GP Recruitment and retention in the Nordic countries

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Abstract: Demographic changes and decentralization of health care provision have led to a higher demand for General Practitioners' (GP) services. As a result, many countries, including the Nordics, report that recruiting and retaining GPs is increasingly difficult. Coupled with younger GPs increasingly valuing work/life balance, countries are ever more concerned about ensuring a sustainable GP supply going forward. In the Nordics, several policies have been implemented to this effect. The purpose of this article is to develop a theoretical framework for informing such policy choices. Our focus is on remuneration schemes, GPs' working conditions and practice quality as levers to incentivize effort and to attract GPs. We show that policies that have a positive effect on recruiting and retaining GPs can have a negative effect on the effort GPs exert. Since reduced effort might have a negative effect on the services patients receive, the total effects of the policies are uncertain. We further show that the dominating effect is sensitive to the extent that GPs are altruistic and care for patients' benefit of treatment, providing important insights for policy makers who want to increase GP supply.

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1 Introduction

Demographic changes and decentralization of health care provision have led to a higher demand for General Practitioners (GP) services in many countries, including the Nordics. At the same time, with larger groups of older GPs about to reach retirement, and younger GPs having preferences for more leisure, a potential result is reduced supply (Sivey et al., 2012). This is partly driven by an increasing share of female physicians, who generally want to work less. The increased demand for their services, however, has increased working hours, exacerbating characteristics of the job they find undesirable (Dale et al., 2015). As a result, many GPs are considering leaving practice pre-retirement (Kuusio et al., 2013; Eneroth et al., 2017).

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Many countries report that recruiting and retaining GPs is increasingly difficult[2] and reforms and policies have been implemented to tackle the challenges. Some of these have been related to how GPs are remunerated; some have focused on the well-being of the GPs or their working conditions and some have been investments in public goods that improve GPs service delivery. An overview with examples of reforms is provided in the Appendix.

We investigate the effects of these policies in a theoretical model for provision of GP health services depicted by two choices; i) whether to work as a GP and ii) how much effort to exert into patient care. We then show how these two trade-offs are influenced by policy-instruments related to remuneration, working conditions and practice quality[3]. That is, we focus on policies relevant for those who already have a relevant education and can work as a GP. We further show how these trade-offs are sensitive to a person's level of altruism, i.e., the caring of patients' benefit of treatment (when working as a GP).

One important insight from our model is that policies that have a positive effect on recruiting GPs can have a negative effect on the effort GPs exert, making the total effects of the policies uncertain. We further show that the dominating effect is sensitive to preferences and characteristics of the GPs, providing important insights for policy makers who want to increase GP supply.

1.1 The Brekke and Nyborg-model

Our model builds on Brekke and Nyborg (2010) (hereinafter "BN"). BN presents a model of work motivation where individuals have heterogeneous preferences for a self-image of being important to others. Specifically, they investigate how an individual's self-image interacts with the way the individual is paid to determine her choice of occupation and effort. If pay is determined by individual productivity, the individuals (called bakers) produce a private good and exert an effort level that correspond to the standard homo economicus model. That is, the preference for being important to others has no behavioral consequence for those who on the margin are compensated by their marginal social value. However, receiving a fixed wage (financed through taxes) individuals (called nurses) exert higher effort in the production of health care than the standard economic model predicts. The mechanism behind is that nurses are motivated by doing good for others, at increasing rates of higher self-image.

Turning to the choice of occupation, BN predicts that individuals with intermediate preferences for being important will seek employment as bakers. Individuals with the highest and lowest work motivation become nurses, whose effort cannot be verified and whose remuneration is a fixed wage. I.e., the nursing sector also attracts poorly motivated workers that shirk. The intuition is that a job switch to the nursing sector might raise or lower net social welfare. It depends on the balance between the positive welfare effect related to increased production in the nursing sector, and the negative welfare effect of increased taxes to finance the new nurse's wage. A baker with low self-image does not care much if her job switch lowers others' welfare, while bakers with intermediate self-image feel bad about moving to the nursing sector and by exerting relatively low effort. These workers choose to continue as bakers. Finally, those with strong social preferences would exert a high effort level after the job switch so that the total welfare effect is positive. Those people would change their occupation and become nurses.

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[2] See e.g., Denmark, (Danish Ministry of Health, 2017); Finland, (Keskimäki et al., 2019); Iceland, (Haraldsdóttir, 2010), Norway, (KS, 2019); Sweden, (Vårdanalys, 2018:5)

[3] We have chosen these instruments on the basis of the identified reforms in Table 1, as well as categories discussed in the literature (i.e., Lafortune, 2016)

An interesting policy implication is that wages in the nursing sector should be kept low to keep shirkers out. However, this will lead to a too small nursing sector (relative to first best). BN proposes another policy to attract highly motivated nurses: Investing in capital equipment (a public good) that increases nurses' efficiency in helping others. Examples of capital equipment are better diagnostic equipment in hospitals and library resources in universities and schools.

1.2 Adapting the BN-model

We argue that alterations should be made to make the BN-model more relevant for GPs. Below, we outline our modelling choices, highlight differences compared to BN, explain why we believe our model is a better fit to the GP sector, and show how our results differ.

One alteration is related to the remuneration system. While nurses, and many other health care workers, receive a fixed wage, GPs are typically remunerated with a combination of fee for service (FFS), capitation, and fixed salary. GPs are thus able to affect their own income by exerting effort, either directly if paid by FFS or indirectly if paid by capitation.

The motivation for a patient to seek treatment from a GP is different from that of a nurse. Specifically, where the patient typically cannot choose her nurse, this is to a large extent the case for a GP. Aboulghate et al. (2012) has shown that most patients prefer to see a particular GP, as motivated by continuity of care and overall satisfaction of the service that is provided. The act of seeking care is driven by the expected treatment from that individual GP, suggesting that increased effort can increase the likelihood of a patient seeking treatment.

An implication of patients' active choice of GPs is that GPs also increase their likelihood of providing good care by improvements in the quality of their practice, as this would be observable for potential patients. Nurses however, are mostly employed at hospitals, elderly care, or community health centers – places where care is sought on the basis of that institution serving a catchment area, or that a third-party gatekeeper (usually a GP) has referred one there. We argue that there is an important distinction to be made with regards to practice quality (which is observable to the patient) and working conditions (which is not).

Lastly, we believe that the inclusion of an altruism parameter better reflects the choices GPs make than self-image. In this sense we are closer to Arrow (1963) who coined the importance of the physician's other-regarding motive to care for a patient when describing physician behavior. We argue that the notion of self-image is not unique to the healthcare profession, but rather a subjective measure of how a person values their contribution to society. Akerlof and Kranton (2005) argues that "identity" – as their use for the term self-image – reflects the level which a person identifies with attributes of his/her work, irrespective of societal impact. Similarly, Tirole (2002) discusses self-image in the context of self-esteem, suggesting that the notion relates to one owns value-judgement. Altruism is widely understood as feeling good about doing good for *others*, and in the context of healthcare, the weight a physician attaches to a patient's health benefit. Altruism is a more precise representation of a GPs motivation, both since medicine is a profession of "doing good for others", but also since the definition provides a direct linkage between the act of providing care to a patient and feeling good about it. We believe that having a dedicated and continuous responsibility for patients on your list, suggests that a GP cares more about the wellbeing of her patients rather than her net contribution to social welfare. This is also supported by Allan et al. (2007) showing that GPs have little awareness of the economic costs of the care they provide, suggesting that any marginal decreases in others utility (e.g., from increased taxes), should not be taken into account. Rachlin and Jones (2008) have shown that altruism is a decreasing function of social distance – i.e., that you care more about people that are close than distant to you.

This suggest that a GP has a higher degree of altruism for the patient in her office, vs. the one on her list. We have operationalized this by assuming that the GP only cares for the patients she sees. This modelling choice is in line with recent papers that consider GP altruism in the cases where the GP faces a list system, see e.g., (Godager et al., 2015; Brekke et al., 2017; 2020).

Our modelling choices have implications for how our results relate to BN. While BN finds that the nursing sector consists of individuals with the lowest and highest work motivation, we find that only individuals with a certain level of work motivation will become GPs. We believe that this property of our model is capturing an important element of the GP sector, as GPs are typically not being thought of as having low motivation for their patients. Second, our model raises questions about the proposition of overinvesting in capital equipment (practice quality). We find that this policy might be counterproductive, i.e., raising the quality of the practice may actually make public sector work less attractive. This result holds even in the case where better practice quality raises the (marginal) effect of effort on attracting patients. Finally, by using the most common remunerations that GPs receive, we identify how a change in the FFS component has heterogeneous effects on attracting GPs due to the indeterminate effect a change in the FFS has on the GPs net income. This differs from BN where all nurses are "penalized" equally from a tax increase because their wage is fixed.

2 A model for GPs and consultants

We consider an economy with $i = 1,2, \dots, I$ individuals. There are two types of jobs in the economy. Either individual i works as a consultant producing a consumption good b or she is a GP funded by the public and producing health. We assume that there are no transaction costs of switching professions, implying that all individuals are qualified to work as GPs. Hence, a consultant is a person who is qualified to work as a GP but has chosen another career and is paid according to the value of her services in her new profession. Examples of such careers include working as health bureaucrats, doctors in private practice, academics, or hospital doctors. The main difference is that consultants are paid according to their marginal productivities[4]; GPs are not. They are paid by the government. All governmental expenses are financed through taxation[5].

Let $d = 0,1,2, \dots, I$ be the number of GPs. There is a list system in the public sector. Everyone is signed up with a doctor, and each doctor has I/d patients on her list[6]. Every individual i has preferences of the following type

$$U_i = u(b_i) - c(e_i, \beta) + \alpha_i \pi(e_i, \theta) \frac{I}{d} \tag{1}$$

where $u(.)$ is a strictly concave and increasing function of i's consumption of good $b_i \geq 0$, $e_i \geq 0$ is effort, and $\beta \geq 0$ is a parameter measuring a GP's working conditions, that are unobservable to the patient. An increase in the parameter reflects more unfavorable working conditions. Examples include the level of administrative and other non-patient related tasks and workplace flexibility. A GPs cost of effort is $c(e_i, \beta)$, where $c(0, \beta) = 0$. $c_e > 0$, $c_{ee} > 0$, $c_\beta > 0$, $c_{\beta\beta} > 0$ denote the first-order and the second-order derivatives respectively. We assume that $c_{\beta e} > 0$, meaning that the cost of effort increases when working conditions deteriorate. This parameter is analogous to working conditions in BN, but is included as part of the cost function to reflect that any improvements in

[4] We discuss this assumption in the discussion section.
[5] To keep the model simple we will assume that consultants are paid by private funds. I.e., the government does not raise taxes to finance their salary.
[6] We discuss this assumption in the discussion section.

working conditions increases utility irrespective of the GP treating any patients. Since consultants are paid according to their marginal product, working conditions are normalized to 0, giving us the cost function $c(e, 0)$.

We assume that (some) individuals are altruistic and care about patients' benefit of treatment when working as a GP. Specifically let $\alpha_i \in [0,1)$ measure the individuals' altruism. An individual with α=0 does not have altruistic preferences, but all individuals with $\alpha > 0$ care about their patients'. We further assume that the GPs can treat the patients that visit them, i.e., improve their health. With this assumption it follows that a GP's altruistic component is increasing in the number of patients who visit her. Furthermore, we assume that a GP can affect the likelihood of patients visiting them by her choice of effort.

Let $\pi(e_i, \theta) \in [0, 1)$ measure the likelihood of patients visiting a GP with effort e and quality of the practice θ. The quality of the practice is related to investments by the government and is a public good that improves treatment and/or patient experience of a visit. Let $\pi_\theta > 0$, $\pi_e > 0$, $\pi_{\theta e} \geq 0$, $\pi_{\theta\theta} \leq 0$ and $\pi_{ee} \leq 0$. Hence, higher efforts and better practice quality attract more patients, but (possible) at decreasing rates. If $\pi_{\theta e} > 0$ then effort and practice quality are complements; better practice quality increases the marginal effect of effort on attracting patients. We also assume that effort is non-verifiable[7], but both effort and the quality of a practice are observable (for the patients).

If an individual works as a consultant, she produces a private good b, in a perfectly competitive market. Working as a GP, she is paid by the public through a combination of a fixed salary $\varphi \geq 0$, is a fixed capitation $\delta \geq 0$ per individual on the GPs list and a FFS component $\gamma \geq 0$). The budget constraints are given by

$$b_i = w - t, \quad \text{where} \quad \begin{matrix} w = \varphi + \frac{I}{d}(\delta + \pi(e_i, \theta)\gamma) & \text{for GPs}^8 \\ w = f(e) & \text{consultants} \end{matrix}$$

where $f(e_i)$ is the market value of the consultant's production (b is the numeraire), $f_e > 0$, $f_{ee} < 0$ and $f(0) = 0$. Remuneration and practice quality are financed through a lump-sum tax t. All individuals pay the same tax, i.e., $t = (\overline{w}d + K(\theta))/I$, where $\overline{w} = \varphi + (I/d)\,(\delta + \bar{\pi}(e)\gamma)$ is the average remuneration of the GPs, $\overline{\pi}(e) = \sum_i \pi(e_i)/d$ is the average share of patients visiting a doctor and $K(\theta)$, with $K'(\theta) > 0$, is the cost of providing GPs with a practice quality. The lump-sum tax is thus given by $t = (\varphi d + K(\theta))/I + \delta + \bar{\pi}(e)\gamma$. It then follows that a GP's consumption of the private good, b_i, is given by her disposal income:

$$b_i = w_i - t = \frac{\varphi(I-d) - K(\theta)}{I} + \frac{(I-d)\delta}{d} + \frac{\gamma\left((I-1)(\pi(e_i)) - \sum_{-i}\pi(e_{-i})\right)}{d} \tag{2}$$

An individual makes two choices: i) For a given type of employment, individual i maximizes her utility with respect to effort $e_i \geq 0$ and ii) chooses whether she produces the private good b or works as a GP. The choice is based on the maximal utility obtained in the two jobs. For both decisions the individual makes, we assume she takes everybody else's choices as given. Hence, our equilibrium concept is a Nash equilibrium, see e.g., Gibbons (1992).

[7] If effort was verifiable it could be contracted upon and remunerated according to the GP's marginal product.
[8] We simplify notation and write $\pi(e_i)$ instead of $\pi(e_i, \theta)$.

2.1 The effort decision

We assume that the optimal effort of a consultant producing the private good is sufficiently high to cover the lump-sum tax, that is $f(e_i^{P*}) > (\varphi d + K(\theta))/I + \delta + \bar{\pi}(e)\gamma$; where e_i^{P*} denotes i's optimal effort choice. Since she does not treat any patients, her optimal effort choice is the solution to the following maximization problem: $U_i^P = \max\{u(f(e_i) - t) - c(e_i)\}$. The first order condition is:[9] $u_b f_e - c_e = 0$.

We now consider a GP's effort decision. From (1) and (2), we see that a GP's maximal utility is given by

$$U_i^D = \max_{e_i}\left\{u\left(\frac{\varphi(I-d)-K(\theta)}{I}+\frac{(I-d)\delta}{d}+\frac{\gamma\left((I-1)\left(\pi(e_i)\right)-\sum_{-i}\pi(e_{-i})\right)}{d}\right)-c(e_i,\beta)+\alpha_i\frac{I}{d}\pi(e_i,\theta)\right\} \tag{3}$$

Differentiation with respect to e_i, yields the following first-order condition:

$$u_b(b_i)\frac{\gamma(I-1)}{d}\pi_e+\frac{\alpha_i I}{d}\pi_e-c_e=0 \tag{4}$$

The first part captures the monetary gain of exerting effort. It depends on the marginal utility of the private good, and the increased FFS, net of the increased tax payment. The second part is capturing the altruistic benefit of exerting effort when working as a GP. The third part is the cost of effort. The second-order condition for a maximum is given by

$$u_{bb}(b_i)\left(\frac{\gamma(I-1)}{d}\pi_e\right)^2+u_b(b_i)\frac{\gamma(I-1)}{d}\pi_{ee}+\frac{\alpha_i I}{d}\pi_{ee}-c_{ee}<0, \tag{5}$$

which is satisfied since $u_{bb} < 0, \pi_{ee} \leq 0$ and $c_{ee} > 0$.

Assuming an internal solution, i.e., $e_i^{D*} > 0$, the first-order condition defines a GP's optimal effort e_i^{D*} as a function of the parameters, i.e., $e_i^{D*} = e_i^{D*}(\gamma, \delta, \varphi, \theta, \beta, \alpha_i)$. By differentiating the first-order condition with respect to e_i^{D*}, α_i, θ and β we get the following comparative static results, (the denominator is negative due to the second-order condition):

$$\frac{de_i^{D*}}{d\alpha_i}=\frac{-\frac{I}{d}\pi_e}{u_{bb}(b_i)\left(\frac{\gamma(I-1)}{d}\pi_e\right)^2+u_b(b_i)\frac{\gamma(I-1)}{d}\pi_{ee}+\frac{\alpha_i I}{d}\pi_{ee}-c_{ee}}>0 \tag{6}$$

$$\frac{de_i^{D*}}{d\theta}=-\frac{u_{bb}(b_i)\left(\frac{\gamma(I-1)}{d}\pi_e\right)\left(\frac{\gamma(I-1)}{d}\pi_\theta-\frac{K'(\theta)}{I}\right)+\left(u_b(b_i)\frac{\gamma(I-1)}{d}+\frac{\alpha_i I}{d}\right)\pi_{e\theta}}{u_{bb}(b_i)\left(\frac{\gamma(I-1)}{d}\pi_e\right)^2+u_b(b_i)\frac{\gamma(I-1)}{d}\pi_{ee}+\frac{\alpha_i I}{d}\pi_{ee}-c_{ee}}\gtreqless 0 \tag{7}$$

[9] The second-order condition for a maximum is satisfied since $u_{bb} < 0, f_{ee} < 0$ *and* $c_{ee} > 0$.

$$\frac{de_i^{D*}}{d\beta} = \frac{c_{e\beta}}{u_{bb}(b_i)\left(\frac{\gamma(I-1)}{d}\pi_e\right)^2 + u_b(b_i)\frac{\gamma(I-1)}{d}\pi_{ee} + \frac{\alpha_i I}{d}\pi_{ee} - c_{ee}} < 0 \tag{8}$$

First, from (6), more altruistic GPs exert higher effort because of the non-monetary reward of treating patients. Second, from (7), the effect of better practice quality on a GP's optimal effort is indeterminate. It depends on the curvature of the utility function ($u_{bb} < 0$) and on the relationship between effort and practice quality ($\pi_{e\theta}$). Suppose $\pi_{e\theta} = 0$; i.e., a change in the practice quality does not affect how a change in effort affect patients' choice of seeing their GP or not, and that the marginal cost of changing the practice quality is small, i.e., $K'(\theta)$ small, then the optimal effort is *decreasing* in practice quality. The mechanism behind this result is that when the practice quality is improved, more patients would like to visit their GP for a given level of the GP's effort. Since effort is costly, the GP respond by reducing her effort (the substitution effect). At the same time, the extra tax burden on the GP is small so that the negative income effect of higher taxes does not dominate the substitution effect. On the other hand, if the marginal utility of the private good is approximately constant ($u_{bb} \approx 0$), the complementarity between effort and practice quality ensures that optimal effort is increasing with better practice quality. Third, from (8), the effect of better working conditions on effort is positive since better working conditions (a reduction in β) reduces the cost of effort.

Regarding the effects of changes in the remuneration parameters φ, γ, and δ we obtain:

$$\frac{de_i^{D*}}{d\varphi} = \frac{-u_{bb}(b_i)\frac{(I-1)(I-d)}{dI}\gamma\pi_e}{u_{bb}(b_i)\left(\frac{\gamma(I-1)}{d}\pi_e\right)^2 + u_b(b_i)\frac{\gamma(I-1)}{d}\pi_{ee} + \frac{\alpha_i I}{d}\pi_{ee} - c_{ee}} \leq 0 \tag{9}$$

$$\frac{de_i^{D*}}{d\delta} = \frac{-u_{bb}(b_i)\frac{(I-1)}{d}\frac{(I-d)}{d}\gamma\pi_e}{u_{bb}(b_i)\left(\frac{\gamma(I-1)}{d}\pi_e\right)^2 + u_b(b_i)\frac{\gamma(I-1)}{d}\pi_{ee} + \frac{\alpha_i I}{d}\pi_{ee} - c_{ee}} \leq 0 \tag{10}$$

$$\frac{de_i^{D*}}{d\gamma} = -\frac{\frac{(I-1)}{d}\pi_e\left[u_{bb}(b_i)\gamma\left(\frac{I}{d}\pi(e_i^{*D}) - \bar{\pi}(e)\right) + u_b(b_i)\right]}{u_{bb}(b_i)\left(\frac{\gamma(I-1)}{d}\pi_e\right)^2 + u_b(b_i)\frac{\gamma(I-1)}{d}\pi_{ee} + \frac{\alpha_i I}{d}\pi_{ee} - c_{ee}} \gtreqless 0 \tag{11}$$

From (9) and (10) we see that a higher salary or an increased capitation reduce a GP's optimal effort level. This is because the valuation of the extra income earned through the FFS component is reduced[10]. From (11), we see that the effect of increased FFS is indeterminate. To understand why, notice that a higher FFS increases income which is a positive effect. However, since the marginal utility of the private good is decreasing ($u_{bb}(b_i) < 0$) and the cost of effort is strictly increasing in effort, a GP might respond by reducing her effort (substitution effect). This is the case for example when the effect on the marginal utility is strong ($u_{bb}(b_i)$ "large"). On the other hand, if the effect on the marginal utility is weak ($u_{bb}(b_i)$ "small"), the GP will respond to increases in FFS by raising her effort. The effect also depends on how much effort the GP exerts relative to the

[10] Because overall income has increased and $u_{bb}(b_i) < 0$.

average effort level of GPs, i.e., on $\pi(e_i^{*D}) - \bar{\pi}(e)$. GPs that exert a high (low) level of effort relatively to others are ceteris paribus more likely to reduce (increase) their effort level. An implication is that one should expect heterogeneous responses in effort following a change in the FFS. Finally, the size of the FFS affects the effort response. Specifically, the higher the FFS the more likely it is that the effort response is negative if the GP's effort was more than average to start with.

2.2 The employment decision

When considering which job to take an individual is comparing the maximal utility she can get. Let $\Delta U(\alpha_i) = U_i^D - U_i^P$ denote the value function of the individual's maximization problem, i.e., the difference in the maximal utilities for individual *i* being a GP or a consultant. From this, we get:

$$\Delta U(\alpha_i) = u\left(\varphi + \frac{I}{d}(\delta + \pi(e_i^{*D})\gamma) - t\right) - u(f(e_i^{P*}) - t) - c(e_i^{D*}) - c(e_i^{P*}) + \alpha_i \frac{I}{d}\pi(e_i^{D*}) \tag{12}$$

From the envelope theorem it follows that

$$\frac{\partial \Delta U(\alpha_i)}{\partial \alpha_i} = \frac{I}{d}\pi(e_i^{D*}) \geq 0, \text{ with strict inequality for } e_i^{D*} > 0. \tag{13}$$

That is, the difference in the maximal utilities is weakly increasing in α_i. Notice that the difference in maximal utilities depends on the number of GPs. Specifically, when the number of GPs increases the differences in the maximal utilities decreases, but the expression is always non-negative.[11] Taken together, these observations imply that if an individual with altruism $\tilde{\alpha}$ choose to become a doctor, then all individuals *i* with $\alpha_i \in [\tilde{\alpha}, 1)$ will also choose to become GPs.
The value function $\Delta U(\alpha_i)$ depends on the tax level, which again depends on the number of GPs. The (Nash) equilibrium in the economy is thus a tax level and a corresponding altruism $\in [0,1)$ such that all individuals with altruism $\alpha_i \in [0, \alpha^*)$ become private consultants and all individuals with $\alpha_i \in (\alpha^*, 1)$ are GPs.

We now derive conditions to ensure that both types of employment are active in equilibrium, and that at least the most altruistic GP exert a positive effort level.[12]

Consider first the case where no individuals work as GPs. In this scenario, each consultant's production just covers her own consumption. I.e., $b_i = f(e_i^{P*})$.

Suppose a random consultant is considering becoming a GP, and that she chooses an effort level such that the cost of effort is the same irrespectively of whether she works as a GP or not, i.e., $c(e, \beta) = c(e_i^{P*}, 0)$. Since she is the only GP, the tax level is $\varphi/I + \delta + \pi(e_i^{P*})\gamma$, and she receives wages $w = I(\varphi + \delta + \pi(e_i^{*P})\gamma)$. Hence, a sufficient condition for the consultant to switch employment is $w - t = (I-1)(\varphi/I + \delta + \pi(e_i^{P*})\gamma) > f(e_i^{P*})$. That is, her net salary is higher than the value of her production.

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[11] The intuition behind this result is that while consultants' utility decreases due to an increased tax burden, a GP's disposal income decreases both because additional GPs raise the tax burden, and because the GP's remuneration decreases (if the GP is not paid only a fixed salary). If the GP is remunerated with a fixed salary, the result goes through since more GPs decreases a GP's altruistic utility.

[12] Since the cost of practice quality is independent of the number of GPs, we ignore this cost when deriving the conditions.

Only in the non-generic case will it be optimal for the GP to exert an effort level that results in the same effort cost as when she produces the consumption good *b*. In the general case, she chooses either zero effort, or the effort level that solves the GP's first-order condition (given in (4)). The next equation gives the condition for the GP to exert zero effort.

$$u((I-1)(\varphi+\delta+\pi(0)\gamma)-u((I-1)(\varphi+\delta+\pi(e_i^{*D})\gamma)-c(0)+c(e_i^{*D})+\alpha_i I(\pi(0)-\pi(e_i^{*D})>0 \qquad (14)$$

Suppose there is no FFS ($\gamma = 0$). Then the two first parts cancel each other out, and we are left with $c(e_i^{*D}) + \alpha_i I(\pi(0) - \pi(e_i^{*D}) > 0$. Obviously, this is positive for small α. Hence, individuals with little concerns for patients' benefit, who considers becoming a GP in a system with no FFS, will shirk (no effort).

We do however believe that (at least) the most altruistic GP finds it optimal to provide a positive effort level independent of the remuneration system she faces. That is, she will choose a positive effort level also when the remuneration system does not contain an FFS. We thus impose the condition that the benefits related to altruism outweighs the cost of effort for the most altruistic GP, i.e., the GP with $\alpha \cong 1$. $c(e_i^{*D}) \leq \left(\pi(e_i^{*D}) - \pi(0)\right) I$.

Consider now the case where everybody works as GPs. In this case, *I=d*; and a GP's net income is given by $w_i - t_i = \gamma\big(\pi(e_i) - \bar{\pi}(e)\big)$. Obviously, all GPs that see less patients than the average, will receive a negative disposal income, i.e., $\pi(e_i) - \bar{\pi}(e) < 0$. Since a GP's effort is (weakly) increasing in α, the GP with the lowest altruism exerts the least effort. Hence, this cannot be an equilibrium for this GP with no altruism since we have assumed that a private consultant's optimal effort is sufficiently high to cover the lump-sum tax, i.e., $f(e_i^{*P}) > \varphi + \delta + \gamma\bar{\pi}(e)$.

The following proposition sums up our results.

Proposition 1.

Suppose $(I-1)\left(\varphi/I + \delta + \gamma\pi(e_i^{*P})\right) > f(e_i^{*P}) > \varphi + \delta + \gamma\bar{\pi}(e)$, *and* $c(e_i^{*D}) \leq \left(\pi(e_i^{*D}) - \pi(0)\right) I$. *Then*

1. *Both consultants and GPs are active in the corresponding Nash equilibrium.*
2. *Since* $\partial\Delta U(\alpha_i)/\partial\alpha_i = (I/d)\,\pi(e_i^{*D}) \geq 0$, *and the difference in maximal utilities is decreasing in the number of GPs, the Nash equilibrium is unique, and there exist an* $\hat{\alpha} \in [0,1)$ *such that* $\Delta U(\alpha_i) < 0\ (>0)$ *for* $\alpha_i \in [0, \hat{\alpha})\ (\hat{\alpha}, 1)$.
3. *The most altruistic GP exerts a positive effort level.*

We now investigate how the proposed governmental policies affect the attractiveness of being a GP. The criterion of becoming a GP is that the value function of individual's maximization problem, i.e., the difference in the maximal utilities (12) is positive. Here, $e_i^{D*} = e_i^{D*}(\gamma, \delta, \varphi, \theta, \beta, \alpha_i)$ is the utility maximizing effort for a GP with altruism α_i implicitly defined for a given set of policy parameters by the first-order condition (4). Differentiation of $\Delta U(\alpha_i)$ (equation (12)) with respect to the policy parameters, where $\partial e_i^{*D}/\partial\vartheta$, $\vartheta = (\gamma, \delta, \varphi, \theta, \beta)$ is implicitly given by (7)-(11), gives the following proposition, assuming an interior solution.

Proposition 2.

1. $\partial\Delta U/\partial\beta = -C_\beta(e_i^{*D},\beta) < 0$ *and* $\partial\Delta U/\partial\theta = u_b(\gamma((I-1)/d)\,\pi_\theta(e_i^{*D},\theta) - K'(\theta)/I) + (\alpha_i I/d)\,\pi_\theta(e_i^{*D},\theta)$ is indeterminate. *Becoming a GP is strictly more attractive when the working conditions* (β) *improves, but the effect of the quality of the practice* (θ) *is indeterminate.*
2. $\partial\Delta U/\partial\varphi = u_b(\cdot)((I-d)/I) > 0, \partial\Delta U/\partial\delta = u_b(\cdot)((I-1)/I) > 0$ *and* $\partial\Delta U/\partial\gamma = u_b((I/d)\,\pi(e_i) - \pi(\bar{e}))$ is indeterminate. *An increase in the GP's salary or the capitation raises the attractiveness of becoming a GP, while an increase in the FFS has an indeterminate effect.*

Proof:
We only provide the proof of the last statement of ii). The other statements can be proved similarly. By differentiating $\Delta U(\alpha_i)$ wrt. γ we obtain:

$$\frac{\partial\Delta U(\alpha_i)}{\partial\gamma} = u_b\left(\frac{I}{d}\pi(e_i) - \bar{\pi}(e)\right) + \left(u_b(b_i)\frac{\gamma(I-1)}{d}\pi_e + \frac{\alpha_i I}{d}\pi_e - c_e\right)\frac{\partial e_i^{*D}}{\partial\gamma}$$

Notice that the last parenthesis is zero as it corresponds to the first-order condition. Hence, $\partial\Delta U(\alpha_i)/\partial\gamma = u_b((I/d)\,\pi(e_i) - \bar{\pi}(e)) > 0\ (< 0)$ depending on the sign of the first parenthesis.

From Proposition 2 it follows that most of the policy parameters have the expected effect, i.e., a more generous remuneration and improvements in the working conditions make it more attractive to work as a GP. Moreover, the positive relationship between becoming a GP and altruism ensures that increases in remuneration attracts the most motivated individuals to enter the profession first. However, when it comes to the FFS, the effect can still be indeterminate as it depends on how high effort a GP exerts relative to the average effort level of GPs. If a GP exerts a low level of effort relative to the other GPs, few patients visit her. If this were the case, an increase in the FFS might result in a *decrease* in the GP's disposal income as the (negative) effect of the tax increase outweighs the increase in gross income. Because FFS is contingent on effort in our model, this secures that new recruitments provide high levels of effort. Interestingly, this is the opposite of what the model predicted for choice of effort; individuals who continue working as GPs are induced to work harder – if not, they lose money.

Similarly, the effect of improved practice quality is indeterminate. It depends on changes in a GPs disposable income, their valuation of it, in addition to any altruistic gains of attracting more patients. Specifically, we see that when the GP's remuneration does not contain FFS elements, then only highly altruistic individuals may find it more attractive to become GPs when the practice quality is improved. The non-altruistic GPs will be worse off since their net income is reduced through higher taxes, resulting in exit from the profession.

3 Discussion

Many countries have challenges with sustaining an adequate level of GP service provision and have implemented several policies to that end. The predictions of our model show that while all policies discussed in this paper can have positive effects, ill-defined objectives can have unintended consequences for the sustainability of GP schemes.

Our findings suggest that only the most motivated individuals choose to become GPs; they are encouraged by the altruistic benefit from treating patients. This also induces them to provide

positive effort, which is reinforced if FFS is (part of) the remuneration scheme. Not surprisingly, we see that improved working conditions increases utility, and thereby recruitment. This means that reduction in administration (as seen in Norway), better coordination of services (as seen in Sweden) or removal of undesirable responsibilities through task shifting (as seen in Finland and Sweden) most likely will have positive effects on attracting new GPs. This would also generally be the case for policies that increase remuneration.

Depending on the preferences of the individual, remuneration schemes can have an effect beyond income. For example, the uncertain nature of activity-based remuneration schemes can be a negative attribute for some – especially younger GPs (Abelsen and Olsen, 2012). This suggests that income guarantees positively affect working conditions. On the other hand, a heavy focus on extrinsic rewards (like FFS) can have the opposite effect among some people, crowding out intrinsic motivation (Deci, 1971). However, there are also studies showing that activity-based contracts can be desirable from an equity perspective, in that people feel like being treated fairly (Clark and Oswald, 1996). These conflicting outcomes are reflected in the form of the ambiguous effect of FFS in our model. One explanation might be heterogeneous preferences depending on the stage of your career; Holte et al. (2015) shows that older GPs have a higher preference for FFS compared to younger and female GPs, suggesting that the income effect dominates.

An important reason for using FFS is that it induces effort for those who are not sufficiently motivated. While we do see this prediction in our model for GPs with below-than-average effort – which could be the target group of the policy maker, we also see that the same group are deterred from becoming GPs altogether. The intuition behind this finding is that if you find yourself in a job that you are not very motivated to do, you will either quit or need strong inducements to work hard. This may also be why the average age of GPs quitting their job has decreased (Norwegian Ministry of Health and Care Services, 2020); assuming that switching costs increases with age (Hyatt and Spletzer, 2016), an older GP will respond by working harder, while a younger GP will choose to quit the profession altogether.

Like with FFS, differing preferences for leisure makes the effect of practice quality on effort ambiguous. For low-income earners, we would expect that the income effect dominates, leading them to capitalize on its complementarity on effort. Interestingly, this income effect is only present when the remuneration scheme includes an FFS component where effort is rewarded, suggesting that such GPs would be early adopters of practice quality measures (i.e. technology) that attracts patient demand (Jha et al., 2008).

The above findings have important policy implications. First, attracting altruistically motivated GPs is often less costly than inducing effort amongst those who are not. As shown by Brekke and Nyborg (2010) an intrinsically motivated person needs less external inducement for a given level of effort. Second, one should try to identify those who appreciate existing working conditions before changing them. Third, for negligible tax increases of an investment in practice quality, we would see a positive effect on recruitment; either because it helps new entrants attract patients, or because it allows them to reduce their burden of work. Fourth, while both utility and effort are monotonically increasing with improved working conditions, changes to remuneration schemes have either ambiguous or opposing effects. Since this ambiguity often results from heterogeneous preferences, one could perceivably solve the problem of heterogeneity in preferences by offering different contracts to different GPs.

Our model has provided a theoretical framework for understanding the effects of policies on increasing supply of GP services, but there are some limitations. We have assumed that all individuals are qualified to work as doctors. Hence, reforms targeting medical education are not

explicitly included. While this is a limitation, this could be analyzed through working conditions by making students more positively predisposed to the attributes of the profession that are otherwise seen as inferior by others (i.e., rurality) (Aaraas et al., 2015). Moreover, the assumption of no transaction costs of entering general practice is a simplification given that some countries require a specialization. While this would require extra effort from the doctor, GPs would still be exposed to the same payment mechanisms. Additionally, the specialization requirement can be waived for locums who have not set up their own practice (Norwegian Directorate of Health, 2017).

Another criticism relates to that the attributes of alternative employment for the non-GPs may defy assumptions of our model with regards to remuneration and altruism. For remuneration, we would argue that the mixed payment system for GPs is unique compared to other professions and the associated effects hold independent of altruism. Moreover, a GP considering switching jobs will only do so if she believes the associated wage adequately reflects her expected marginal productivity in the new job, and that overtime work is paid according to expected marginal productivity. Equally, an employer will set the wage according to his/her expectation of the worker's productivity. This means that former GPs will be paid according to the value of their services in their new professions as e.g., health bureaucrats, doctors in private practice, academics, or hospital doctors. Similar arguments hold for candidates at the end of the medical university education in her choice say between becoming a hospital doctor (paid by a fixed wage) or becoming a GP.

An alternative employment may involve patient care and therefore involve an altruistic benefit, which is not explicitly included in our model. However, studies have shown that people who choose general practice have higher rates of altruism than for other specialties (Deci, 1971, Borges and Savickas, 2002; Mullola et al., 2018), lending support for differences in utility increasing in altruism. Moreover, a doctor may find it easier to capitalize or altruistic preferences as a GP because she can affect patient demand. Our altruistic parameter could thus be interpreted as the extra utility GPs get additional to alternative employment involving patient care, e.g. as a hospital doctor. Lastly, our model assumptions imply that GPs have an equal number of patients on their list. While this is a simplification, we believe that a non-GP wanting to enter general practice would expect a list equal to the average length. Moreover, the sustained GP deficit and prolonged working hours for the active workforce, suggests that new GPs would cater to unmet patient demand rather than compete for patients.

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4 References

Aaraas, I.J., Halvorsen, P.A., and Aasland, O.G. (2015). Supply of doctors to a rural region: Occupations of Tromsø medical graduates 1979–2012. *Medical Teacher*, 37 (12), 1078–1082.

Abelsen, B. and Olsen, J.A. (2012). Does an activity based remuneration system attract young doctors to general practice? *BMC Health Services Research*, 12 (1), 1–8.

Aboulghate, A., Abel, G., Elliott, M.N., Parker, R.A., Campbell, J., Lyratzopoulos, G., and Roland, M. (2012). Do English patients want continuity of care, and do they receive it? *British Journal of General Practice*, 62 (601), 567–575.

Akerlof, G.A. and Kranton, R.E. (2005). Identity and the economics of organizations. *Journal of Economic Perspectives*, 19 (1), 9–32.

Allan, G.M., Lexchin, J., and Wiebe, N. (2007). Physician awareness of drug cost: a systematic review. *PLOS Medicine*, 4 (9), e283.

Borges, N.J. and Savickas, M.L. (2002). Personality and medical specialty choice: A literature review and integration. *Journal of Career Assessment*, 10 (3), 362–380.

Brekke, K.A. and Nyborg, K. (2010). Selfish bakers, caring nurses? A model of work motivation. *Journal of Economic Behavior & Organization*, 75 (3), 377–394.

Brekke, K.R., Holmås, T.H., Monstad, K., and Straume, O.R. (2017). Do treatment decisions depend on physicians' financial incentives? *Journal of Public Economics*, 155, 74–92.

Brekke, K.R., Holmås, T.H., Monstad, K., and Straume, O.R. (2020). How does the type of remuneration affect physician behavior? *American Journal of Health Economics*, 6 (1), 104–138.

Clark, A.E. and Oswald, A.J. (1996). Satisfaction and comparison income. *Journal of Public Economics*, 61 (3), 359–381.

Danish Ministry of Health (2017). Lægedekning i hele Danmark.

Deci, E.L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, 18 (1), 105.

Eneroth, M., Gustafsson Sendén, M., Schenck Gustafsson, K., Wall, M., and Fridner, A. (2017). Threats or violence from patients was associated with turnover intention among foreign-born GPs–a comparison of four workplace factors associated with attitudes of wanting to quit one's job as a GP. *Scandinavian Journal of Primary Health Care*, 35 (2), 208–213.

Finnish Ministry of Social Affairs and Health (2016). *National programme for training medical and dental specialists 2017–2019*. Helsinki: Finnish Ministry of Social Affairs and Health.

Gibbons, R. (1992). *A primer in game theory*. Prentice Hall.

Godager, G., Iversen, T., and Ma, C.A. (2015). Competition, gatekeeping, and health care access. *Journal of Health Economics*, 39, 159–170.

Government proposition 2019:164 (2019). Inriktningen för en nära och tillgänglig vård – en primärvårdsreform.

Haraldsdóttir, H.B.S.& S. (2010). Skortur á heimilislæknum. *Fréttabréf Landlæknis um Heilbrigðistölfræði* .

Holte, J.H., Abelsen, B., Halvorsen, P.A., and Olsen, J.A. (2015). General practitioners' altered preferences for private practice vs. salaried positions: a consequence of proposed policy regulations? *BMC Health Services Research*, 15 (1), 1–10.

Hyatt, H.R. and Spletzer, J.R. (2016). The shifting job tenure distribution. *Labour Economics*, 41, 363–377.

Icelandic Directory of Health (2016). Heilsuvera: mínar heilbrigðisupplýsingar. Available from: https://www.landlaeknir.is/gaedi-og-eftirlit/heilbrigdisthjonusta/rafraen-sjukraskra/heilsuvera-minar-heilbrigdisupplysingar/ (Accessed: 2 June 2020).

Jha, A.K., Doolan, D., Grandt, D., Scott, T., and Bates, D.W. (2008). The use of health information technology in seven nations. *International Journal of Medical Informatics*, 77 (12), 848–854.

Keskimäki, I., Tynkkynen, L.-K., Reissell, E., Koivusalo, M., Syrjä, V., Vuorenkoski, L., Rechel, B., Karanikolos, M., and Organization, W.H. (2019). Finland: Health system review. *Health System Review*, 21(2), 1–166.

KS (2019). *Kommunesektorens arbeidsgivermonitor 2019*. The Norwegian Association of Local and Regional Authorities.

Kuusio, H., Heponiemi, T., Vänskä, J., Aalto, A.-M., Ruskoaho, J., and Elovainio, M. (2013).

Psychosocial stress factors and intention to leave job: differences between foreign-born and Finnish-born general practitioners. *Scandinavian Journal of Public Health*, 41 (4), 405–411.

Lafortune, G. (2016). Analytical framework of health labour markets. *In*: OECD, ed. *Health Workforce Policies in OECD Countries: Right Jobs, Right Skills, Right Places*. Paris: OECD Publishing.

Mullola, S., Hakulinen, C., Presseau, J., Gimeno Ruiz de Porras, D., Jokela, M., Hintsa, T., and Elovainio, M. (2018). Personality traits and career choices among physicians in Finland: employment sector, clinical patient contact, specialty and change of specialty. *BMC Medical Education 2018 18:1*, 18 (1), 1–12.

National Audit Office (2017). *Heilsugæsla höfuðborgarsvæðisins*. Reykjavík.

Norwegian Directorate of Health (2017). Kompetansekrav for leger i kommunene. Available from: https://www.helsedirektoratet.no/nyheter/krav-til-spesialisering-for-leger-i-kommunene (Accessed: 17 April 2022).

Norwegian Ministry of Health and Care Services (2020). *Handlingsplan for allmennlegetjenesten*. Oslo.

OECD (2016). *Health Workforce Policies in OECD Countries*. OECD Health Policy Studies. Paris: OECD Publishing.

Rachlin, H. and Jones, B.A. (2008). Social discounting and delay discounting. *Journal of Behavioral Decision Making*, 21 (1), 29–43.

Sigurgeirsdóttir Sigurbjörg Maresso Anna, W.J. (2014). Iceland: Health system review. *Health Systems in Transition*, 16(6): 1-182.

Sivey, P., Scott, A., Witt, J., Joyce, C., and Humphreys, J. (2012). Junior doctors' preferences for specialty choice. *Journal of Health Economics*, 31 (6), 813–823.

SOU 2018:39 (2018). *God och nära vård*. Stockholm: Norstedts Juridiks.

The Danish Ministry of Health (2018). *En læge tæt på dig: En plan for fremtidens almen praksis*.

The National Board of Health and Welfare (2018). *Bättre resursutnyttjande i hälso- och sjukvården*. Stockholm: The National Board of Health and Welfare,.

Tirole, J. (2002). Rational irrationality: Some economics of self-management. *European Economic Review*, 46 (4–5), 633–655.

Vårdanalys 2018:5 (2018). Allmän tillgång?

Zanaboni, P. and Fagerlund, A.J. (2020). Patients' use and experiences with e-consultation and other digital health services with their general practitioner in Norway: results from an online survey. *BMJ Open*, 10 (6), e034773.

5. Appendix

Table 1: Overview of selected reforms and policy measures, 2010-2020

Type of policy measure	Denmark	Finland	Iceland	Norway	Sweden
Remuneration	Differentiated capitation fees (i.e. severity-based)[a] DKK 1500 **compensation** per patient for deficit (compared with target list length)[c]	**FFS and capitation introduced** in addition to basic salary for subset of GPs[g]	**Incentive payments** as a bonus-supplement for extra effort[h]	Proposed policies on **income guarantees** up to a 500 patient list[f] Differentiated capitation, with lower capitation when list size > 1000[f] Expansion of salaried positions for new graduates (ALIS)[f]	Locums are generally offered higher salaries[g]
Working conditions	Earmarked funding to incentivise establishment of **group practices**[a] Older GPs have been **relieved** of the requirement to work in the emergency ward. They're also provided an **incentive payment** after turning 62 years to stay in the job[b]	Policies implemented to reduce demand for GP services through **task shifting**[b]	Post graduate studies for advanced nurses introduced, including to induce **task shifting**[h]	Removal **administrative tasks**, including through task shifting and use of IT[f]	The reform "Profesjonsmilliarden" seeks to induce **task shifting**[i] Better coordination and clarification of roles between primary and specialist care to reduce stress among GPs[j]
Practice quality	Proposed to renovate/ improve GP offices used for training[a] GP offices subsidized to to be accredited in accordance with the Danish Quality Model[a]	IT system Apotti launched in 2018, enabling information sharing and consultations between practitioners and patients in selected regions[d] Proposed to improve specialist training[k]	Electronic health systems put in place to enable electronic communication between patients and GPs and data-sharing across primary and specialist care[el]	Online platform established and e-consultation enabled for GP-practices[m] Specialist requirement to become GP[n]	Investments in effort to reduce **waiting time** for primary care.[o] Recommended that the government **subsidizes specialization** for GPs[g]

Source: a: (The Danish Ministry of Health, 2018) b: (OECD, 2016) c: (Lafortune, 2016) d: (Keskimäki et al., 2019) e: (Sigurgeirsdóttir Sigurbjörg Maresso Anna, 2014) f: (Norwegian Ministry of Health and Care Services, 2020) g:(Vårdanalys, 2018:5) h: (National Audit Office, 2017) i:(The National Board of Health and Welfare, 2018) j:(SOU, 2018:39) k: (Finnish Ministry of Social Affairs and Health, 2016) l: (Icelandic Directory of Health, 2016) m: (Zanaboni and Fagerlund, 2020) n: (Norwegian Directorate of Health, 2017) o: (Government proposition, 2019:164)