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Policy Evaluation in Equilibrium The Case of Job Search Counseling in France

P. CAHUC[1] **B. CRÉPON**[2]
J. GUITARD[3] **M. GURGAND**[4]

[1] Ecole Polytechnique, CREST-INSEE, IZA, CEPR. cahuc@ensae.fr
[2] CREST-INSEE, IZA, CEPR. crepon@ensae.fr
[3] CREST-INSEE. julien.guitard@ensae.fr
[4] Paris School of Economics, CREST-INSEE. gurgand@pse.ens.fr

Policy Evaluation in Equilibrium
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Pierre Cahuc, Bruno Crépon, Julien Guitard, Marc Gurgand

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Abstract

We develop a partial equilibrium stochastic job matching model of the labor market to examine whether the counseling of unemployment workers displaces unemployed workers not offered the counseling. In this model, the improvement of the reservation utility of counseled job seekers induces them to refuse job offers that they would have accepted if they were not counseled. This behavior, which exerts a negative spillover on job creation, reduces the arrival rate of job offers to the unemployed workers who do not benefit from counseling. The model is estimated on data concerning intensive counseling schemes that are provided to about 12.5 percent of the unemployed workers since the 2001 French unemployment policy reform (PARE). We find significant favourable effects of counselling on the exit rate out of unemployment of counseled workers. We also find that counselling reduces the exit rate from unemployment of workers not offered the counseling. This effect is sufficiently large to imply that counseling reduces the average exit rate from unemployment of counseled and non counseled workers when a small share of unemployed workers are counseled. This result puts to the fore that evaluations relying only on comparisons of differences in outcomes between a treatment group and a control group can lead to misleading conclusions even when a small share of the population is treated.

Résumé

Dans ce chapitre nous avons développé modèle d'équilibre partiel sur le marché du travail à partir du modèle d'appariement classique de Pissaridès. Nous avons cherché à identifier si l'accompagnement augmente réellement le nombre de contact chômeurs-employeurs ou s'il ne fait que déplacer les offres d'emplois des chômeurs vers les chômeurs accompagnés au détriment des chômeurs non accompagnés. Elle part de l'évaluation que Crépon, Dejemeppe et Gurgand (2005) ont faite des prestations offertes aux demandeurs d'emploi dans le cadre du PARE entre 2001 et 2004. Cette évaluation, qui trouvait des effets favorables de l'accompagnement sur la durée de chômage et plus encore sur la récurrence, ne tenait pas compte des effets d'équilibre. Le contexte de cette politique amène pourtant à se poser sérieusement la question de tels effets. D'abord, il peut exister des effets d'éviction importants, les chômeurs traités étant simplement replacés plus haut dans une file d'attente. Dans ce cas, la politique a simultanément un effet positif sur les traités et négatif sur les non-traités, si bien que la comparaison des traités et des non-traités ne mesure pas l'effet bénéfique qu'il y aurait, à l'équilibre, à renforcer l'accompagnement. Ensuite, la plus grande fluidité du marché résultant de comportements de recherche d'emploi plus efficaces, peut entraîner des créations d'emploi plus nombreuses. Enfin, les demandeurs accompagnés peuvent aussi se montrer plus exigeants, ce qui peut venir limiter l'effet précédent. Au total, les effets d'équilibres sont ambigus, et leur évaluation nécessite de décrire explicitement la formation de l'équilibre et d'estimer les paramètres du modèle, de manière à évaluer empiriquement l'existence, la direction et l'ampleur d'éventuels effets d'équilibre.

1 Introduction

Most policy evaluations are based on comparing the behavior of participants and non participants in the policy. But the differences in outcome between the treatment group and the control group do estimate the policy mean impact only if the outcomes of the control group are not influenced by the policy, the so-called 'no-interference' (Rubin, 1978) or 'stable unit treatment value' (Angrist, Imbens and Rubin, 1996) assumption. However, the policy may have equilibrium effects that affect the untreated altogether. For instance, Heckman, Lochner and Taber (1998) strikingly illustrate this point in the context of education policies. This issue, which is discussed in a broader perspective in the survey of Meghir (2006), is particularly relevant to the evaluation of labor supply based policies (such as increasing incentives or monitoring the unemployed). First, they generally aim at increasing the overall number of filled jobs, which depends on the interactions between aggregate labor supply and labor demand. Second, these policies may induce displacement effects: treated persons may crowd out the untreated because they compete for the same jobs.

Although they have been long recognized, these questions have received limited empirical attention to date. Davidson and Woodbury (1993) and Calmfors (1994) are early contributions. More recently, Lise, Seitz and Smith (2005) using a calibrated equilibrium model of the labor market find that the Self-Sufficient Project incentive program in Canada has much less impact in equilibrium than implied by direct comparison of treated and untreated. Also using a calibrated model, Albrecht, van den Berg and Vroman (2005) find equilibrium effects of a Swedish training program to be stronger than implied by direct comparison. In contrast, based on a comparison of pilot with control areas, Blundell, Costa Dias, Meghir and Van Reenen (2004) find that direct and equilibrium evaluations of the New Deal for Young People in the U.K. provide similar results. Looking at theoretical models of counseling, Van der Linden (2005) shows that micro and equilibrium evaluations are likely to differ widely when job search effort and wages are endogenous.

The aim of this paper is to evaluate the effects of the intensive counseling schemes that are provided to about 12.5 percent of the unemployed workers in France since the 2001 unemployment policy reform (PARE[1]). Estimating differences in outcomes between

[1] PARE is the acronym of Plan d'Aide au Retour à l'Emploi.

the treatment group and the control group, Crepon, Dejemeppe and Gurgand (2005) find significant favorable effects of the counseling schemes on both unemployment and employment spells. However, their results do not account for equilibrium effects, since it is assumed that the outcomes of the control group are not influenced by the counseling schemes. Our paper looks further into their contribution by accounting for such effects in a simple equilibrium model of the labor market with search and matching, inspired from Pissarides (2000).

In order to account for the prevalence of the minimum wage among low skilled workers in France, we develop a model with a single exogenous wage but where jobs differ in their duration. In this framework, counseling affects non-counseled unemployed workers through three channels. First, the counseled have a higher rate of entry into jobs so that, holding job creation, they displace the non-counseled. Second, by increasing search efficiency, counseling induces employers to create more jobs since they expect to recruit workers more quickly. Third, counseling also reduces the overall job offers because counseled unemployed workers, who are more choosy than those who do not benefit from counseling, refuse more job offers. This behavior induces employers to open less job vacancies since the probability to meet a worker who refuses a job offer is larger when there is counseling. In our model, the sum of these effects implies that treatment reduces the *untreated* exit rate from unemployment in equilibrium. Accordingly, even if simple comparison finds higher exit rate out of unemployment for counseled workers, whether counseling really increases the *treated* exit rate in equilibrium and what is the overall effect of the policy remains an empirical matter.

Using administrative data on 1/12th of individual unemployment spells in France between 2001 and 2004, we estimate a structural model over unemployment duration, subsequent employment duration (if any) and duration until treatment, imposing all the structure implied by equilibrium conditions. This identifies all parameters, except for the matching function elasticity that has to be calibrated. Based on this, we can estimate the full effect of the policy, in the observed equilibrium, for both treated and untreated, and we find that it is less positive than based on direct comparison of both groups.

We can also simulate the impact of expanding counseling. When doing so, we find that the causal relation between the share of counseled workers and the average exit rate from unemployment in the population is J-shaped. Counseling reduces the average exit rate from unemployment when a small share of unemployed workers are counseled. When the share of counseled workers is large enough, spreading counseling raises the average exit rate from unemployment. One source of this striking result is a composition effect: the share of untreated, who are adversely affected by the policy, decreases when the policy expands. But another mechanisms plays an important role. Counseling creates an opportunity cost of accepting job offers because counseled job seekers who find jobs can loose them and will then have to wait a while before benefiting from counseling again. This opportunity cost is higher when the probability to be counseled again, after the accepted job is lost, is lower. Therefore, counseled workers are very choosy and then refuse many job offers when the probability of counseling (or equivalently the share of workers who benefit from counseling) is low. This mechanism implies that increases in the share of counseled workers raise the share of very choosy workers when there are few counseled workers. Thus, expanding counseling when only a small share of workers are counseled discourages job creation and exerts a negative impact on the average exit rate out of unemployment. When the probability of receiving counseling increases, treated wowrkers are much less choosy, the negative impact is smaller and the composition effect dominates. This result shows that a naive evaluation, relying on a simple comparison of the outcomes of participants and non participants that neglects equilibrium effects can lead to the wrong conclusion that counseling increases the average exit rate of unemployment, especially when the share of counseled unemployed is small. However, generalizing counseling to all job seekers is, in this model, desirable.

The paper is organized as follows: the labor market model is presented in section 2. Section 3 presents the econometric strategy and section 4 describes the data. Results are given in section 5 and section 6 concludes.

2 The model

We consider a labor market with a continuum of infinitely-lived risk neutral workers whose measure is normalized to one. Their common discount rate r, is strictly positive. Time is continuous. Workers can be in three different states: (1) employed, (2) unemployed and counseled, (3) unemployed and not counseled. Upon entering unemployment, workers are not counseled. They then enter into counseled status at a rate μ and they keep on receiving counseling until they find a job. Since we focus on low skilled workers, we only consider workers who are paid the minimum wage, which is treated as an exogenous variable. The duration of jobs, denoted by Δ, is match specific. It depends on the adaptability of the worker for the type of job to which he is matched. When a worker and a job are matched, the duration of the job is drawn in an exogenous distribution whose cumulative distribution function is denoted by F, which is assumed to be continously differentiable over its entire support. The distribution of durations of job offers is the same for counseled and non counseled unemployed workers. However, since it will be shown that counseled and non counseled unemployed workers do not have the same reservation utilities, the distributions of durations of jobs that are *accepted* by counseled and non counseled unemployed are different.

The assumption that there is a binding minimum wage and heterogeneous job durations allows us to account for two important features of the French labor market for low skilled workers. First, in France, the legal minimum wage covers about 15 percent of the workforce and most low skilled workers are covered by the minimum wage. Moreover, more than 70 percent of workers are recruited with fixed term contracts, this figure being higher for low skilled workers. This feature is related to the specificity of the French labor market regulation with very high firing costs (mainly due to costly legal procedures) for regular contracts with no fixed duration that induce employers to offer fixed term contracts. Therefore, the heterogeneity of low skilled jobs relies much more on differences in contract durations rather than on wage differences.

There is an endogenous number of jobs. Each job can be either vacant of filled. Filled jobs produce y units of the numeraire good per unit of time, whereas vacant jobs cost h per unit of time.

Vacant jobs and unemployed workers (the only job seekers, by assumption) are brought together in pairs through an imperfect matching process. This process is represented by the customary matching function, which relates total contacts per unit of time to the seekers on each side of the market. Let us denote by u_0 and u_1 the number of non counseled and counseled unemployed workers respectively. In our set-up, the only potential effect of counseling is to increase the arrival rate of job offers to the counseled unemployed workers.

Let us normalize to one the number of efficiency units of job search per unit of time of each non counseled unemployed worker. Counseled unemployed workers are assumed to produce a different number of efficiency units of search, denoted by $\delta \geq 1$. In this setting, the number of efficiency units of job search per unit of time amounts to $s = u_0 + \delta u_1$.

If v denotes the number of job vacancies, the number of employer-worker contacts per unit of time is given by $M(s, v)$, where the matching function M is twice continuously differentiable, increasing and concave in both of its arguments, and linearly homogeneous. Linear homogeneity of the matching function allows us to express the probability per unit of time for a vacant job (unemployed worker) to meet an unemployed worker (a vacant job) as a function of the labor market tightness ratio, $\theta = v/s$. A vacant job can meet on average $M(s, v)/v = m(\theta)$ unemployed workers per unit of time, with $m'(\cdot) < 0$. Similarly, the rate at which counseled and non conseled unemployed job seekers can meet jobs is $\lambda_1 = \delta\theta m(\theta)$ and $\lambda_0 = \theta m(\theta)$ respectively. It is worth noting that all job contacts do no necessarily lead to job creation because some job matches may yield jobs with duration that can be considered as too short by the worker.

2.1 The supply side

Let us denote by V_0, V_1 and $V_e(\Delta)$ the value function of a non counseled unemployed worker, of a counseled unemployed workers and of a worker recruited on a job with duration Δ respectively.

Unemployed workers get unemployment benefits denoted by b. Non counseled unemployed workers become counseled at rate μ and get job offers at rate λ_0. Accordingly, the value function of a non counseled unemployed worker satisfies

$$rV_0 = b + \mu (V_1 - V_0) + \lambda_0 \left(\int_0^{+\infty} \max [V_e(\Delta), V_0] \, \mathrm{d}F(\Delta) - V_0 \right). \tag{1}$$

Counseled unemployed workers get job offers at rate $\delta\lambda_0$. Their value function, V_1, satisfies

$$rV_1 = b + \delta\lambda_0 \left(\int_0^{+\infty} \max [V_e(\Delta), V_1] \, \mathrm{d}F(\Delta) - V_1 \right). \tag{2}$$

A job seeker who accepts a job offer with duration Δ is paid the wage w for the duration of the job. At the end of the employment spell, the worker will be unemployed and non counseled. Accordingly, the value of a job offer with duration Δ reads

$$V_e(\Delta) = \int_0^{\Delta} we^{-rt}\mathrm{d}t + e^{-r\Delta}V_0.$$

This expression can also be written as follows:

$$V_e(\Delta) = V_0 + \gamma(\Delta)(w - rV_0), \tag{3}$$

where $\gamma(\Delta) = \int_0^{\Delta} e^{-rt}\mathrm{d}t = \left(1 - e^{-\Delta r}\right)/r \geq 0$, is an increasing function of Δ which satisfies $\gamma(0) = 0$. Equation (3) implies that $V_e(0) = V_0$ and that workers accept jobs only if $w \geq rV_0$. We assume that this condition is fulfilled. Thus $V_e(\Delta)$ is increasing with respect to Δ. Accordingly, the best rule for non counseled workers is to accept any job whatever its duration $\Delta \geq 0$. We deduce from this that the value function of non counseled unemployed workers, defined in equation (1), satisfies

$$rV_0 = b + \mu(V_1 - V_0) + \lambda_0(w - rV_0)\int_0^{+\infty} \gamma(\Delta)\mathrm{d}F(\Delta). \tag{4}$$

The behavior of counseled job seekers can be different from the behavior of non counseled workers because their expected discounted utility, V_1, is higher than that of non counseled workers if $\delta > 1$. Counseled workers only accept jobs whose duration is above a reservation value, denoted by Δ_1, which is defined by $V_e(\Delta_1) = V_1$. Since V_1 is higher than V_0 and $V_e(\Delta)$ is a strictly increasing function of Δ, with $V_e(0) = V_0$, one gets $\Delta_1 > 0$ if $\delta > 1$. Thus, equation (2) can be re-written as follows:

$$rV_1 = b + \delta\lambda_0 \int_{\Delta_1}^{+\infty} \left[V_e(\Delta) - V_1\right]\mathrm{d}F(\Delta). \tag{5}$$

Moreover, using equation (3), the equality $V_e(\Delta_1) = V_1$ reads

$$\gamma(\Delta_1) = \frac{V_1 - V_0}{w - rV_0}. \tag{6}$$

It is possible to get, from equations (2), (4) and (6) a relation between λ_0, the arrival rate of job offers to the non counseled unemployed workers, and Δ_1, the reservation duration of counseled unemployed workers, which reads:[2]

$$\frac{(r+\mu)}{\lambda_0} = \delta \int_{\Delta_1}^{+\infty} \frac{\gamma(\Delta) - \gamma(\Delta_1)}{\gamma(\Delta_1)}\mathrm{d}F(\Delta) - \int_0^{+\infty} \frac{\gamma(\Delta)}{\gamma(\Delta_1)}\mathrm{d}F(\Delta) \tag{7}$$

[2] Equations (4) and (5) imply:

$$(r+\mu)(V_1 - V_0) = \delta\lambda_0(w - rV_0)\int_{\Delta_1}^{+\infty} \left[\gamma(\Delta) - (V_1 - V_0)\right]\mathrm{d}F(\Delta) - \lambda_0(w - rV_0)\int_0^{+\infty} \gamma(\Delta)\mathrm{d}F(\Delta),$$

This equation can be interpreted as a labor supply condition, which defines the relation between the minimum duration of jobs accepted by the counseled job seekers and the arrival rate of job offers. It turns out that the reservation duration of counseled workers increases with the arrival rate of job offers because job seekers become more choosy when they can get more job offers.

2.2 The demand side

The demand side describes the behavior of firms. It is assumed that each new match can produce $y > w$ units of good per unit of time for a period Δ. The employer offers a contract that stipulates the duration of the job, Δ, at wage w. At the end of the spell Δ, employers get rid of the worker. The value of a job with duration Δ, denoted by $\Pi(\Delta)$, satisfies

$$\Pi(\Delta) = \int_0^{\Delta} (y - w)e^{-rt}\mathrm{d}t + e^{-\Delta r}\Pi_v, \tag{8}$$

where Π_v stands for the value of a vacant job. A vacant job costs h per unit of time and meets a worker at rate $m(\theta)$. The probability to meet an unemployed worker not counseled given that an unemployed workers has been met is defined by:

$$\alpha = \frac{u_0}{u_1\delta + u_0}.$$

When a worker is met, he is thus counseled with probability $1 - \alpha$. Non counseled job seekers accept any job offer whereas counseled job seekers only accept job whose duration is longer than Δ_1. Accordingly, the value of a vacant job satisfies

$$r\Pi_v = -h + m(\theta)\left(\alpha \int_0^{+\infty} \Pi(\Delta)\,\mathrm{d}F(\Delta) + (1-\alpha)\int_{\Delta_1}^{+\infty} \Pi(\Delta)\,\mathrm{d}F(\Delta)\right). \tag{9}$$

The free entry condition, $\Pi_v = 0$, implies, together with equations (8) and (9), that

$$\frac{h}{m(\theta)} = \left(\alpha \int_0^{+\infty} \gamma(\Delta)\,\mathrm{d}F(\Delta) + (1-\alpha)\int_{\Delta_1}^{+\infty} \gamma(\Delta)\,\mathrm{d}F(\Delta)\right)(y - w). \tag{10}$$

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that is

$$r + \mu = \delta\lambda_0 \frac{w - rV_0}{V_1 - V_0}\int_{\Delta_1}^{+\infty} \gamma(\Delta) dF(\Delta) - \delta\lambda_0 \bar{F}(\Delta_1) - \lambda_0 \frac{w - rV_0}{V_1 - V_0}\int_0^{+\infty} \gamma(\Delta)\mathrm{d}F(\Delta).$$

Using the definition (6) of the reservation productivity of counseled unemployed workers, one gets equation (7).

The free entry condition can be interpreted as a labor demand equation that relates the labor market tightness θ to the reservation duration of counseled job seekers.The labor market tightness decreases with the reservation duration on the labor demand curve because employers face a higher probability to meet a worker who refuses job offers when the reservation duration is higher. Since the arrival rate of job offers to the non counseled workers, equal to $\theta m(\theta)$, increases with the labor market tightness, a raise in the reservation duration of counseled unemployed workers has a negative impact on the job arrival rate of the non counseled unemployed workers.

In steady state equilibrium, the flows of entries into and exits from counseled unemployment are equal:

$$\mu u_0 = \lambda_0 \bar{F}(\Delta_1)\delta u_1,$$

where $\bar{F} = 1 - F$, thus

$$\alpha = \frac{\lambda_0 \bar{F}(\Delta_1)}{\lambda_0 \bar{F}(\Delta_1) + \mu}. \tag{11}$$

Let us assume that the matching function takes the form $m_0 s^\eta v^{1-\eta}$, $\eta \in (0,1)$, $m_0 > 0$. This implies that $m(\theta) = m_0 \theta^{-\eta}$. Then, from $\lambda_0 = \theta m(\theta)$, we get $m(\theta) = m_0^{1/(1-\eta)} \lambda_0^{-\eta/(1-\eta)} = \Lambda \lambda_0^{-\sigma}$.

Using the value of α defined in equation (11), the free entry condition (10) can be written as a relation between λ_0, the arrival rate of job offers to the non counseled job seekers and Δ_1, the reservation productivity of counseled workers:

$$\frac{h}{(y-w)\Lambda} = \lambda_0^{-\sigma} \left(\frac{\mu}{\lambda_0 \bar{F}(\Delta_1) + \mu} \int_{\Delta_1}^{+\infty} \gamma(\Delta)\, \mathrm{d}F(\Delta) + \frac{\lambda_0 \bar{F}(\Delta_1)}{\lambda_0 \bar{F}(\Delta_1) + \mu} \int_0^{+\infty} \gamma(\Delta)\, \mathrm{d}F(\Delta) \right). \tag{12}$$

2.3 The equilibrium

The equilibrium values of the two unknown variables λ_0 and Δ_1 are defined by the solution to the system of equations (7) and (12), where r, δ, $F(.)$, h, π, Λ, σ and μ are parameters.

The existence of an equilibrium can easily be proved. The labor supply equation (7), which is depicted on figure 1, defines an increasing relation between λ_0 and Δ_1 with $\lambda_0 \to 0$ when $\Delta_1 \to 0$ and $\lambda_0 \to +\infty$ when $\Delta_1 \to +\infty$. The labor demand equation (12) defines a relation between λ_0 and Δ_1, with $\lambda_0 \to 0$ when $\Delta_1 \to +\infty$ and $\lambda_0 \to \lambda_{00}$ when

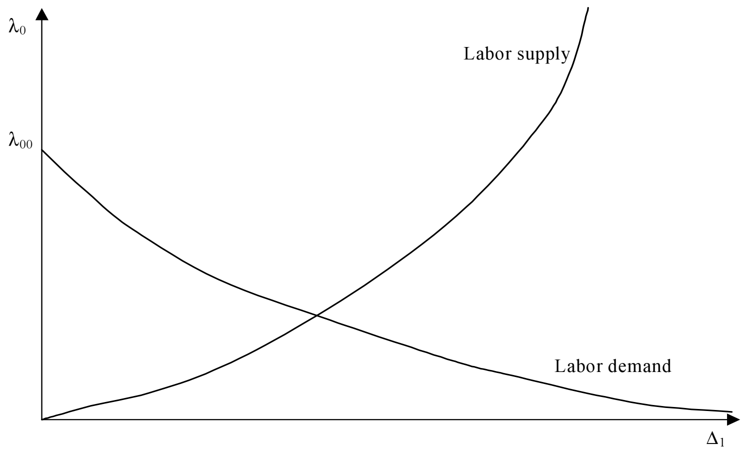

Figure 1: Labor market equilibrium

$\Delta_1 \to 0$, where λ_{00} is the counterfactual equilibrium job offers arrival rate in the absence of the policy ($\mu = 0$), which is merely given by:

$$\frac{h}{(y-w)\Lambda} = \lambda_{00}^{-\sigma} \int_0^{+\infty} \gamma(\Delta) \mathrm{d}F(\Delta) \tag{13}$$

Therefore, the labor demand and the labor supply equation intersect at least once as it is illustrated on figure 1.

The labor demand equation (12) does not always define a negative relation between λ_0 and Δ_1. Accordingly, the unicity of the equilibrium is not always fulfilled. However, it will be checked that the unicity of the equilibrium is fulfilled for the values of the paramaters that are estimated.

Knowledge of the parameters of the model will allow us to compute the equilibrium value of the arrival rate of job offers in the absence of counseling, denoted by λ_{00}, which is defined in equation (13). In particular, the effect of counseling on the non counseled job seekers is measured by λ_0/λ_{00}. The model allows us to analyze more generally the consequence of counseling on labor market equilibrium.

On another hand, an increase in μ, the rate of entry into counseling, moves upwards the labor supply curve depicted on figure 1: unemployed workers accept jobs with lower duration when the rate of entry into counseled unemployment is higher. This relation can be understood as follows. Counseling creates an opportunity cost of accepting job offers because workers are not counseled any more when they are employed. And once counseled job seekers lose their job, they will have to wait a while before receiving counseling again. The opportunity cost of accepting a job offer is thus lower when the waiting period to come back into counseling is shorter (higher μ). Since a lower opportunity cost of accepting jobs implies a lower reservation utility, this phenomenon implies that the reservation utility of counseled job seekers decreases with the share of workers who benefit from counseling. In the limit, when all job seekers are counseled, the opportunity cost of accepting a job goes to zero, because the waiting period before coming back into counseling after a job-loss goes to zero.

An increase in the rate of entry into counseling moves the labor demand curve downwards: firms create less job vacancies when a larger share of job seekers are counseled because the probability to meet a worker who refuses job offers is higher.

These changes in labor supply and labor demand imply that the spread of counseling always reduces the reservation duration of counseled job seekers. However, the impact of spreading out counseling on the baseline arrival rate of job offers ($\lambda_0 = \theta m(\theta)$) has ambiguous sign. As shown by Figure 2, the relation between the entry rate into counseling and the arrival of job offers is U-shaped: increases in μ reduce the arrival rate of job offers when the entry rate is small. The opposite holds true when the entry rate is large. Moreover, in the limit, the arrival rate of job offers *to the non counseled workers* is identical when the share of counseled workers goes to 1 and in the absence of counseling, since the reservation duration is equal to zero in both cases. Naturally, if *all* workers are treated upon entering unemployment, the equilibrium exit rate that applies to the economy is higher than when counseling is absent, because search efficiency is higher, everything else equal - *thus the effect on overall exit rate is rather J-shaped.*

3 Econometric implementation

Assessing the equilibrium impact of the policy in this model, and the effect of changing the policy intensity, requires knowledge of all parameters. They can be estimated based on data about: (1) unemployment duration until counseling, (2) unemployment duration until employment and (3) employment duration. The informal identification argument is as follows. Treatment intensity (μ) can be obtained from the first duration. The second duration contains information on λ_0, and comparing treated and untreated is

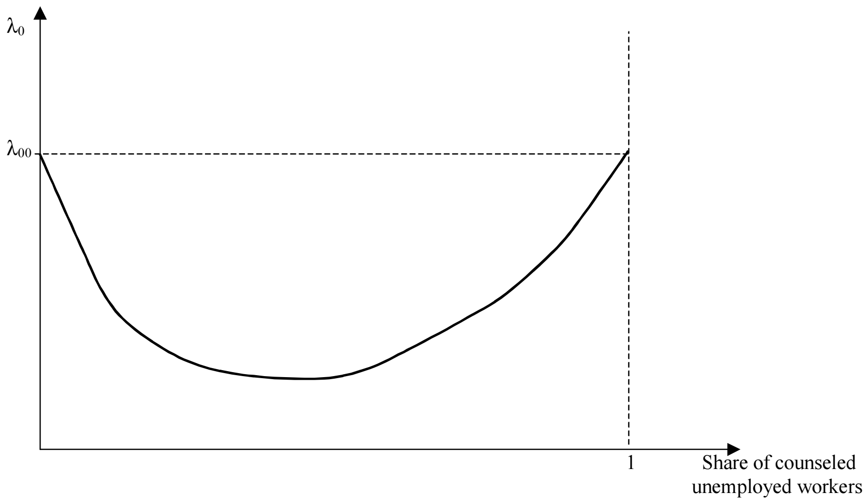

Figure 2: The relation between λ_0 the exit rate out of unemployment of non counseled unemployed and the share of counseled unemployed.

informative on δ. The distribution of employment duration $F(.)$ can be inferred from the third duration and, again, comparing treated and untreated is informative on Δ_1, which is the only source of employment duration difference between the two groups. The discount rate is not estimated, it is set to $r = 0.05$.

This set of parameters can be constrained to fit the labor supply curve defined by equation (7).[3] The labor demand curve, equation (12), still depends on two additional unknown parameters, σ and $h/(y-w)\Lambda$. We choose to set $\sigma = 1$ (and test for robustness of the results over the range 0.75-1.25). Then, knowledge of the equilibrium point (λ_0, Δ_1) in figure 1 identifies the parameter $h/(y-w)\Lambda$, thus λ_{00}. As there is no information to disentangle h, y, w and Λ, we set $R = h/(y-w)\Lambda$ and estimate R directly. This latter parameter can be interpreted as the inverse of a 'return' to job creation (the profit $(y-w)$ weighted by baseline market efficiency $\Lambda = m_0^{1/(1-\eta)}$, relative to the cost h): markets with higher R tend to have a lower demand curve.

We assume that the distribution $F(.)$ can be parametrized as

$$F(\Delta) = 1 - e^{-\eta\Delta}$$

implying that the employment duration has a constant hazard η. Notice that duration

[3] Given r, this is an equality constraint over the parameters.

until counseling also has constant hasard μ. As a result, λ_0 doesn't have duration dependance either. Including non-stationarity in such an empirical structural model would be a formidable task. As will appear, *observed* duration dependence will be accounted for by unobserved heterogeneity.

In order to account for observed and unobserved heterogeneity, we group data into cells defined by a set of observed characteristics (X =region, education, age and sex) and we assume that, within each cell, unobserved heterogeneity can be captured by a random variable, distributed on a discrete support. We further assume that each group defined by a set of observed characteristics *and* a value of unobserved heterogeneity forms a distinct 'job market', over which equations (7) and (12) hold. In this setup, we have to face the usual problem that treatment parameters δ and $F(\Delta_1)$ can be counfounded with unobserved heterogeneity: a group that is intrinsically more efficient at job search may be also treated less often, so that direct comparison of unemployment durations accross treated and untreated would, in this example, understate the true policy parameter δ. However, it is well known that, in the mixed proportional hasard model, this parameter is non-parametrically identified (Abbring and van den Berg, 2003). Our model differs from this standard setup, but identification is proved in appendix A. The constant hasards hypothesis plays an important role in this proof, as *observed* duration dependance helps identify unobserved heterogeneity.

The model is estimated separately for cells defined by observed characteristics. We call t_U total unemployment duration, t_T unemployment duration until entry into treatment and t_E employment duration. In a given market (conditional on X and ε), the likelihood has the following expressions (where all parameters, but r and σ, are specific to market (X, ε), which is kept implicit for legibility):

- If treatment occurs before exit to employment ($t_T < t_U$):

$$L(t_U, t_T, t_E | X, \varepsilon) = \mu \left[\lambda_0 \delta \overline{F}(\Delta_1)\right]^{c(U)} e^{-([\lambda_0+\mu]t_T+\lambda_1[t_U-t_T])} \left[\eta^{c(E)} 1_{t_E>\Delta_1} e^{-\eta(t_E-\Delta_1)}\right]^{c(U)}$$

- If exit to employment occurs before treatment ($t_T = t_U$):

$$L(t_U, t_T, t_E | X, \varepsilon) = \lambda_0^{c(U)} e^{-([\lambda_0+\mu]t_U)} \left[\eta^{c(E)} e^{-\eta t_E}\right]^{c(U)}$$

where $c(U) = 0$ when the unemployment spell is censored and 1 otherwise and $c(E) = 0$ when the employment spell is censored and 1 otherwise. We also impose the two restrictions derived from equations (7) and (12), which implicitly define the two endogenous variables within each market:

$$\lambda_0 (\delta, \sigma, \mu, R, \eta)$$
$$\Delta_1 (\delta, \sigma, \mu, R, \eta)$$

The observable likelihood then has the following expression:

$$L(t_U, t_T, t_E|X) = \int L(t_U, t_T, t_E|X, \varepsilon) dH(\varepsilon; \pi)$$

where $H(\varepsilon; \pi)$ is the distribution of unobserved heterogeneity and π its parameters. Heterogeneity applies to μ, R and η and is specified with two factor loadings: conditional on X they have values

$$\mu = \exp(\pi_\mu^1), R = \exp(\pi_R^1), \eta = \exp(\pi_\eta^1)$$

with probability p and values

$$\mu = \exp(\pi_\mu^2), R = \exp(\pi_R^2), \eta = \exp(\pi_\eta^2)$$

with probability $1 - p$. This specification ensures that μ, R and η can be correlated in an unconstrained manner. For instance, unobserved features can make treatment μ more intensive in markets that have longer contracts (η).

For tractability reason we split our sample into cells over which estimations are run separately. As explained above a cells is a set of spells sharing the same region/education/age/sex. A 'market' will be the set of spells sharing the same region/education/age/sex and the same unobserved type. Thus there are two 'markets' in each cell. We estimate the maximum likelihood above as a constrained parametric duration model with finite mixture using the software KNITRO AMPL. This estimation provides us with a set of parameters by unobserved types: in other words we end up with an estimate by 'market'. Then we work out MLE variance through MATLAB.
As the likelihood is not differentiable in Δ_1, we smooth it by replacing the dummy function $t_E - \Delta_1 > 0$ with a logistic function $\frac{1}{1+exp(-6*(t_E-\Delta_1))}$ The estimation lasts 5 nearly days. A few cells (less than 5) shows convergence issues.

The distribution of parameters over all markets can then be presented non-parametrically.

In order to have a more structured view of the results, we can also project the parameters linearly over the region/education/age/sex variables, so as to describe the effects of observable characteristics on the various durations.

Based on the estimates, we can then compute a set of evaluation parameters and counterfactuals. In each case, there are as many effects as there are markets. In this sense, our specification is very flexible with respect to heterogeneity of treatment effects. The main effects we are interested in are the following:

- The effect of the policy on the non-treated : the exit rate from unemployment for the non treated λ_0 compared with the exit rate λ_{00} that would prevail if the policy did not exist ($\mu = 0$). This is a measure of the policy spillover on the untreated.
- The direct effect of the treatment: the treated net exit rate from unemployment, $\lambda_0 \delta e^{-\eta \Delta_1}$ compared with the exit rate λ_0 of the non treated.
- The equilibrium effect of the treatment on the treated: $\lambda_0 \delta e^{-\eta \Delta_1}$ compared with the exit rate λ_{00} in the absence of the policy.
- The effect of the policy on unemployment duration: the expected duration (*ex ante* i.e. either treated or non treated) compared with the counterfactual expected duration in the absence of the policy ($\delta = 0$).

4 Data

The empirical analysis is based on administrative longitudinal data extracted from the records of the French public unemployment service (ANPE). We use unemployment inflow since July 2001, when counseling schemes where introduced at a significant scale as part of the so-called *Plan d'Aide au Retour à l'Emploi*. During a compulsory meeting, the unemployed person and the caseworker come to an agreement over the degree of assistance that the person should receive. Depending on this evaluation and available spots, the unemployed may be subsequentely offered a scheme. We count as treatment two categories of schemes: a basic *Skill assessment* and a *Job-search support*, aimed at directly helping individuals on their search actions. Although there is sufficient data to analyze those schemes separately (Crépon et al. 2005), we bunch them into a unique treatement. We use a 1/12 nationally representative sample of all unemployed persons registered with ANPE.[4] We sample all inflow spells since July 2001 and data end in June 2004. We also truncate spells when the unemployed reaches 55 year-old. The average unemployment rate is high (36 percent) because our data cover individuals registered at the ANPE at least once between July 1001 and June 2004.

Entry into and exit from unemployment are recorded on a daily basis, so that we model duration in continuous time. In this data, unemployment differs from the ILO conventional notion, in the sense that people are recorded as job seekers as long as they report so to ANPE on a monthly filled form, even if they have held occasional or short-term jobs, which they have to declare. As a result, we have reconstructed unemployment spells to account for the fact that a job is found, even if the individuals still reports himself as a job-seeker to the administration. In practice, we end the spell when the individuals either exits for good or holds such a short-term job, provided he worked at least 78 hours in the month. The exact date of employment is not declared in that case and we compute it as if reported hours where worked full time at the end of the period. When this occasional employment stops, we start a new spell (with the same kind of conventional starting date), and so on. We end up with a sample of 479,334 individuals for 981,901 unemployment spells overall.

Transitions may occur towards other destinations than employment but they are be treated as censoring, which implies that they depend upon a disjoint subset of parameters. Although undesirable in some instances, this hypothesis maintains tractable estimation. "Other destinations" include training, illness, inactivity and, most importantly, subsidized public employment. In addition, some unemployed do not send their monthly form at some point so that they are known to exit but the destination is unobserved. Estimation is limited to individuals with known exit.

As we have no direct information on employment periods, we proxy employment duration with the time between an exit to employment and a new unemployment spell. We have 552,508 such employment spells.

ANPE also provided data on the services that benefited each unemployed worker in the sample, with a date for the effective beginning of the scheme. This has been matched

[4] The sample consists of all individuals born on March of an even year or October of an odd year. This sample, named "Fichier historique statistique" is updated routinely by ANPE.

with the data on unemployment spells. Out of the 981,901 unemployment spells, 62,941 received counseling. Note that, when we split administrative spells into a series of effective spells separated by short-term jobs, we maintain the treatment status only for the effective spells in effect when treatment started.

5 Results

We first present the estimated parameters, and specifically their distribution accross the "markets". Then, we evaluate the impact of counseling on transitions between unemployment and employment. Finally, we analyze the effect of counseling on unemployment rates.

5.1 Estimated parameters

Parameters are estimated by maximum likelyhood independently on cells assumed to represent distinct labor markets differentiated by sex, age, education and region. We only retain the 1562 cells with 41 or more observations. The largest cell contains 7676 observations. Table 1 gives a few statistics on these cells.

Table 2 gives the mean value of the following parameters:[5] the rate of entry into counseling (μ), the exit rate out of employment (η), the baseline arrival rate of job offers (λ_0), the reservation employment duration of counseled job seekers (Δ_1), the direct impact of counseling on the arrival rate of job offers (δ), the exit rate out of employment of counseled job seekers ($\delta\lambda_0\bar{F}(\Delta_1)$) and the value of the counterfactual arrival of job offers in the absence of counseling (λ_{00}).

The average entry rate into counseling is 0.22. This is a very low rate of entry which implies that unemployed workers have to wait on average about four years and seven months to benefit from counseling. It should be noticed that the observed average unemployment duration necessary to enter into counseling is smaller since most unemployed workers find a job before four years and seven mounths. Actually, the average unemployment duration of non counseled job seekers ($1/\lambda_0$) is about seven months.

[5] We compute the average values of the parameters estimated on each labor market. Each observation is weighted by the size of the corresponding market.

The average unemployment duration of counseled job seekers (equal to $1/\lambda_1$) is 2.2 percent smaller than the average unemployment duration of those who are not counseled. The difference between the arrival rates of job offers to counseled and non counseled individuals is much bigger since it is 15.6 percent higher for counseled individuals.[6] Therefore, the relative small difference between unemployment spells of counseled and non counseled job seekers is explained to a large extent by the fact that counseled individuals refuse short term contracts whereas non counseled job seekers accept all jobs, as shown in the theoretical model. The estimated value of Δ_1 implies that counseled workers refuse, on average, jobs whose duration is smaller than 0.21 year

Table 2 also sheds some light on the equilibrium effects of counseling. It shows that the average effect of counseling on the arrival rate of job offers to non counseled workers is weak: the baseline arrival rate of job offers (λ_0) is 1.2 percent smaller than the counterfactual arrival rate of job offers in the absence of counseling (λ_{00}). However, compared with the difference between the exit rate of counseled individuals and those who are non counseled, which amounts to 2.8 percent, this number is not negligeable.

The densities of the parameters whose average value is presented in Table 2 are displayed on Figures 3, 4, 5, 6, 7 and 8. It turns out that the densities of the job loss rate (η) and of the two exit rates out of unemployment (λ_0 and $\delta\lambda_0\bar{F}(\Delta_1)$) are clearly bimodal. This illustrates the well documented dual feature of the French labor market where some workers have access to stable jobs that benefits from a strong employment protection and other workers are constrained to accept fixed term contracts associated with shorter employment spell. Table 3 gives the distribution of these parameters per centiles.

Table 4 documents the relation between the estimated parameters and the features of labor markets. In this table we regress the values of the maximum likelyhood estimates of the parameters on the cells characteristics (gender, age, education, region). This table shows that women, young workers and people with low education have shorter employment spells than other people. The exit rates out of unemployment of men and women are not statistically different. Individuals with high levels of education, above high school, exit faster out of unemployment than those without any diploma. It also appears that unemployment duration increases with age. Table 4 also shows that counseling does

[6] This difference is captured by parameter δ.

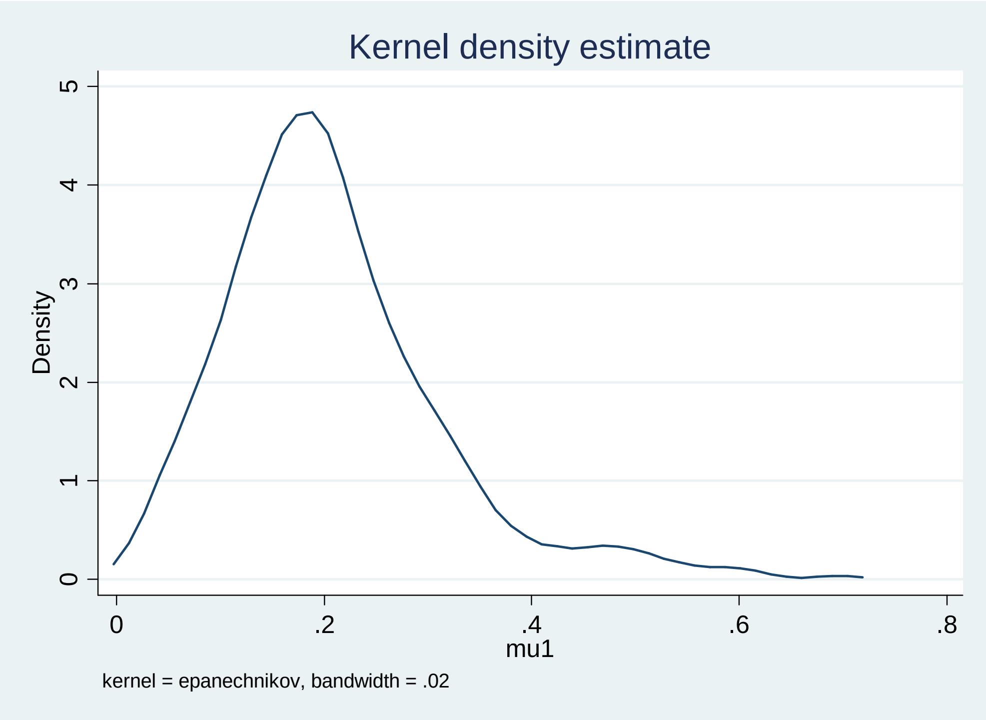

Figure 3: Density of the rate of entry into counseling μ.

not always contribute to help the most disadvanged: although women tend to receive counseling more often (2 percent) than do men, people with medium academia standards (finishing high school) are the most often treated. Counseling is the most frequent at mid-career (30-50 year-old).

5.2 The effects of the policy on transitions between employment and unemployment

Standard evaluations, relying on a simple comparison of the outcome of the treated and the non treated, can lead to wrong results if the policy induces equilibrium effects that change the arrival rate of job offers λ_0. The error comes from the choice of wrong counterfactuals when evaluating the impact of the policy: standard evaluations assume that the counterfactual arrival rate of job offers and the reservation employment duration in the absence of the policy are the same as those observed by the econometrician in the presence of the policy for the untreated, whereas the 'true' counterfactuals are different. In our model, the exit rate out of unemployment of counseled job seekers amounts to $\delta\lambda_0\bar{F}(\Delta_1)$.

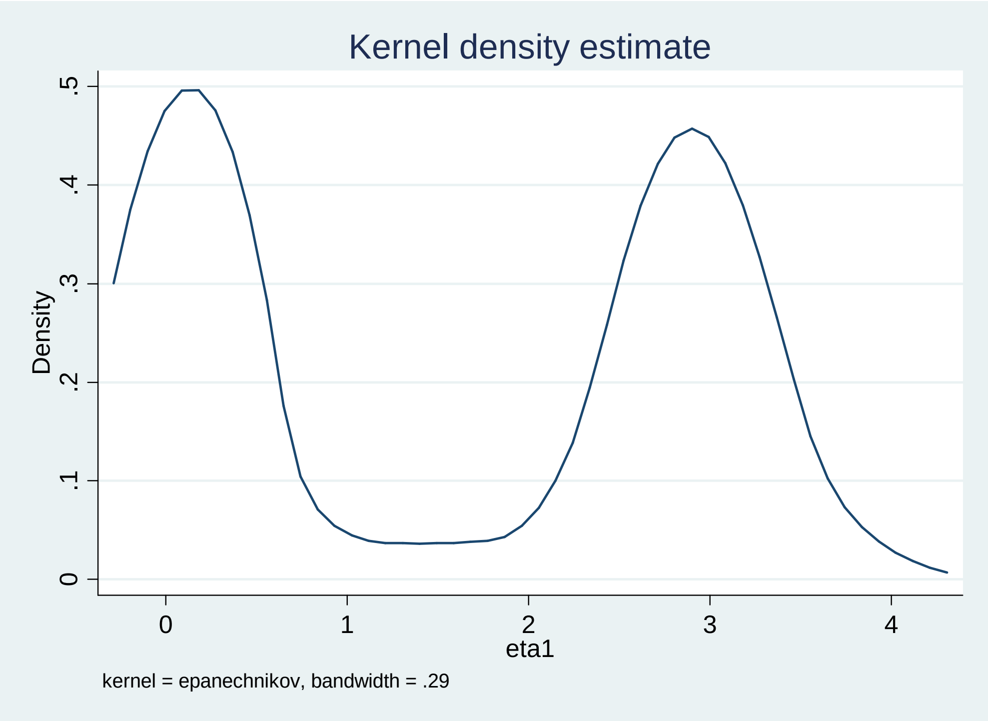

Figure 4: Density of the exit rate out of employment η.

Non treated individuals exit unemployment at rate λ_0. The effect of the treatment on the treated is usually defined as the ratio between these two exit rates, that is $\delta\bar{F}(\Delta_1)$. However, this approach yields a naive evaluation of the effects of the treatment to the extent that it does not account for equilibrium effects which may change the value of the arrival rate of job offers to the non counseled job seekers. To account for such effects one needs to know the exit rate out of unemployment in the absence of counseling, that is λ_{00}. Then, the effect of the treatment on the treated accounting for equilibrium effects is defined as $\delta\lambda_0\bar{F}(\Delta_1)/\lambda_{00}$. The error induced by the ignorance of equilibrium effects, expressed in percentage of the impact of the treatment not accounting for equilibrium effects, is thus $(\lambda_0 - \lambda_{00})/\lambda_{00} \simeq \ln(\lambda_0/\lambda_{00})$. Our empirical strategy allows us to estimate this error.

The naive evaluation of the effect of counseling on counseled workers The evaluation of the impact of the treatment on the exit rate out of unemployment of counseled workers with no account of equilibrium effects, $\delta\bar{F}(\Delta_1)$, is 3.5 percent on average.

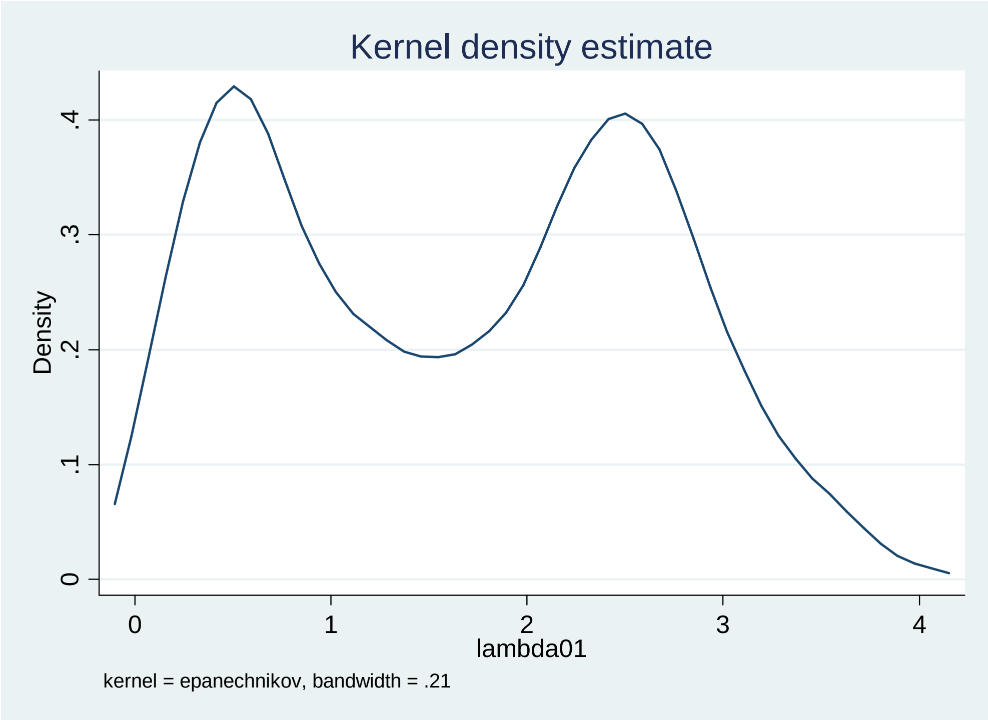

Figure 5: Density of the exit rate out of unemployment of non counseled workers λ_0.

It is different across labor markets. The density of the naive evaluation of the effect of counseling is displayed on figure 9. The orders of magnitude of the estimates are in line with those of Crepon et al. (2005).

As shown by Table 4, the impact of counseling depends on observed individual characteristics: the treatment is 5.7 percent stronger for women. The treatment is significantly stronger for persons without diploma than for people with some high school and with diploma. The impact of age is either very small or not significant.

The exit rate out of unemployment of non counseled workers and the evaluation error In our model, the policy lowers the arrival rate of job offers to the non counseled, λ_0, compared to the rate that would prevail in the absence of the policy, λ_{00}. Figure 10 displays the density of the term $\ln(\lambda_0/\lambda_{00})$ which measures, on each labor market, the impact of the policy on the exit rate of non counseled workers expressed in percentage of their exit rate in the absence of the policy. It is also worth noting that the term $\ln(\lambda_0/\lambda_{00})$ measures the size of the evaluation error due to the ignorance of

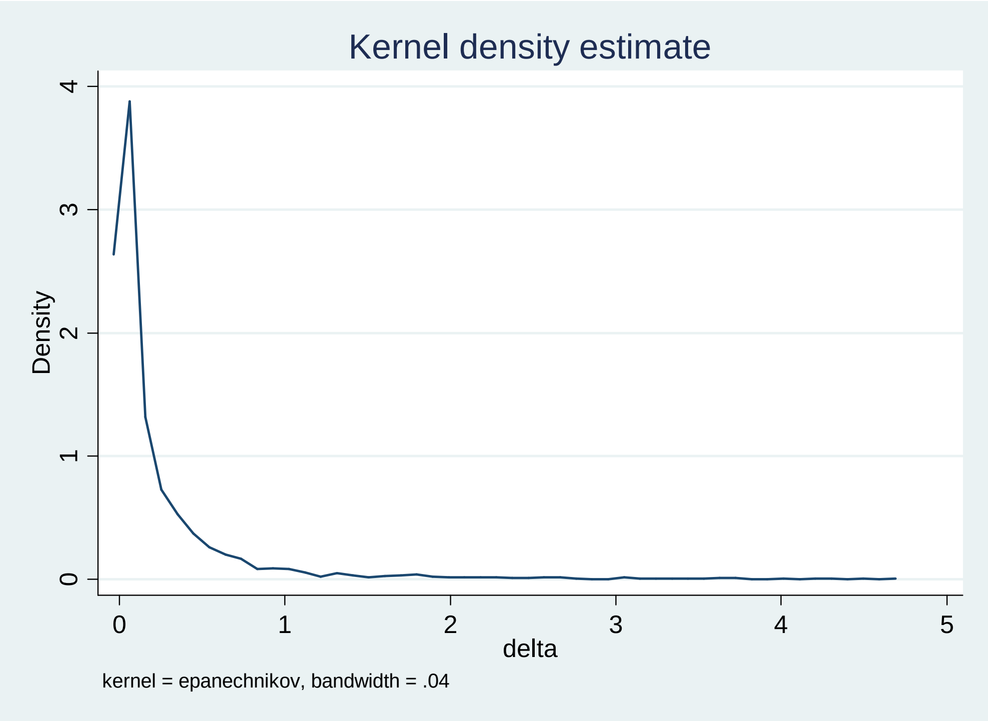

Figure 6: Density of the direct impact of counseling on the arrival rate of job offers δ.

equilibrium effects.

On average, the arrival rate of job offers to non counseled job seekers is reduced by 1.2 percent only by the policy. Since the average evaluation error is small, accounting for equilibrium effects does not change much the average estimated effects of counseling on the exit rate out of unemployment of the treated. However, there are strong differences across labor markets as it is illustrated by Figure 11. The vertical axis reports the impact of counseling on the exit rate out of unemployment of the non treated $\ln(\lambda_0/\lambda_{00})$. The horizontal axis corresponds to the rate of entry into counseling. Figure 11 shows that the effects of counseling on the non treated is different across labor markets. These effects can be quite large, reducing the exit rate out of unemployment of non counseled by up to 7 percent. It turns out that the magnitude of the impact is stronger in labor markets where the entry rate into counseling is lower, according to the prediction of our model.

It should also be noticed, as shown in table 4, that the magnitude of the negative impact of the policy on the exit rate out of unemployment of the non treated is 10 percent stronger for women. The negative impact is also stronger for individuals without

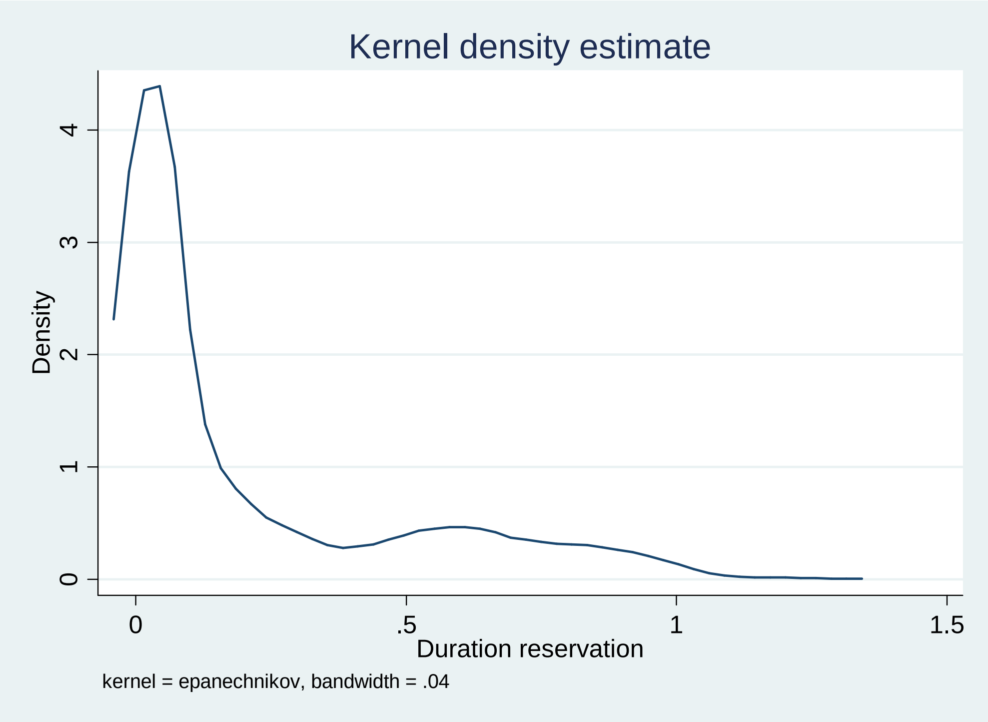

Figure 7: Density of the reservation duration Δ_1.

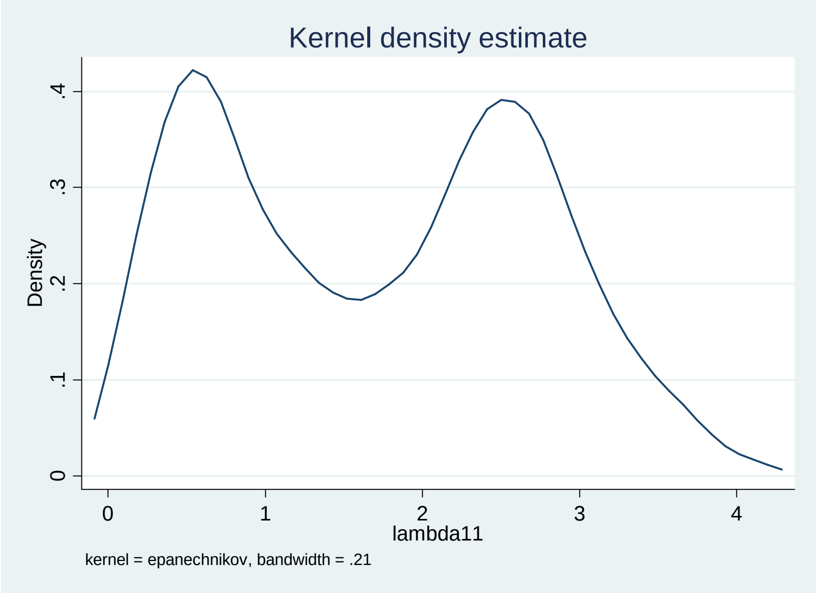

Figure 8: Density of the exit rate out of unemployment of counseled job seekers $\delta\lambda_0\overline{F}(\Delta_1)$.

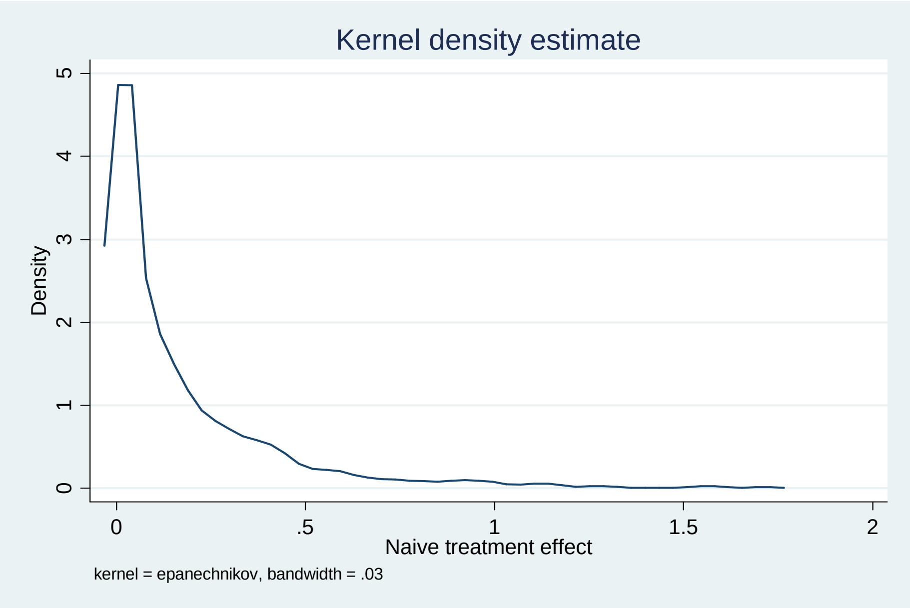

Figure 9: The density of the effect of counseling $(\delta\bar{F}(\Delta_1))$ with no account of equilibrium effects.

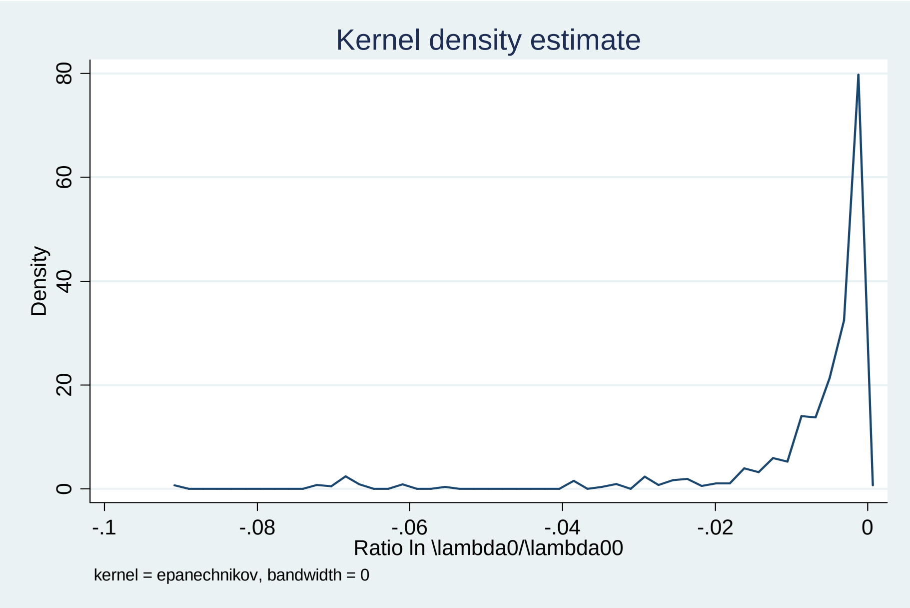

Figure 10: Density of the ratio $\ln \lambda_0/\lambda_{00}$

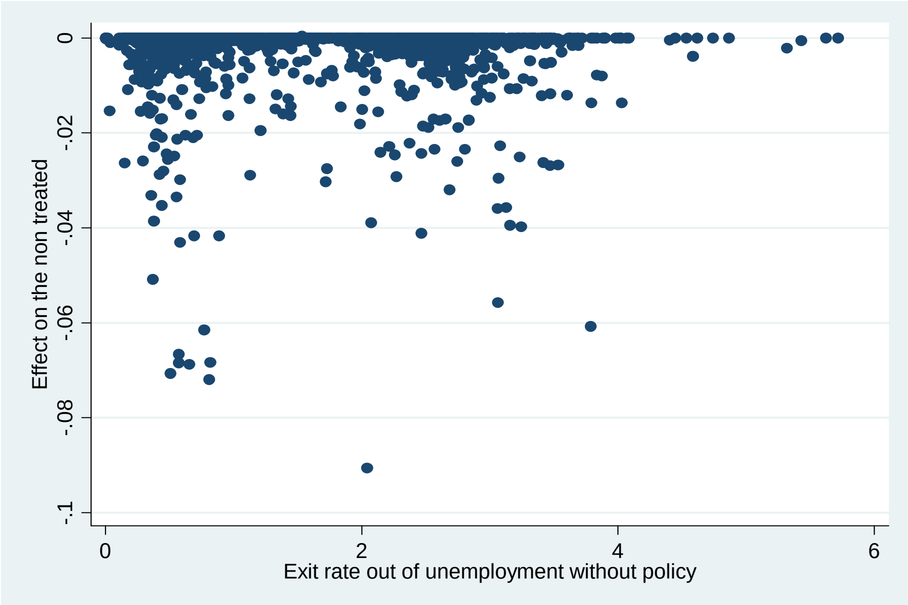

Figure 11: Impact of counseling on the exit rate of the non treated.

diploma. This result suggests that the most disadvantaged people are those who suffer the most from the crowding out effects of counseling.

The effect of the policy on employment duration Counseling changes the employment reservation duration of counseled workers. The non counseled accept all jobs, whereas the counseled accept jobs whose duration is above the threshold Δ_1. Figure 8 displays the density of the reservation duration. Counseling has a strong positive impact on the reservation duration of counseled job seekers. Accordingly, the employment duration is longer for the counseled than for the non counseled.

5.3 Measuring the effect of counseling on unemployment rate

Counseling changes the unemployment rate throught its effects on the search efficiency, δ, and the reservation duration, Δ_1, of counseled workers, but also throught its impact on the arrival rate of job offers λ_0. The choice of wrong counterfactuals can lead to different type of evaluation errors of the impact of the policy on unemployment.

Let us denote by $u(\delta, s, \lambda_0, \Delta_1)$ the unemployment rate, which depends on δ, the job search efficiency of counseled workers, on s, the share of counseled job seekers, on λ_0, the arrival rate of job offers and on Δ_1, the employment reservation duration. This unemployment rate can be computed as the stationary equilibrium rate, based on our structural model, at estimated parameters.

Naive evaluations compute the impact of the policy with the assumption that the arrival rate of job offers and the reservation duration remain unchanged in the absence of the policy. Then, the counterfactual unemployment rate is $u(\delta, 0, \lambda_0, \Delta_1)$, whereas the 'true' counterfactual should be evaluated with λ_{00} and with a reservation employment duration equal to zero, i.e. it should be $u(\delta, 0, \lambda_{00}, 0)$. Figure 12 shows the values of the impact of the policy on the unemployment rate computed with the true counterfactual (i.e. $\ln[u(\delta, s, \lambda_0, \Delta_1)/u(\delta, 0, \lambda_{00}, 0)]$) depending on the value of unemployment without the policy, $u(\delta, 0, \lambda_{00}, \Delta_1)$. We can see that, for most 'markets', the unemployment decrease resulting from the actual level of the policy is less than 2 points, but it tends to be stronger for high unemployment 'markets'. On average, the unemployment rate is reduced by 1.4 percentage point, droping from 36.3 percent to 35.9 percent.

Figure 13 displays the density of the error we would make if we compared the actual unemployment rate with a stationary rate computed at λ_0 and Δ_1 equilibrium values. The bias is then equal to $\ln[u(\delta, 0, \lambda_0, \Delta_1)/u(\delta, 0, \lambda_{00}, 0)]$. Not accounting for equilibrium effects leads to overestimate the impact of counseling on the unemployment rate by 4.1 percent on average, because counseling reduces the exit rate out of unemployment of non counseled job seekers. This is a relatively small figure. However the error can be much larger on some labor markets as previously shown.

Another error can be made when simulating the consequence of the spread of the policy to all workers. Looking at this type of error is important to the extent that some policy makers think that policies should first be evaluated at a small scale before being generalized if their evaluations are favorable. This idea is right only if equilibrium effects are properly taken into account. Ignoring such effects can lead to false conclusions, because it is wrong to simulate the impact of the generalization of counseling to all job seekers with the assumption that the arrival of job offers and the reservation employment duration remain unchanged. Evaluation of the unemployment rate impact of expanding the policy completely is presented on Figure 14 which plots $\ln[u(\delta, 1, \lambda_{00}, \Delta_1)/u(\delta, 0, \lambda_{00}, 0)]$, again depending on unemployment without the policy. The effects are now much stronger, and

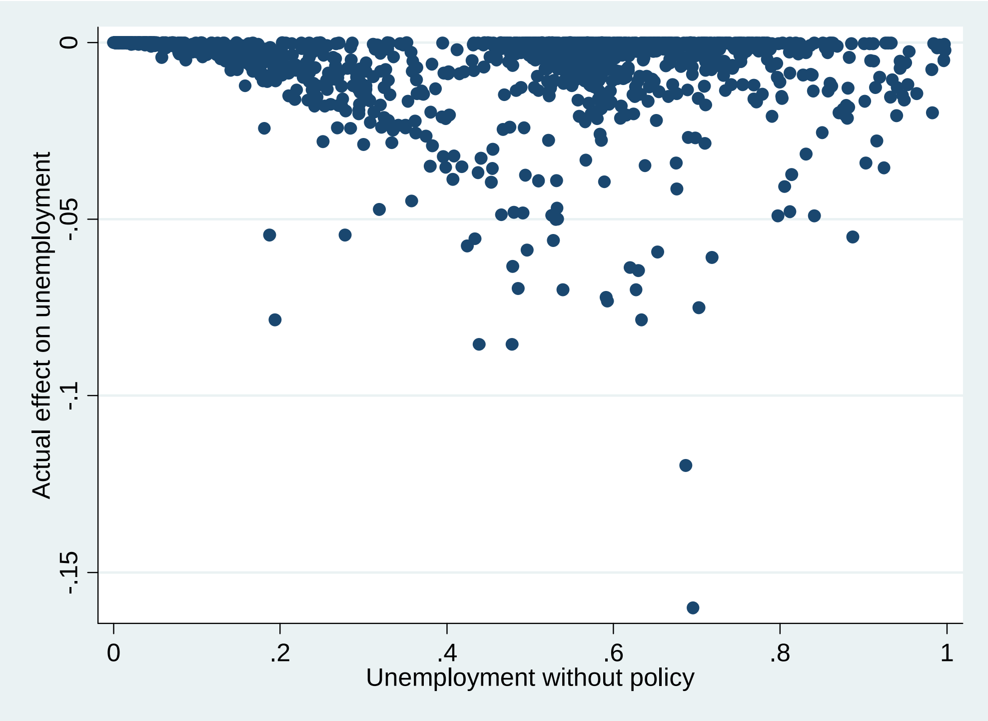

Figure 12: The impact of counseling on the unemployment rate in each labor market computed with the true counterfactual (i.e. $u(\delta, s, \lambda_0, \Delta_1)/u(\delta, 0, \lambda_{00}, 0) - 1$) depending on the value of unemployment without the policy, $u(\delta, 0, \lambda_{00}, \Delta_1)$

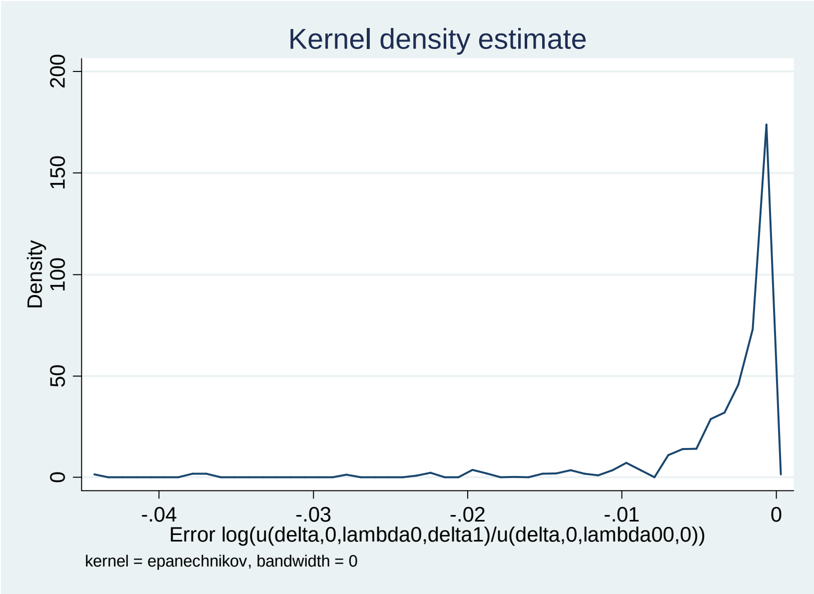

Figure 13: Density of the evaluation error of the impact of counseling on the unemployment rate.

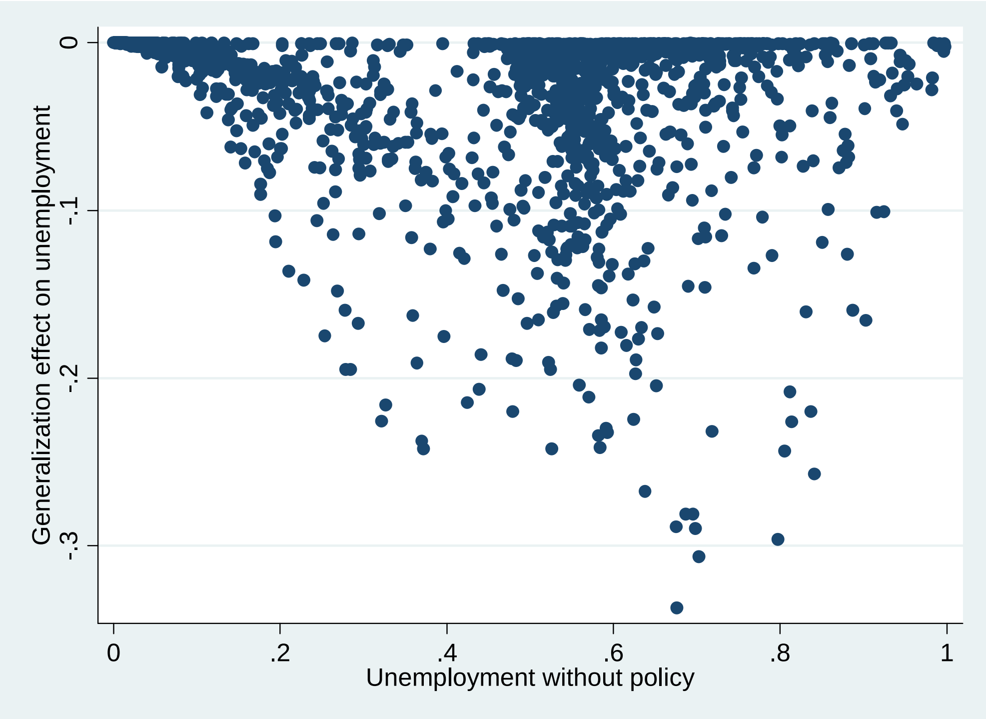

Figure 14: The change in the unemployment rate induced by counseling all workers depending on the value of unemployment without the policy.

again larger for high unemployment 'markets'.

When the impact of the policy is evaluated without accounting for equilibrium effects, the estimated change in the unemployment rate induced by counseling all workers, compared to the situation without counseling, is $D_0 = \ln[u(\delta, 1, \lambda_0, \Delta_1)/u(\delta, 0, \lambda_0, \Delta_1)]$. The density of the error induced by the ignorance of equilibrium effects when one simulates the impact of the spreading of counseling to all workers is displayed on Figure 15. Ignoring equilibrium effects leads to underevaluate the impact of the generalization of counseling because the baseline arrival rate of job offers λ_0 is always higher when all job seekers are counseled than when only a fraction of them benefit from counseling (as shown by figure 2). On average, the reduction of unemployment entailled by the generalization of counseling to all job seekers is underevaluated by 0.4 percent. Once again, this figure is relatively small, but it can be much bigger on some labor markets.

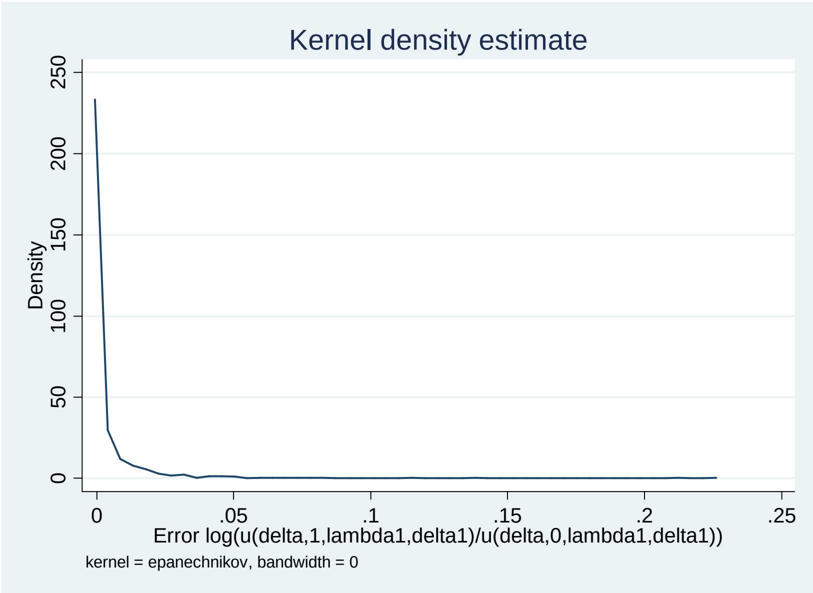

Figure 15: Evaluation error of the impact of counseling all workers on the unemployment rate

6 Conclusion

Our analysis of equilibrium effects of job search counseling provides some striking insights.

First, evaluation errors made when equilibrium effects are not accounted for can lead to misleading conclusions even when the treatment group is small. For instance, naive evaluations based on differences in exit rate out of unemployment of treated and non treated individuals may conclude that counseling increases the average exit rate out of unemployment although the right conclusion can be opposite even when the share of counseled job seekers is close to zero.

Second, equilibrium effects of counseling are not monotonous: spreading counseling to more job seekers has a negative impact on the exit rate out of unemployment of non counseled job seekers when the share of counseled workers is small, and this impact becomes positive when the share of counseled workers is large enough. The non monotonicity stems from the interactions of labor supply and labor demand reactions.

Our approach also allows us to show how equilibrium effects vary across labor markets. They are more important for workers who are more at the margin of the labor market, like women and less skilled workers.

These results have important policy implications. They obviously show that it is important to account for equilibrium effects to correctly evaluate policies. The non monotonicity of the equilibrium effects of counseling and its potential positive impact on unemployment also implies that it can be worthless counseling a small share of job seekers but worth counseling a large share of job seekers.

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A Identification

The model defines λ_0, Δ_1 and $\lambda_1 = \lambda_0 \delta \overline{F}(\Delta_1)$, as functions of parameters δ and σ, and values of μ, R and η, which contain heterogeneity terms. We have

$$\begin{aligned}
\lambda_0 &= \lambda_0(\delta, \sigma, \mu, R, \eta) \\
\Delta_1 &= \Delta_1(\delta, \sigma, \mu, R, \eta) \\
\lambda_1 &= \lambda_1(\delta, \sigma, \mu, R, \eta) = \lambda_0(\delta, \sigma, \mu, R, \eta)_0 \, \delta e^{-\eta \Delta_1(\delta,\sigma,\mu,R,\eta)}
\end{aligned}$$

We reset these parameters as $x = \lambda_0 + \mu$, $y = \lambda_1$ and $z = \eta$. Likewise we can express:

$$\begin{aligned}
\mu &= \mu(\delta, \sigma, x, y, z) \\
\lambda_0 &= \lambda_0(\delta, \sigma, x, y, z) = x - \mu(\delta, \sigma, x, y, z) \\
\lambda_1 &= y \\
\Delta_1 &= \Delta_1(\delta, \sigma, x, y, z) = \left(\log(x - \mu(\delta, \sigma, x, y, z)) - \log\left(\frac{y}{\delta}\right)\right) \Big/ z \\
R &= R(\delta, \sigma, x, y, z) \\
\eta &= z
\end{aligned}$$

The data identifies the probability of transition at different time:

$$\begin{aligned}
p(t_t, t_R, t_E) &= \int \mu \lambda_1 \eta \exp\left(-(\lambda_0 + \mu) t_T - \lambda_1 t_R - \eta (t_E - \Delta_1)\right) H(t_E - \Delta_1) \, \mathrm{d}G(x, y, z) \\
&= \int \exp(-x t_T - y t_R - z t_E) \, \mu(\delta, \sigma, x, y, z) \, yz \exp(z \Delta_1(\delta, \sigma, x, y, z)) \ldots \\
&\quad \ldots H(t_E - \Delta_1) \, g(x, y, z, \sigma, \delta) \, \mathrm{d}x \mathrm{d}y \mathrm{d}z
\end{aligned}$$

where H is the Heavyside function, t_T is the date of treatment, $t_R = t_U - t_T$ the residual duration in unemployment in case of treatment and t_E the employment duration.

Recalling the injectivity of Laplace transform, for given δ and σ we identify the function $\mu(\delta, \sigma, x, y, z) \, yz \exp(z \Delta_1(\delta, \sigma, x, y, z)) \, g(x, y, z, \delta, \sigma)$. Given the expression of Δ_1, the data identifies $\delta \mu(\delta, \sigma, x, y, z) \, \lambda_0(\delta, \sigma, x, y, z) \, \eta(\delta, \sigma, x, y, z) \, g(x, y, z, \delta, \sigma)$. Inverting (x, y, z) to (μ, R, η), this term becomes $\delta \mu \lambda_0(\delta, \sigma, \mu, R, \eta) \, \eta g(\delta, \sigma, \mu, R, \eta) \, J \mathrm{d}\mu \mathrm{d}R \mathrm{d}\eta$ where J is the Jacobian of the transform. Thus, for δ and σ given, $\delta \lambda 0(\mu, R, \eta, \delta, \sigma) h(\mu, R, \eta)$ is identified and so the distribution of (μ, R, η). Besides, using that p -the integral of this term- does not depend on δ and that $\delta \lambda 0$ -the differential rate of offer between the treated and the non treated- is increasing with δ by construction, we see that for a given σ δ is also identified.

	Freq.	Percent
Gender		
Female	1,162	56.52
Male	894	43.48
# Gender		
Child=0	932	45.33
Child=1	501	24.37
Child=2	353	17.17
Child=3+	270	13.13
Marital status		
Single	605	29.43
Divorced	313	15.22
Married	1,138	55.35
Background		
French	1,734	84.34
Western Europe	34	1.65
Rest of Europe	32	1.56
Northern African	207	10.07
Rest of Africa	36	1.75
Other background	13	0.63
Job termination		
Newcomers	209	10.17
End of contract	628	30.54
Resignal	194	9.44
Fired	456	22.18
Other	569	27.68
Education		
Other	398	19.36
BEPC	211	10.26
BEP	467	22.71
BAC equivalent	201	9.78
BAC equivalent	251	12.21
Bachelor equivalent	115	5.59
Bachelor equivalent	183	8.90
Bachelor+	230	11.19
Age		
25	250	12.16
25-30	367	17.85
30-40	674	32.78
40-50	530	25.78
50-55	235	11.43
# obs.	2056	

Table 1: Descriptive statistics for cells > 50

B Tables

	η	μ	λ_{00}	λ_0	λ_1	Δ_1	$\delta*$	NT	TE
Mean	2.437	0.225	1.659	1.657	1.694	0.209	0.156	-0.002	0.037

Table 2: Parameters means

	η	μ	λ_{00}	λ_0	λ_1	Δ_1	$\delta*$	NT	TE
C1	0.003	0.017	0.108	0.107	0.136	0.001	0.002	-0.172	0
C2	0.005	0.032	0.159	0.158	0.184	0.001	0.003	-0.093	0
C5	0.01	0.061	0.25	0.243	0.277	0.001	0.003	-0.028	0
C10	0.024	0.087	0.34	0.337	0.377	0.001	0.003	-0.011	0.001
C25	0.098	0.137	0.629	0.621	0.670	0.014	0.006	-0.002	0.002
C50	1.618	0.190	1.803	1.788	1.842	0.061	0.065	0.000	0.016
C75	2.909	0.257	2.586	2.575	2.635	0.370	0.263	0.000	0.058
C90	3.161	0.347	3.063	3.032	3.115	0.744	0.675	0.000	0.139
C95	3.388	0.428	3.432	3.387	3.475	0.882	1.295	0.000	0.225
C98	3.771	0.570	3.993	3.911	4.028	1.016	2.907	0.000	0.394
C99	4.091	0.721	4.476	4.238	4.438	1.113	5.598	0.000	0.576

Table 3: Parameters centiles

	η	μ	λ_{00}	λ_0	λ_1	Δ_1	$\delta*$	NT	TE
Female	-0.285	0.024	-0.128	-0.030	-0.018	0.032	0.057	-0.001	0.016
(ref=Male)	0.033	0.004	0.034	0.048	0.048	0.013	0.010	0.000	0.002
Vocational	-0.618	0.025	0.101	0.303	0.253	-0.077	-0.359	0.013	-0.041
(ref=No diplôme)	0.067	0.008	0.073	0.102	0.102	0.028	0.022	0.001	0.004
Some High School	-0.280	-0.009	0.215	0.368	0.340	-0.051	-0.245	0.011	-0.029
	0.088	0.009	0.096	0.134	0.135	0.037	0.029	0.001	0.005
A-Level	-0.139	0.022	0.316	0.497	0.439	-0.142	-0.399	0.014	-0.057
	0.078	0.009	0.082	0.114	0.115	0.032	0.024	0.001	0.004
Some College	0.302	0.062	0.361	0.412	0.391	-0.026	-0.244	0.010	-0.033
	0.094	0.009	0.111	0.155	0.156	0.043	0.033	0.001	0.006
College	-0.121	0.114	0.551	0.738	0.687	-0.108	-0.403	0.014	-0.055
	0.081	0.009	0.089	0.124	0.125	0.035	0.027	0.001	0.005
Master+	-0.594	-0.005	0.123	0.205	0.154	-0.068	-0.387	0.013	-0.050
	0.075	0.009	0.086	0.120	0.121	0.034	0.026	0.001	0.005
Other	-0.664	0.031	0.314	0.490	0.445	-0.095	-0.346	0.013	-0.043
	0.080	0.008	0.083	0.116	0.117	0.032	0.025	0.001	0.004
25-30	-0.546	-0.002	-0.335	-0.385	-0.395	-0.033	-0.014	0.001	-0.003
(ref=<25)	0.048	0.006	0.051	0.071	0.071	0.020	0.015	0.001	0.003
30-40	-0.203	0.023	-0.432	-0.361	-0.368	-0.028	-0.017	0.001	0.003
	0.047	0.005	0.046	0.064	0.064	0.018	0.014	0.001	0.002
40-50	0.032	0.037	-0.477	-0.320	-0.316	-0.002	0.023	0.001	0.016
	0.056	0.006	0.053	0.074	0.074	0.020	0.016	0.001	0.003
50-55	0.328	0.082	-0.581	-0.534	-0.539	-0.065	0.011	0.000	0.008
	0.075	0.007	0.080	0.112	0.112	0.031	0.024	0.001	0.004
Intercept	2.371	0.122	1.635	1.484	1.547	0.256	0.392	-0.013	0.057
	0.075	0.009	0.085	0.118	0.119	0.033	0.025	0.001	0.005
Regional dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 4: Parameters analysis (ALS). TE: Treatment effect. NT: Effect on the Non treated.