilibrium and optimal allocations. The first one is incomplete appropriability distortion — the inability of firms to appropriate the full consumer surplus. The second one is the business stealing effect — a downward pressure of a firm's production on others' prices. The appropriability distortion depends on the elasticity of utility and represents a "social" markup, while business stealing depends on the elasticity of demand and is connected to the behavior of prices and "private" markups. It is shown by Zhelobodko et al. (2012) and Dhingra and Morrow (2019) for the directly additive preferences, and by Bertoletti and Etro (2017) for the indirectly additive preferences, that only in the particular case of CES preferences these two distortions offset each other and generate optimal firm size and number of firms.

The focus of these papers is competition and allocational efficiency on the product market side, and thus they put aside the question of unemployment. The present paper adds to them by introducing labor matching frictions and by connecting the product market effects associated with VES modeling to the labor market.

The second strand of the literature examines the interaction between product and labor markets. Nicoletti and Scarpetta (2005), among others, find a detrimental effect of restrictive product market regulations for employment. Following on this empirical evidence, Blanchard and Giavazzi (2003) discuss the political economy of deregulation in a model with individual wage bargaining and CES preferences. While product market deregulation reduces rents going to workers, a concurrent fall in prices leads to a higher real wage and higher employment. An interesting extension to a heterogeneous firm model is by Felbermayr and Prat

(2011) who distinguish between product market regulation related to entry costs versus the one related to fixed production costs. While fixed entry costs deter overall competition and reduce employment, fixed production costs intensify productivity selection and can boost the employment rate. Finally, many works, such as Felbermayr et al. (2011), Helpman et al. (2010), Fajgelbaum (2020), have applied similar frameworks to study the implications of international trade to the product market competition, unemployment, and wage inequality.

The aforementioned papers differ from the present framework both in their focus and in the assumptions. On the demand side, to tackle firm heterogeneity or dynamics, they assume CES preferences to preserve the tractability of the model. This, however, precludes the study of product market distortions and pro-competitive effects on unemployment. In turn, the present paper studies a one-period homogeneous firm model but allows for VES preferences and looks closely at the optimality conditions on both markets. On the labor side, the aforementioned papers utilize the individual wage bargaining model, while I employ directed search assumption. Although bargaining models are useful to determine how rents are split between workers and firms, they also generate an additional labor market distortion arising from the inefficient split of the rents. This confounds product and labor market effects, making results hard to interpret.[2] For this reason, a directed search model is favored in this paper. As a robustness check, numerical simulations show that individual and collective wage bargaining assumptions do not seem to affect the main qualitative predictions of the model.

The remainder of the paper is structured as follows. Section 2 outlines the model, characterizes the equilibrium, and compares it to the social optimum. Section 3 is devoted to the analysis of product and labor market regulation, with an emphasis on the cross-market interaction. Section 4 calibrates the model and estimates the quantitative relevance of inter-market effects of product market regulation. Section 5 concludes.

2 Model

I adopt the general equilibrium Dixit-Stiglitz model with homogeneous firm and variable elasticity of substitution among varieties. A key departure from the classical model is that the labor market is no longer assumed to be perfect and is characterized by labor matching frictions with hiring costs. The model is one-period that analyzes a long-term equilibrium.

A single-sector economy exhibits monopolistic competition and involves a continuum of homogeneous firms producing a horizontally differentiated good, one variety per firm. Labor

[2]From the technical viewpoint, individual wage bargaining in a monopolistic competition setup necessitates a solution to a differential equation — a difficult task when one considers general demand systems.

is the only factor of production. Each worker is a part of a household, and each household consists of a number of workers. The role of a household is to aggregate workers' income and to choose the optimal consumption[3]. Conditional on being employed, each worker supplies inelastically 1 unit of labor. The mass of the households is $\mathcal{L}$ and the mass of workers in each household is 1.

In a directed search model, firms post wages to attract workers. Workers have full information on the wage distribution and choose which wage contract to apply for. Conditional on applying for a job with a certain wage, the worker gets it with probability $m[\theta_w]\,\theta_w$. Here, θ_w is the market tightness of the wage contract w, and it is defined as the ratio of the total number of vacancies corresponding to the posted wage w divided by the total number of workers applying for jobs with this wage. The matching function $m[\theta_w]$, which is the probability of a vacancy to be filled, is decreasing and convex—it is increasingly hard to find matches for vacancies in a more competitive market. When directing their search, workers face a coordination problem: better-paid jobs also attract more workers, decreasing the matching probability for workers. Whether search is governed by the household, or whether each worker searches for jobs individually in the interest of the household, results in the same equilibrium conditions. For notational brevity, I assume the first. Finally, for the expositional purposes, later in the paper I assume that $m[\theta_w]$ is a constant-returns-to-scale matching function, $m[\theta_w] \equiv \theta_w^{-\eta}$, although much of the analysis can be done for a general form matching function.

A representative household maximizes its utility with respect to per-variety consumption, x_ω, and the wage:

$$\max_{x_\omega, w} \log\left[\int_\Omega v[x_\omega]\, d\omega\right] - \Gamma m[\theta_w]\,\theta_w,$$

subject to the budget constraint

$$\int_\Omega p_\omega x_\omega d\omega \leqslant w(1-t_w)\, m[\theta_w]\,\theta_w + t_{lump-sum}.$$

Here, Ω is the endogenously determined set of varieties in the economy, p_ω is the price corresponding to variety ω, Γ is the disutility of work[4]. t_w is the labor income tax, which can be returned to households in the form of a lump-sum transfer $t_{lump-sum}$. The disutility of

[3] This assumption, adopted in Shimmer (2010), allows one to avoid the complications related to demand aggregation of consumers with different incomes based on employment status. Instead, the income is aggregated on the household level before the consumption decision, and the employment rate affects the total consumption via the income effect, and not due to income inequality.

[4] The model with disutility of work is equivalent to a model with utility of leasure, where now the utility function is $\log\left[\int_\Omega v[x_\omega]\, d\omega\right] + (1 - m[\theta_w]\,\theta_w)\,\Gamma$ and Γ is the utility of leasure parameter.

work is assumed small enough so that a household always wants all its workers to participate in the job market.

To ensure the existence and uniqueness of each consumer's/producer's choice in any market situation, I impose the following restrictions, standard for VES models. As in Mrázová and Neary (2014), the elementary utility $v(\cdot)$ is thrice continuously differentiable, strictly concave, increasing at least on some interval $[0, \check{z})$, where $\check{z} \equiv \arg\max_z v(z)$ denotes the satiation point, which can be infinite (for HARA utility) or finite (for quadratic utility). Additionally, using the Arrow-Pratt concavity measure $r_g(z) \equiv -\frac{zg''(z)}{g'(z)}$ (defined for any function g), I restrict the concavity of v, $v'(z)$ as

$$\{0 < r_v[z] < 1 \ \wedge \ r_{v'}[z] < 2 \ \forall z \in (0, \check{z})\}, \ v[0] = 0. \tag{1}$$

The respective Lagrangian to the maximization program above is

$$\max_{x_\omega, w, \lambda} \ \mathcal{L} \equiv \log\left[\int_\Omega v[x_\omega]\, d\omega\right] - \Gamma m[\theta_w]\,\theta_w - \lambda\left\{\int_\Omega p_\omega x_\omega d\omega - w(1-t_w)\, m[\theta_w]\,\theta_w - t_{lump-sum}\right\}.$$

The household's first-order condition (FOC) with respect to consumption x_ω yields the inverse demand function for each variety:

$$p_\omega = \frac{1}{\int_\Omega v[x_\omega]\, d\omega} \frac{v'[x_\omega]}{\lambda}. \tag{2}$$

Here λ is the Lagrange multiplier, it represents the marginal utility of income and serves as a market aggregator, similar to the inverse price index in CES modeling. Because the optimal consumption also depends on the marginal utility of consumption bundle, the price is determined simultaneously by λ and $\frac{1}{\int_\Omega v(x_\omega) d\omega}$. Therefore, $\left(\int_\Omega v[x_\omega]\, d\omega\right) \cdot \lambda$ acts as a composite demand shifter. The direct expression for λ can be found by multiplying the inverse demand by the consumption quantity and integrating it over all varieties:

$$\lambda = \frac{1}{wm[\theta_w]\,\theta_w} \frac{\int_\Omega v'[x_\omega]\, x_\omega d\omega}{\int_\Omega v[x_\omega]\, d\omega}. \tag{3}$$

Since workers (households) freely chose to what wage contract to apply for, the expected utility of job search has to be equalized across all vacancies. Otherwise, workers, being perfectly mobile in directing their seach, would not apply to any jobs with a lower expected utility. Formally, the *maximized* Lagrangian with respect to consumption (and with respect to the Lagrange multiplier) has to be constant for any incentive-compatible wage:

$$d\frac{\max_{x_\omega,\lambda}\mathcal{L}}{dw}=0.$$

By the envelope theorem, all indirect effects of re-optimization due to changes in the wage and income can be neglected, $\partial\frac{\max_{x_\omega,\lambda}\mathcal{L}}{\partial x_\omega}=0$ and $\partial\frac{\max_{x_\omega,\lambda}\mathcal{L}}{\partial\lambda}=0$, leaving only the direct effect of variation in w:

$$\partial\frac{\max_{x_\omega,\lambda}\mathcal{L}}{\partial w}=0\ \ \forall w.$$

In other words, the part of the Lagrangian that directly depends on the wage is constant:

$$(\lambda w(1-t_w)-\Gamma)\,m[\theta_w]\,\theta_w=H, \tag{4}$$

where H is the common expected utility of job search, taken as given by any individual firm. This equation describes the wage curve—a negative relationship between the acceptable wage and the probability of being employed, $m[\theta_w]\,\theta_w$. In other words, if a firm wants to increase its vacancy filling rate $m[\theta_w]$, it has to attract more workers by posting a higher wage. Alternatively, for a worker to accept this decline in the job-fidning probability $m[\theta_w]\,\theta_w$, a firm needs to compensate the applicants with a higher expected wage.

Producers. There is a continuum of monopolistically competitive firms which freely enter the market for a horizontally differentiated good, each firm produces a single unique variety. A household's demand for the firm's good is denoted by x. Then, the total demand the firm faces is $x\mathcal{L}$, where $\mathcal{L}$ is the mass of the households. To produce $x\mathcal{L}$ amount of the good, a firm has to spend $cx\mathcal{L}+f+f_l$ amount of labor, where c is the marginal cost, f denotes the fixed costs of production, and f_l are licensing fixed costs imposed by the government[5]. A firm faces the inverse demand function (2) and wage curve (4), while taking the composite demand shifter $\left(\int_\Omega v[x_\omega]\,d\omega\right)\lambda$ as given. The firm chooses the posted wage, as well as the number of vacancies, to maximize its profit. Since market tightness is not affected by actions of each individual firm, the matching function is bijective and can be inverted: $\theta[m]\equiv m^{-1}[\theta]$, where $\theta[m]$ is decreasing and convex. The problem thus can be viewed in the opposite direction: a firm chooses the matching probability m and pays the corresponding wage $w[m]$.

Labor is hired by posting V amount of vacancies. Each vacancy is filled with probability m. To post vacancies the firm spends h units of its own labor per vacancy. Thus, if L is the total labor employed by the firm, then the labor used for the production of the good is

[5] The licensing costs are expressed in the quantity of the good, and not in the fixed amount of money. This is a convenient formulation, akin to "iceberg" transportation costs in International Trade literature, which does not affect the qualitative results but makes formulas easier to read.

$L - hV - f - f_l$, where hV is the labor used for hiring. Therefore, the output of the firm is determined by the following equation:

$$x\mathcal{L} = \frac{1}{c}\left(L - hV - (f + f_l)\right).$$

Substituting the matching technology, $L = Vm$, I find that the labor-size of a firm is the production costs multiplied by the hiring costs factor, $\frac{m}{m-h}$:

$$L = (cx\mathcal{L} + f + f_l)\frac{m}{m-h}. \tag{5}$$

A firm maximizes its profit by choosing the sales per capita, x, and the matching probability, m:

$$\max_{x,m} \pi \equiv \frac{1}{\lambda}\frac{1}{\int_\Omega v\left[x_\omega\right] d\omega} v'\left[x\right] x\mathcal{L} - \left(\left(1 + t_f\right) w\left[m\right] + t_L\right)\left(cx\mathcal{L} + f + f_l\right)\frac{m}{m-h},$$

where t_f is the wage tax (e.g. pension contributions), t_L is the employment tax (e.g. firing costs and employment protection). Tax revenues, including the licensing costs, are redistributed to the households in the form of a lump-sum transfer.

The first-order conditions for the profit maximization are

$$\begin{cases} \frac{v'[x]}{\lambda\int_\Omega v[x_\omega]d\omega}\left(1 - r_v\left[x\right]\right) = \left(\left(1 + t_f\right) w\left[m\right] + t_L\right) c\frac{m}{m-h}, \\ \frac{w[m]\left(1+t_f\right)\mathcal{E}w[m]}{\left(1+t_f\right)w[m]+t_L} = \frac{h}{m-h}. \end{cases} \tag{6}$$

Since firms are symmetric, they choose the same optimal output x, matching probability m, and wage $w\left(m\right)$. Henceforth, I omit the firm index ω. Then, the marginal utility of the consumption bundle is expressed as $\frac{1}{\int_\Omega v[x_\omega]d\omega} = \frac{1}{Mv[x]}$, where M is the mass of firms.

To close the model, I use the following aggregate equilibrium conditions. First, firms enter the market until they no longer earn positive profits, yielding the zero-profit condition:

$$\frac{1}{\lambda}\frac{1}{Mv\left[x\right]} v'\left[x\right] x\mathcal{L} - \left(w\left[m\right]\left(1 + t_f\right) + t_L\right)\left(cx\mathcal{L} + f + f_l\right)\frac{m}{m-h} = 0. \tag{7}$$

Second, the labor market clearing condition states that all labor supplied by matched workers equals the labor used by firms:

$$M\left[\left(cx\mathcal{L} + f\right)\frac{m}{m-h}\right] = \mathcal{L}m\theta\left[m\right]. \tag{8}$$

Fixed licensing costs, levied from firms and redistributed to the households do not enter this physical constraint. Lastly, since monetary units are arbitrary, I normalize wage to one,

$$w = 1. \tag{9}$$

Equilibrium is the set

$$\{p^*, x^*, m^*, w^*, \lambda^*, M^*\},$$

determined by consumer's inverse demand function (2), firm's first-order conditions (6), wage curve (4), zero profit condition (7), labor clearing condition (8), and wage normalization.

3 Markets Efficiency

Having described an economy with symmetric firms and a frictional labor market, I now examine market efficiency. In standard models with partial equilibrium or models with perfect competition, directed search generally results in an efficient level of unemployment. As demonstrated below, when firms are monopolistically competitive, and entry and competition levels are determined endogenously, it is no longer the case that directed search leads to efficiency. Therefore, the gap between the optimal and equilibrium labor market allocations is caused by embedding directed search model in general equilibrium monopolistic competition framework. The goal of this section is to identify precisely the source of this distortion and the mechanism behind it. For this, in what follows, I compare the equilibrium allocation with the social optimum.

Equilibrium Allocation First, to find the reduced-form equation for the equilibrium on the product market, I substitute the firm's first-order condition (6) with respect to x into zero-profit condition (7) to get

$$\frac{cx\mathcal{L}}{cx\mathcal{L} + f + f_l} = 1 - r_v\left[x\right]. \tag{10}$$

This expression equates the markup of the firm to the share of the fixed costs in total costs, and determines the equilibrium level of output, x, independently from the labor market.

To pin down the equilibrium level of unemployment, I combine the firm's first-order condition (6) taken with respect to m together with the wage curve (4) from the consumer's problem and aggregate equilibrium conditions (7)-(9). From now on, I assume that m is a constant-returns-to-scale matching function $m\left[\theta_w\right] \equiv \theta_w^{-\eta} \iff \theta\left[m_w\right] = m^{-\frac{1}{\eta}}$. This yields the equation that determines the equilibrium matching probability, m:

$$\left(\frac{1-\eta}{\eta}\right)\Gamma\frac{1+t_f+t_L}{1-t_w}=\frac{cx\mathcal{L}+f}{cx\mathcal{L}+f+f_l}\frac{1}{m\theta\left[m\right]}\mathcal{E}v\left[x\right]\left(\frac{1-\eta}{\eta}-\frac{h}{m-h}\frac{1+t_f+t_L}{1+t_f}\right). \tag{11}$$

In general, the optimal matching probability depends on the firm's output size, wage and employment subsidies. The directed search model with symmetric firms gives a rather convenient structure of the equilibrium. Firm output x is determined independently from the labor market and by the same expression as in the classical Dixit and Stiglitz (1977) model. The labor market is determined second and is "built on top" of the product market.

Optimal Allocation To find the optimal level of employment and firm size, consider a social planner who maximizes the consumer's welfare

$$\max \ \ \log\left[Mv\left[x\right]\right]-\Gamma m\theta\left[m\right],$$

subject to the technological constraint combined with the matching technology, $M\left(cx\mathcal{L}+f\right)\frac{m}{m-h}=\mathcal{L}m\theta\left[m\right].$ The first-order conditions of the social planner are

$$\frac{cx\mathcal{L}}{cx\mathcal{L}+f}=\mathcal{E}v\left[x\right], \tag{12}$$

and

$$\left(\frac{1-\eta}{\eta}-\frac{h}{m-h}\right)=\Gamma m\theta\left[m\right]\frac{1-\eta}{\eta}. \tag{13}$$

I am in a position to make a comparison of the equilibrium equations (10)-(11) with the social optimum equations. The following proposition summarizes the results:

Proposition 1. *Consider the situation without taxes or firm licensing. Then, the labor market equilibium is distorted and the unemployment rate is inefficiently high,* $m^{mkt}\theta\left[m^{mkt}\right]<m^{opt}\theta\left[m^{opt}\right]$*. The wedge between social and market levels of unemployment is caused by the incomplete appropriability distortion coming from the product market. Moreover, the standard Dixit-Stiglitz conclusion applies: firms under-produce if* $\left(\mathcal{E}v\left[x\right]\right)'<0$ *and they over-produce if* $\left(\mathcal{E}v\left[x\right]\right)'<0$*.*

Proof and discussion. Equations (11) and (13) pin down the market and the socially optimal matching probability respectively:

$$\begin{cases}\Gamma m\theta\left[m\right]\frac{1-\eta}{\eta}=\mathcal{E}v\left[x\right]\left(\frac{1-\eta}{\eta}-\frac{h}{m-h}\right), & ME\\ \Gamma m\theta\left[m\right]\frac{1-\eta}{\eta}=\left(\frac{1-\eta}{\eta}-\frac{h}{m-h}\right). & SO\end{cases}$$

If there is no government intervention, they differ only by the surplus appropriability factor $\mathcal{E}v[x] < 1$ in the right-hand side of the equation. This reduces the equilibrium market tightness ($m^{mkt} > m^{opt}$), since $m\theta[m]\left(\frac{1-\eta}{\eta} - \frac{h}{m-h}\right)^{-1}$ is a monotonically decreasing function in m. As a result, the private benefits of an increase in the matching probability are lower than the social ones, and firms *under-employ*.

Economically, the surplus appropriability factor $\mathcal{E}v[x]$ represents the distortion propagated from the product market. Usually, under directed search, the division of the surplus is efficient and the level of employment is optimal (see Rogerson et al., 2005). In the current situation, the incomplete appropriability factor distorts this split and creates a wedge between the social and private value of a job (employment). The reason is, as discussed in Vives (1999), monopolistically competitive firms incorporate only *a share* of the consumer surplus, which discourages firm entry. As it turns out, the same market distortion decreases the firm's share of the social surplus created by the job, resulting in under-employment.

Formally, the role of the appropriability factor in the determination of private and social values of employment can be seen in the following way. Consider an increase in the job finding probability $\theta[m]m$. Since the firm's size is determined independently from the labor market, a higher job-finding probability translates directly into a higher number of firms. The private benefit of such increase is the increment in the revenue generated by new entrants, multiplied by the marginal utility of money (to transform it into utility units): $\lambda R(x) \cdot dM = u'(Mv(x))v'(x)xdM$. The social benefits of a higher matching probability is the increment in the consumer's utility generated by new entrants: $u'(Mv(x))v(x)dM$. Then, the share of the increment in consumer utility captured by firms is measured by the elasticity of the sub-utility function, $v(x)$:

$$\frac{u'(Mv(x))v'(x)x\frac{dM}{dm}dm}{u'(Mv(x))v(x)\frac{dM}{dm}dm} = \mathcal{E}v(x).$$

The comparison between market equilibrium and social optimum on the product market is straightforward and repeats the classical Dixit-Stiglitz result. Namely, equations (10) and (12) determine market and optimal firm sizes respectively, and differ only in the right-hand side:

$$\begin{cases} \frac{cx\mathcal{L}}{cx\mathcal{L}+f+f_l} = 1 - r_v[x], & ME \\ \frac{cx\mathcal{L}}{cx\mathcal{L}+f} = \mathcal{E}v[x]. & SO \end{cases}$$

As explained in Dhingra and Morrow (2019) for the frictionless labor market, this difference arises from the fact that $1 - r_v(x)$ is the elasticity of revenue and measures market incentives for higher product variety (operating profit gained by an additional firm), while the elasticity of utility, $\mathcal{E}v(x)$, measures social incentives for higher product variety through a firm's contribution to welfare (utility added by an additional firm). When preferences are non-CES the two incentives differ, resulting in the Dixit-Stiglitz output distortion, the sign of which depends solely on the derivative of the elasticity of utility function, $\mathcal{E}(\mathcal{E}v(x)) = 1 - r_v(x) - \mathcal{E}v(x)$:

- If $(\mathcal{E}v(x))' < 0$ then necessarily $1 - r_v(x) < \mathcal{E}v(x)$, market firm size is distorted downward and firms under-produce relative to the social optimum, $x^{mkt} < x^{opt}$;
- If $(\mathcal{E}v(x))' > 0$ then necessarily $1 - r_v(x) > \mathcal{E}v(x)$, market firm size is distorted upward and firms over-produce relative to the social optimum, $x^{mkt} > x^{opt}$.

Note that the labor market is distorted even if the firm size is optimal. The reason is that, under CES, the product market is efficient but not undistorted. Namely, the incomplete appropriability distortion, $\mathcal{E}v(x)$, discourages firm entry. On the other hand, entrants do not internalize their adverse effect on the revenue of other firms (business-stealing effect), which encourages firm entry. Under CES preferences, the two distortions balance each other. However, only the incomplete appropriability distortion propagates onto the labor market, therefore distorting it only in one direction. The business-stealing effect impacts the firm size and the surplus created by the job, but not its split among the firm and the worker. Therefore, the business-stealing effect, which is responsible for pro-competitive effects in the product market, does not affect efficiency in the labor market. □

4 Market regulation

Empirical evidence points to a positive effect of product market deregulation, proxied by barriers of entry, on the employment rate (see Nicoletti and Scarpetta, 2005 for an overview). However, the underlying mechanism for such a phenomenon is still debated. The positive inter-market effect suggests that product market deregulation corrects the distortion which causes the gap between the market and optimal levels of employment. To study this question, the first subsection below examines comparative statics of the model with respect to entry costs. It provides the theoretical conditions for such a result to hold in the current model and explains the mechanism. The second subsection considers another form of regulation — licensing costs. While being similar in spirit with the fixed entry costs, which are "lost" during production, the licensing costs are a tax on firm entry and are redistributed back to consumers. Licensing costs are often suggested as a way to correct the Dixit and Stiglitz (1977) excessive entry distortion, without introducing any sort of additional inefficiencies. As it turns out, this logic can no longer be applied in the presence of labor market frictions and firm entry regulation creates a trade-off between product market efficiency and unemployment.

4.1 A reduction in entry costs

The effect of a decrease in fixed entry costs on employment can be seen from market equilibrium equations (10)-(11) and is summarised by the following proposition.

Proposition 2. *A decrease in fixed entry costs intensifies competition and reduces the firm's output. When there are no licensing costs*[6]*, then*

- *the employment rate grows (falls) if and only if the elasticity of utility is decreasing (increasing);*
- *the fall in the output is less (more) than under CES if the elasticity of demand is increasing (decreasing).*

Table 1: The effect of the decrease in entry costs.

$Fall\,in\,entry\,costs$	$(1-r_v(x))' < 0$	$(1-r_v(x))' > 0$
$(\mathcal{E}v(x))' < 0$	$0 < \mathcal{E}_f x < 1$, $\mathcal{E}_f(m\theta(m)) < 0$	$\mathcal{E}_f x > 1$, $\mathcal{E}_f(m\theta(m)) < 0$
$(\mathcal{E}v(x))' > 0$	$0 < \mathcal{E}_f x < 1$, $\mathcal{E}_f(m\theta(m)) > 0$	$\mathcal{E}_f x > 1$, $\mathcal{E}_f(m\theta(m)) > 0$

Proof. Taking the elasticity of both sides of equation (10) with respect to f gives

$$\left(\frac{f}{cx\mathcal{L}+f}+\frac{r_v[x]}{1-r_v[x]}\mathcal{E}_x r_v[x]\right)\mathcal{E}_f x=\frac{f}{cx\mathcal{L}+f}.$$

When preferences are CES, $\mathcal{E}_x r_v[x]=0$ and $\mathcal{E}_f x=1$. Consequently, if $\mathcal{E}_x r_v[x]\gtrless 0$ then $0<\mathcal{E}_f x\lessgtr 1$. On the labor market, from equation 11, the elasticcity of utility function and the matching probability, m, move in the opposite directions. Therefore, when the firm output increases, it moves the employment rate, $m[\theta]\theta$, in the same direction as the $\mathcal{E}v(x)$. □

Table 1 shows that the more general structure of VES preferences leads to a richer depiction of the world, but it also necessitates a choice of the utility function. Can we assert which pair of assumptions on the elasticities of utility and demand functions, presented in Table 1, is the most realistic? Previous studies (see Mrázová and Neary 2014, p. 3840) have

[6]When there are licensing costs, the labor market is complicated by the additional impact of the redistribution and the sign of the effect on employment is not clear. On the product market, the elasticity of output is $\mathcal{E}_f x\lessgtr\frac{f}{f+f_l}$ when $(1-r_v(x))'\lessgtr 0$.

argued that increasing elasticity of the inverse demand is a more plausible condition because it leads to (i) prices and markups decreasing in the market size and (ii) an incomplete pass-through of a productivity change on prices. At the same time, as pointed out by Dhingra and Morrow (2019), while "the empirical literature largely finds increasing firm markups, social markups (elasticity of utility) are rarely observable." The current paper fills this gap by showing that the sign of the change in employment rate depends on the elasticity of utility. Thus, to match the empirical evidence of the positive inter-market effect of product market deregulation, the assumption of decreasing elasticity of utility has to be favored.

To understand the mechanism behind this intermarket effect, it is useful to consider the following reasoning. Assume that, in the short run, the wage is fixed. Then, we can think of the adjustment process from the standard models of monopolistic competition. Namely, lower fixed costs invite additional firm entry and higher competition, leading to a reduction in the output size of each firm. However, in the long run, when wages are flexible, households reoptimize their labor search decision due to a change in the marginal utility of income, λ. The household's first-order condition describes this adjustment and implicitly defines the wage curve (wage as a function of matching probability m). The household compares different wage-employment-probability pairs and equates the marginal expected benefit of increased employment rate with the marginal expected disutility of work:

$$\Gamma \left(m\theta\left[m\right]\right)' = \lambda \left(w\left[m\right] m\theta\left[m\right]\right)'.$$

The solution to this first-order linear differential equation gives the wage curve expression,

$$w\left[m\right] = Cm^{\frac{1-\eta}{\eta}} - \frac{\Gamma}{\lambda}, \tag{14}$$

where the constant of integration, C, is determined by the wage normalization in equilibrium. Equation (14) shows that the wage is increasing in the vacancy filling rate, m, and in the marginal utility of income, λ. The explanation lies in the standard trade-off (for the worker) between a wage and an employment probability. The wage is increasing in m because filling a vacancy with a higher rate requires the firm to post a higher wage to attract more workers. Alternatively, the higher wage can be viewed as compensation for the subsequent lower job finding probability for workers[7]. An increase in the marginal utility of money, λ, shifts the wage curve upward. That is, workers demand higher compensation for the decrease in the employment probability because the benefit of being employed rises, relative to the disutility of work. When the wage curve shifts up, firms react by adjusting the vacancy filling

[7]Higher vacancy filling probability means a lower amount of vacancies and a lower probability that any particular worker is matched with an open vacancy

probability downward, therefore increasing the number of vacancies, and positively affecting market tightness and employment rate. Hence, the marginal utility of income, employment rate, and wage move in the same direction.

What remains to be seen is the connection of increased competition with the appropriability distortion, $\mathcal{E}v\,[x]$, discussed in the previous section. For symmetric firms, expression (3) for the marginal utility of income reveals its direct relation:

$$w\,[m]\,m\theta\,[m] = \frac{\mathcal{E}v\,[x]}{\lambda}.$$

In words, money received by workers is exactly equal to the consumer surplus captured by firms.[8]. This is a natural generalization of the aggregate budget constraint for the case when workers exert disutility of work. Moving the Lagrange multiplier to the left-hand side of the expression, one can see that, if firms appropriate a higher share of consumer surplus, it necessarily leads to higher employment because the employment rate, the wage, and the Lagrange multiplier are shown to move in the same direction. This explains the connection between increased competition (lower firm size), the marginal utility of money, wage curve, and employment.

This mechanism may seem surprising. Here, employment increases not because workers are eager to supply their labor (the labor supply is fixed), but exactly due to higher labor costs. A firm can increment the vacancy filling probability by posting a higher wage and attracting more workers. Under decreasing elasticity of utility, higher competition makes such increment more costly. Therefore, firms post lower wages and set up a higher number of vacancies to hire the same amount of workers. As a result, it boosts the labor market tightness and the employment rate. In equilibrium, the monetary units are assumed such that the wage is normalized to one, however, the real cost of labor (the real wage) still increases due to higher competition. Blanchard and Giavazzi (2003) point to a similar role of the real wage as the key determinant of the unemployment rate but for the individual wage bargaining model. Here, what is important is the cost of better matching technology for firms relative to its less costly alternatives, thus affecting firm hiring strategy.

[8]The expression is particularly simple because of the $\log\,[consumption]$ upper-tier utility function, which is convenient and is chosen for expositional purposes. For a general upper-tier utility function $u\,[consumption]$ the results are similar. Namely, the general budget constraint reads as $w\,[m]\,m\theta\,[m] = \frac{1}{\lambda}u\,[Nv\,[x]]\,\mathcal{E}u\,[Nv\,[x]]\,\mathcal{E}v\,[x]$. Therefore, the consumer surplus captured by firms is determined by two factors: (i) $\mathcal{E}v\,[x]$ is the appropriability factor when the employment is fixed, and (ii) $\mathcal{E}u\,[Nv\,[x]]$ is appropriability factor stemming from the change in the value of consumption relative to the disutility of work. Under log-upper-tier utility function the second factor becomes $\frac{1}{u[v[x]]}$, which makes results more tractable.

4.2 A trade-off between product market efficiency and employment

Following the previous subsection, let us assume decreasing elasticity of utility as the most realistic case. As discussed before, this generates the Dixit-Stiglitz distortion, which represents the trade-off between the number of firms and the firm's size. In particular, economies-of-scale are inefficiently low and $x^{mkt} < x^{opt}$. Then, as suggested by Dixit and Stiglitz (1977, p. 300), the solution to such distortion is franchise taxes, f_l. However, since it improves the average labor productivity and decreases the number of firms, it is apriori unclear how it will affect the equilibrium employment rate. The following proposition describes the trade-off between product market efficiency and the employment rate.

Proposition 3. *Given that* $(\mathcal{E}v(x))' < 0$*, firms licensing restores the market efficiency on the product market, but magnifies the distortion on the labor market and increases the equilibrium unemployment rate.*

Proof. Higher licensing costs make it harder for firms to cover fixed costs. This pushes some firms out of the market, while the surviving firms increase their output, thus decreasing the output distortion. However, because the elasticity of sub-utility $v(x)$ is decreasing in consumption, it lessens the share of consumer surplus appropriated by firms, $\mathcal{E}v(x)$. As a result employment rate falls, intensifying the labor market distortion. □

This shows that higher economies of scale and lower average costs of production, do not imply a higher employment rate. As a consequence, the optimal magnitude of the licensing fees should be lower than the ones based on models without labor market frictions. This follows from the fact that the marginal benefit of increasing licensing fees at optimum is zero, while the marginal costs of reduced employment (and therefore the household's income) are positive.

A strictly better scenario, however, is a mixed market policy that imposes firm licensing and deregulates the labor market at the same time. The three forms of labor market regulation considered are (i) labor income tax, t_w, (ii) wage tax imposed on firms (pension contributions), t_f, (iii) employment tax (firing costs and employment protection), t_L. The effects of labor market deregulation are summarized by the following proposition.

Proposition 4. *Labor market deregulation increases the employment rate and corrects the labor market distortion. Spending collected taxes from firm licensing to finance a reduction in labor market taxes is a strictly welfare-beneficial policy than simply redistributing licensing fees taxes to households.*

Proof. From equation (10), it is clear that the equilibrium firm output is determined independently of the employment taxes/subsidies. Then, the total derivative of equation (11), with respect to the compound factor of employment and labor taxes $\frac{1+t_f+t_L}{1-t_w}$, gives the direction of the employment change:

$$\left(\frac{1-\eta}{\eta}\right)\Gamma\left(d\frac{1+t_f+t_L}{1-t_w}\right)=\frac{cx\mathcal{L}+f}{cx\mathcal{L}+f+f_l}\mathcal{E}v\left[x\right]\times$$

$$\times\left\{\left(d\frac{1}{m\theta\left[m\right]}\right)\left(\frac{1-\eta}{\eta}-\frac{h}{m-h}\frac{1+t_f+t_L}{1+t_f}\right)-\frac{1}{m\theta\left[m\right]}\left(d\frac{h}{m-h}\right)\frac{1+t_f+t_L}{1+t_f}-\frac{h}{m-h}\left(d\frac{1+t_f+t_L}{1-t_w}\right)\right\}.$$

Substituting the functional form of the matching function, $m^{-\frac{1}{\eta}}=\theta$, simplifies it to

$$\left\{\left(\frac{1-\eta}{\eta}\right)\Gamma+\frac{cx\mathcal{L}+f}{cx\mathcal{L}+f+f_l}\mathcal{E}v\left[x\right]\frac{h}{m-h}\right\}d\left(\frac{1+t_f+t_L}{1-t_w}\right)$$

$$=\frac{cx\mathcal{L}+f}{cx\mathcal{L}+f+f_l}\mathcal{E}v\left[x\right]\left\{\frac{1-\eta}{\eta}m^{\frac{1}{\eta}-2}\left(\frac{1-\eta}{\eta}-\frac{h}{m-h}\frac{1+t_f+t_L}{1+t_f}\right)+m^{-\frac{1-\eta}{\eta}}\frac{hm^{-\frac{1}{\eta}-1}}{\left(m^{-\frac{1}{\eta}}-h\right)^2}\right\}dm.$$

Here, parentesis on both sides of the equation are positive and, therefore, $\frac{dm}{d\left(\frac{1+t_f+t_L}{1-t_w}\right)}>0\iff\frac{d\theta[m]}{d\left(\frac{1+t_f+t_L}{1-t_w}\right)}<0$. In other words, when any of the labor taxes $\{t_f,t_w,t_L\}$ are reduced (or labor subsidies are increased), the employment rises. □

Therefore, the government regulator can correct both market distortions simultaneously. The distortive inter-market effect of licensing costs will be (at least partially) compensated by the labor market deregulation. This supports the harmonization between product and labor market regulators.

4.2.1 Quantitative results

In this section, I calibrate the model to match moments of the US economy. Table 2 summarizes the parameter values. I follow Arkolakis et al. (2019) and assume the following VES utility function:

$$v\left(x\right)=\frac{\left(x+\alpha\right)^{\gamma+1}}{\gamma+1}-\frac{\alpha^{\gamma+1}}{\gamma+1}.$$

Arkolakis et al. (2019) use the data on bilateral U.S. merchandise imports within narrowly defined product codes and estimated the demand parameters to be $\alpha=1.5$ and $\gamma=-0.253$. Under these parameter values, the utility function above also satisfies the two most realistic assumptions discussed before. Namely, decreasing elasticity of utility and increasing elasticity of inverse demand.

To analyze the quantitative questions, I, first, calibrate the parameters related to the labor market. The estimation for the matching function elasticity is taken from Rogerson and Shimer (2011), who examine the correlation between average market tightness and the quarterly series for the job-finding probability. The correlation is $1-\eta = 0.42$ and corresponds to the elasticity of the job-finding probability with respect to the market tightness (the elasticity of the vacancy filling rate is $\eta = 0.58$). The constant term of the regression corresponds to the matching efficiency and can be pinned down from the following two moments. From Rogerson and Shimer (2011), the measure of the average market tightness is ≈ 0.45 and the average unemployment rate is ≈ 0.05. Then, the matching efficiency parameter is expressed as $m_0 = \frac{(1-0.05)}{(0.45)^{0.42}} \approx 1.33$.

Cahuc et al. (2014, p. 120) assert that there is no consensus on the value of the hiring costs. Nevertheless, they suggest that the estimated replacement costs of a worker vary from 25% to 100% of the annual wage. Given the fact that the average age of a firm in the US during 2014-2018 (weighted by the employment size) is 2.65 years[9], the replacement costs of a worker during the lifespan of a firm is $9.4\% - 37.7\%$ of the total wage bill. In the model, the replacement costs correspond to the percentage of the labor force employed in the hiring activity, $\left(\frac{m}{m-h} - 1\right) \approx (1.094 - 1.377)$. It implies the value of the hiring costs $h \approx (0.136 - 0.435)$. The disutility of work, Γ, is calibrated to match the equilibrium unemployment rate of 5%.

Second, I approximate the average firm markup. In models with CES modeling, firm markup is estimated to be about 25% (see Bernard et al. (2003) and Melitz and Redding (2013, p. 23)). I adopt this approximate markup value for the VES modeling, which implies that $r_v[x] = 0.25$. I determine market size $\mathcal{L}$ and fixed entry costs f from the following two equations. In equilibrium, the firm's share of variable costs in total costs, $\frac{cxL}{cxL+f}$, is equal to the firm's markup, which gives the first equation. Furthermore, Rogerson and Shimer (2011) estimate the vacancy rate of about 0.03[10], which gives the second equation. The values for $(\Gamma, f, \mathcal{L})$ depend on the assumed value of the hiring costs, and therefore, their calibrated values are reported for the minimal and maximal values of h.

Third, Cahuc et al. (2014, p. 755) note that the income tax wedge[11] for the US is around 30%, where about 16% accounts for the income tax. Therefore, if $\frac{1-t_w}{1+t_f} = 0.3$ and $t_w = 0.16$, the payroll tax is $t_f = 0.2$, which is consistent with the payroll tax proposed by Mortensen

[9] The data is taken from https://ssti.org/blog/useful-stats-job-creation-firm-age-2014-2018.

[10] The vacancy rate is defined as the number of vacancies divided by the number of vacancies and unemployed workers.

[11] Income tax wedge the difference between the labor costs to the employer and the corresponding net take-home pay of the employee. It is calculated as the sum of the total personal income tax (PIT) and social security contributions (SSCs) paid by employees and employers, minus cash benefits received, as a proportion of the total labor costs for employers.

Table 2: Calibrated parameter values for the model.

Parameter	Interpretation	Value		Source
η	Matching elasticity	0.58		$1-\eta=0.42$ from Rogerson and Shimer (2011)
m_0	Matching efficiency	1.32854		$\theta\approx 0.45$ and $m[\theta]\theta\approx 0.05$ from Rogerson and Shimer (2011)
c	Marginal costs	1		normalization of the measurement units for productivivty
t_w	income tax rate	16%		Cahuc et al. (2014, p. 755)
t_f	payroll tax	0.2		income tax wedge ≈ 0.3 from Cahuc et al. (2014, p. 755)
t_L	Firing tax	0.094		Mortensen and Pissarides (2001, p. 9, p. 20)
		min h:	max h:	
h	vacancy cost	0.136	0.435	replacement costs of a worker Cahuc et al. (2014, p. 120)
Γ	disutility of work	0.47	0.321	unemployment rate in equilibirum $m[\theta]\theta\approx 0.05$
f	fixed costs	0.0145	0.0123	firm's share of variable costs in total costs = 25%
$\mathcal{L}$	market size	0.000348	0.000295	vacancy rate ≈ 0.03 from Rogerson and Shimer (2011)

and Pissarides (2001, p. 9, p. 20). The latter paper also estimates the firing costs to be 1/4 of the annual wage, making 9.4% of the total wage bill of a worker for a firm with the average lifespan of 2.65 years. I am now in a position to measure the effect of product market regulation. The main results are reported in Table 3, for the two extreme values of the hiring costs. I firstly examine a social planner who is only concerned with the product market efficiency and therefore is oblivious of the labor market repercussions. It illustrates the scenario when the market policy is designed solely based on the classical models of imperfect competition and frictionless labor market. In the case when the social planner directly commands the optimal number of firms (first-best), the unintended consequence on the labor market is a decrease in the unemployment rate by $4.4-11.8$ percentage points. However, such unconstrained optimum requires pricing below average cost and therefore acts only as a comparison point. A more realistic policy is a second-best optimum, where the social planner achieves the optimal number of firms by imposing franchise taxes (licensing costs), f_l. Licensing costs lead to the same product market outcome but with higher aggregate employment (the decrease in employment rate is now lower and equals $0.9-1.6$ percentage points). Intuitively, the reason is that firms pay higher fixed costs and require more labor.

Nevertheless, the classical product market regulation policy still entails a fall the aggregate employment, relative to the initial market equilibrium. In other words, a policy that improves efficiency in the product market does not necessarily promote efficiency in the labor market. The welfare cost of reduced employment is large enough so that it offsets any benefit from higher economies of scale. Therefore, when labor market repercussions are taken into account, no product-market regulation is advised.

The shortcoming above can be alleviated by a concurrent labor market deregulation policy. Namely, I consider three complementary policies, where tax revenues from firm

Table 3: The impact of product and labor market regulation.

	h		x^{opt} first best	$x^{opt}\&f_l$	$x^{opt}\&f_l \to t_L$	$x^{opt}\&f_l \to t_f$	$x^{opt}\&f_l \to t_w$
Δ Employment	0.136		-4.4 pp.	-1.6 pp.	-0.4 pp.	-0.7 pp.	+0.3 pp.
	0.435		-11.8 pp.	-0.9 pp.	-0.07 pp.	-0.4 pp.	-0.2 pp.

licensing are spent to reduce (i) the employment tax, t_L, (ii) the payroll tax, t_f, (ii) or the personal income tax, t_w. All three policy types are strictly better than tax revenue being directly redistributed to consumers because they result in a lower employment fall. Reducing the payroll tax seems to be the least efficient and results in the employment fall by $0.4 - 0.7$ percentage points. A slightly better situation is the employment tax reduction, with the fall in employment only by $0.07 - 0.4$ percentage points. Finally, if the hiring costs are small enough, a subsidy to the income tax boosts the employment rate and positively affects *both* markets.

The main takeout of this section is the trade-off between product market efficiency and unemployment, which points to the necessity of coordination between product and labor market regulators.

Conclusion

The current paper studies the impact of product market competition and associated distortions on the labor market. The novelty of the framework is to allow for non-CES preferences and the interplay between product and labor markets inefficiency. I demonstrate that the directed search does no longer imply an optimal unemployment level when the labor market is embedded in a model with imperfect product market competition. The reason is the incomplete appropriability distortion, inherent to monopolistic competition. It acts as an additional wedge between the social and private value of a job, resulting in an inefficient split of the vacancy surplus, which leads firms to under-employ.

I then consider the effect of product market regulation on the employment level. Entry deregulation boosts or pulls employment down, depending on the change in the real wage. When higher competition increases the marginal utility of money, households put a higher value on employment. For this reason, the cost of a higher vacancy filling rate for firms (lower job finding probability for workers) shifts up and firms prefer to post a higher number of vacancies but with a lower wage. It increments the labor market tightness and overall employment.

This mechanism introduces an important trade-off between product market efficiency and employment level. When the social planner corrects underproduction distortion by firms, it increases economies of scale but also reduces prices and the revenue earned by a firm. Consequently, the real wage decreases because it is determined based on the product of labor. This provides incentives for firms to attract more workers by posting higher wages with fewer vacancies. The market tightness falls and so does the employment.

The calibration of the model shows that the labor market repercussions are significant and can completely offset any benefits from the product market regulation and increased product market efficiency. However, much of the negative trade-off effect can be mitigated by a complementary labor market deregulation policy. Therefore, harmonization between product and labor market regulations is advised.

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