White Rose Research Online

eprints@whiterose.ac.uk
https://eprints.whiterose.ac.uk
Universities of Leeds, Sheffield and York

Deposited via The University of York.

White Rose Research Online URL for this paper:
https://eprints.whiterose.ac.uk/id/eprint/239750/

Version: Published Version

Article:
Oxholm, Anne Sophie, Pedersen, Line, Gyrd-Hansen, Dorte et al. (2026) What motivates (un)satisfied physicians? Social Science & Medicine. 119263. ISSN: 1873-5347

https://doi.org/10.1016/j.socscimed.2026.119263

Reuse
This article is distributed under the terms of the Creative Commons Attribution (CC BY) licence. This licence allows you to distribute, remix, tweak, and build upon the work, even commercially, as long as you credit the authors for the original work. More information and the full terms of the licence here: https://creativecommons.org/licenses/

Takedown
If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

UNIVERSITY OF LEEDS
University of Sheffield
UNIVERSITY of York

Social Science & Medicine 400 (2026) 119263

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

What motivates (un)satisfied physicians?

Anne Sophie Oxholm [a,*], Line Bjørnskov Pedersen [a,b], Dorte Gyrd-Hansen [a], Luigi Siciliani [a,c]

[a] Danish Centre for Health Economics, Department of Public Health, University of Southern Denmark, Campusvej 55, Odense M, DK 5230, Denmark
[b] Research Unit of General Practice, Department of Public Health, University of Southern Denmark, Campusvej 55, Odense M, DK 5230, Denmark
[c] Department of Economics and Related Studies, University of York, Alcuin College Block D, Alcuin Way, Heslington, York, YO10 5DD, United Kingdom

ARTICLE INFO

Keywords:
Physicians
Satisfaction
Motivation
Agency theory
Retainment
Recruitment
General practice

ABSTRACT

Policymakers across countries are struggling to retain and attract physicians. The design of policies to retain and attract physicians requires knowledge about their motivations to ensure that physicians are satisfied with their work. Based on the agency literature, we set up a theoretical framework outlining physicians' satisfaction (a proxy of utility) as a function of different sources of motivation (profits, patient benefits, societal benefits, and reputation). We then provide novel empirical evidence of how these motivations link to physicians' work satisfaction. This evidence is based on unique survey data on Danish general practitioners (GPs) which measures different dimensions of motivations and work satisfaction in 2019, combined with detailed register data on their working conditions. Using ordinary least square regressions, we estimate the association between GPs' work satisfaction and different sources of motivations, while controlling for a rich set of demand and supply factors. We find that one standard deviation (SD) increase in altruism towards society and in reputational motivation is associated with an increase of 8.4% and 8.7% of one SD in GP satisfaction, respectively. In contrast, one SD increase in profit orientation is associated with a 8.0% reduction of one SD in GP satisfaction. These results are robust to accounting for demand and supply factors. Overall, we predict theoretically and demonstrate empirically that different sources of motivation relate differently to physicians' work satisfaction. This knowledge may be useful for policymakers to design policies that can attract and retain more individuals to the profession.

1. Introduction

Many policymakers find it increasingly difficult to attract and retain physicians in different parts of healthcare systems (OECD, 2023). This can affect their ability to ensure adequate access to health care and impact quality of care (Moscelli et al., 2024). Work satisfaction is critical to retain physicians because those who are the least satisfied are more likely to leave the workforce (Andersen et al., 2018). Policymakers are therefore looking for policy options that may motivate physicians. Physicians may have different sources of motivation, which may contribute differently to their work satisfaction. The theoretical literature typically assumes that physicians' satisfaction (or their utility) depends on their motivations for generating profits, patient's health or wellbeing (Ellis and McGuire, 1986; Farley, 1986), societal welfare (Allen et al., 2022; Oxholm et al., 2024), and reputation (Olivella and Siciliani, 2017; Huesmann et al., 2026). Empirical evidence shows that physicians' motivations vary (Yordanov et al., 2023), but the extent to which they contribute to their satisfaction remains unknown.

This study sets up a theoretical framework of physician behaviour to guide our empirical analysis that aims at estimating how different sources of motivation relate to physicians' work satisfaction. Such evidence builds on and informs the literature on different sources of physician motivation towards profits, reputation, patient and societal benefits. It can help policymakers to design policies that can attract and retain physicians to the profession. Despite both the high theoretical and policy relevance, empirical evidence on how physicians' work satisfaction relates to their motivations appears to be lacking.

To guide our empirical analysis and the interpretation of its findings, we first set up a simple theoretical framework of physicians' care. This framework builds on the agency literature by assuming that physicians provide care that maximise their satisfaction (or utility in microeconomic terms), which is a function of different sources of motivation (profits, patient benefits, societal benefits, and reputation), exogenous working conditions (demand and supply factors), and their non-

* Corresponding author. Campusvej 55, 5230, Odense M, Denmark.
E-mail addresses: asoxholm@sdu.dk (A.S. Oxholm), lib@sdu.dk (L.B. Pedersen), dgh@sdu.dk (D. Gyrd-Hansen), luigi.siciliani@york.ac.uk (L. Siciliani).

https://doi.org/10.1016/j.socscimed.2026.119263
Received 9 January 2026; Received in revised form 27 February 2026; Accepted 1 April 2026
Available online 9 April 2026
0277-9536/© 2026 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

monetary costs of care (such as leisure time). We also include a term capturing a personality trait of being satisfied to further explain individual variation in utility. We then derive physicians' equilibrium care and from this compute their indirect utility as a function of different sources of motivation, demand and supply factors. The model assumes that physicians' utility increases with their motivations. However, we show that this relationship may be impacted if physicians work under challenging conditions, fall short of their target profits (McGuire and Pauly, 1991), or if negative externalities for society are generated from their care (Allen et al., 2022; Blomqvist, 1991). As a result, we may observe no or even a negative relationship between different sources of motivation and physicians' satisfaction.

In the empirical analysis, we exploit unique survey data on Danish general practitioners' (GPs') motivations and work satisfaction in 2019. Our measures of motivations are based on validated items related to the theoretical literature on physician agency, which includes their degree of profit orientation, altruism towards the patient (Ellis and McGuire, 1986), altruism towards society (Allen et al., 2022; Francois, 2000; Delfgaauw and Dur, 2008), and reputational concerns (Olivella and Siciliani, 2017; Huesmann et al., 2026). We link this survey data with rich register data on demand and supply factors, which may impact GPs' ability to generate profits, patient benefits, societal benefits, and reputation gains. These factors can thus impact the relationship between physicians' motivations and work satisfaction.

Using ordinary least square (OLS) regressions, we estimate two sets of regressions uncovering the extent to which different sources of motivation are associated with GPs' work satisfaction. In the first, we regress GPs' work satisfaction against our different sources of motivation. These associations could be impacted by demand and supply factors. Therefore, in the second set of regressions, we include a rich set of such variables. From these regressions we thereby explore how different sources of motivations' relation to GPs' satisfaction are explained by their working conditions.

Our findings suggest that different sources of motivation are associated with GPs' work satisfaction. We find that a higher level of GP altruism or reputational concerns is positively associated with work satisfaction. A one standard deviation (SD) increase in altruism towards society or reputational concerns is associated with an increase of 8.4% or 8.7% of one SD in GP work satisfaction, respectively. The estimate is also positive for patient altruism, but statistically insignificant. In contrast, profit orientation is negatively associated with work satisfaction. A one SD increase in profit-orientation is associated with a decrease in GPs' work satisfaction of 8.0% of one SD. Our results are robust to controlling for our rich set of demand and supply factors, such as list sizes, enlisted patients' health and socioeconomic statuses, organisational factors, and access to healthcare providers.

We are careful not to interpret the estimated coefficients as causal effects of GPs' motivation on their work satisfaction. One reason is that we cannot rule out possible omitted variable bias due to other sources of motivation or unobserved demand and supply factors. We reduce the risk of omitted variable bias by including a comprehensive set of motivation variables as well as many controls for demand and supply variables that could affect working conditions. We are reassured that our estimates are stable after inclusion of these controls. We also follow the Oster (2019) approach, which adjusts for the influence of potential unobservable variables, and find that our estimates are stable to these adjustments. Therefore, although we cannot claim that our estimates are causal, we argue that we have included a comprehensive set of controls both in terms of the main sources of motivation and external factors in terms of handling omitted variable bias.

This paper contributes to the literature in several ways. First, we develop a theoretical framework which guides our empirical analysis. The framework brings together different findings of the theoretical literature that recognises agents to be motivated by multiple factors (e.g., Bénabou and Tirole (2003); Delfgaauw and Dur (2008); Besley and Ghatak (2005)) – specifically physicians (e.g., Olivella and Siciliani (2017); Ellis and McGuire (1986); Allen et al. (2022)). In line with previous studies, our model accounts for profit targets (McGuire and Pauly, 1991) and externalities from care (Allen et al., 2022; Blomqvist, 1991) as critical factors in the relationship between physicians' motivations and utility. To further highlight heterogeneity in care across different physicians, we show how both supply and demand factors affect care and physician satisfaction either directly or indirectly (through the effect on care).

Second, we are to the best of our knowledge the first to estimate physicians' work satisfaction association with different motivations using large representative survey and register data. The current empirical literature has mostly indirectly inferred physicians' motivations based on their responses to incentives (see related literature in appendix A). Exceptions are a few recent studies that have directly measured physicians' motivations using survey data and found them to associate with care provision (e.g. Brosig-Koch et al. (2024); Jensen and Vestergaard (2017); Oxholm et al. (2024, 2025)). These studies have, however, not considered how different motivations relate to physicians' work satisfaction, which studies find to be important for retention in the profession (Andersen et al., 2018). We thus provide novel empirical evidence of an association between physicians' utility and key motivational measures.

Third, the few existing empirical studies measuring physicians' motivations directly have not included reputational concerns, which may represent a critical component in their utility function (Olivella and Siciliani, 2017; Huesmann et al., 2026). Our study addresses this gap by directly measuring physicians' reputational concerns towards both their patients and peers and estimating how these concerns relate to their work satisfaction.

2. Theoretical framework

To guide our empirical analysis, we develop a theoretical framework which summarises different sources of physicians' motivation based on the existing theoretical literature on physician behaviour (Ellis and McGuire, 1986). We assume that physician i chooses the level of care q_i, which maximises their utility function, $V(q_i)$:

$$V(q_i) = \alpha_i\, b^p\left(q_i, x_i^D\right) + \gamma_i\, b^s\left(q_i, x_i^D\right) + \theta_i\left(\pi\left(q_i, x_i^D, x_i^S\right) - \widetilde{\pi}_i\right) + \beta_i\, r\left(q_i, x_i^D, x_i^S\right) - \varphi\left(q_i, x_i^D, x_i^S\right) + \delta_i, \tag{1}$$

where α_i is the physician's degree of altruism related to patient benefits $b^p\left(q_i, x_i^D\right)$, which is a function of the amount of patient care provided q_i and exogenous demand factors x_i^D that relate to the needs of the population served (such as the size of the population served and its composition, e.g. elderly population, chronic conditions and deprivation and copayments). We interpret q_i as the allocation of care provided to patients over a certain time period (e.g. a year or period over which certain contractual arrangements hold) to address the needs of the pool of the population served.

γ_i is physicians' degree of altruism related to additional societal benefits from care $b^s\left(q_i, x_i^D\right)$ that arise from externalities from provided care (e.g. physicians' vaccinations of patients may reduce the risk of spread of disease in the wider society due to herd immunity). In cases with negative externalities from care, it is particularly relevant to

separate patient and societal benefits. For example, physicians' patients may request broad-spectrum antibiotics to speed up their recovery, but it may increase the risk of antibiotic resistance in the wider society (Allen et al., 2022). Societal benefits may also be affected by exogenous demand factors due to different levels of need x_i^D (e.g. patients' demand for antibiotics). Physicians' altruism towards society relates closely to the term 'public service motivation' (Francois, 2000; Delfgaauw and Dur, 2008), which expresses a desire to serve public interests (for further details see section 4.1). Given that both $b^p(.)$ and $b^s(.)$ reflect benefits related to the demand of care, they are a function of supply factors, x_i^S, such as operating prices and capital endowment but only indirectly (e.g., if these working conditions affect the ability of the GP to provide care q_i, which is ultimately what matters to patients).

θ_i is physician's degree of profit orientation, $\pi(q_i, x_i^D, x_i^S)$ is physician profits, and $\tilde{\pi}_i$ is their target profit. The concept of target profits follows McGuire and Pauly (1991), who model how physicians may strive for a specific profit level. The term $(\pi(.) - \tilde{\pi}_i)$ captures how much their actual profits π exceed or fall short of their target $\tilde{\pi}_i$. We assume that the physician has a positive utility if the profit is above the target profit, and a negative utility if the profit is below the target profit. We also assume that the profit is a function of demand factors x_i^D and supply factor x_i^S capturing working conditions. We can write more explicitly the profit function as $\pi(q_i, x_i^D, x_i^S) = R(q_i, x_i^D) - C(q_i, x_i^S)$, where $R(.)$ are the revenues and $C(.)$ are the monetary costs. For example, under a fee for service system, additional visits increase revenues and costs. Higher levels of need among the served population will increase demand and increase revenues. Worse working conditions effectively increase the cost (and the marginal cost) of providing care.

β_i captures the extent to which physicians care about their reputation. $r(q_i, x_i^D, x_i^S)$ are the reputational benefits from being perceived as a good physician (Olivella and Siciliani, 2017). Higher levels of care q_i signal that the physician is good and contribute to the physician being reputable amongst patients, the community, and peers. The reputation enjoyed by physicians can also be affected by exogenous demand and supply factors, x_i^D and x_i^S. For example, a larger population served by the physician leads to higher demand that allows the physician to enjoy a good reputation in a wider community. On the supply side, more modern facilities can also contribute positively to physician's reputation.

We also assume that physicians have non-monetary costs (disutility) from providing care $\varphi(q_i, x_i^D, x_i^S)$, such as the loss of leisure time, which also depend on provided care and working conditions. When deciding how many services to provide, the physician has to decide how much time to spend on work and how much time to allocate to leisure, which effectively translates into a higher disutility from providing additional services.

δ_i is individual physician heterogeneity in the personality trait of being generally satisfied.

We assume that patient benefits and reputational benefits are positively related to care ($\partial b^p/\partial q_i > 0$, and $\partial r/\partial q_i > 0$). Societal benefits capture externalities from the provided care, which may be positively, negatively or unrelated to care ($\partial b^s/\partial q_i \gtreqless 0$). For example, an individual patient may benefit from receiving a treatment with broad-spectrum antibiotics ($\partial b^p/\partial q_i > 0$), but this may not be in the interest of society if it increases the risk of antibiotic resistance in the population ($\partial b^s/\partial q_i < 0$). Another example could be a patient receiving a vaccination, which not only benefits the patient ($\partial b^p/\partial q_i > 0$) but also society at large as it prevents the spread of diseases ($\partial b^s/\partial q_i > 0$).

We assume that the effect of care on profits is also indeterminate as it depends on whether the marginal revenue is higher than the marginal cost ($\frac{\partial \pi}{\partial q_i} = \frac{\partial R}{\partial q_i} - \frac{\partial C}{\partial q_i} \gtreqless 0$). For example, an additional visit generates an additional fee (under a fee-for-service reimbursement system), but this could be higher or lower than the marginal cost depending on how many services have already been provided. We assume that the physician's disutility (non-monetary costs) is increasing in the care provided ($\partial \varphi / \partial q_i > 0$).

Maximising the utility function with respect to the amount of care q_i, the equilibrium amount of care satisfies the first order condition $\partial V/\partial q_i = 0$, or more explicitly:

$$\alpha_i \frac{\partial b^p}{\partial q_i} + \gamma_i \frac{\partial b^s}{\partial q_i} + \theta_i \frac{\partial \pi}{\partial q_i} + \beta_i \frac{\partial r}{\partial q_i} = \frac{\partial \varphi}{\partial q_i}, \tag{2}$$

which gives the equilibrium amount of care $q_i^*(\alpha_i, \gamma_i, \theta_i, \beta_i, x_i^D, x_i^S)$. We assume that the problem is well behaved, and the utility function is concave in the amount of care provided, $\partial^2 V/\partial q_i^2 < 0$. Substituting the equilibrium care into the utility function (1), we obtain the indirect utility function:

$$V_i^* = V(q_i^*(\alpha_i, \gamma_i, \theta_i, \beta_i, x_i^D, x_i^S), \delta_i). \tag{3}$$

We can now conduct comparative statics to investigate how physicians' different sources of motivation relate to their utility. Using the envelope theorem, we can ignore the effect of a change on one of the parameters that affect care.[1] We therefore have:

$$\frac{\partial V_i^*}{\partial \alpha_i} = b^p(q_i^* i, x_i^D) > 0,$$

$$\frac{\partial V_i^*}{\partial \gamma_i} = b^s(q_i^* i, x_i^D) \gtreqless 0,$$

$$\frac{\partial V_i^*}{\partial \theta_i} = \pi(q_i^*, x_i^D, x_i^S) - \tilde{\pi}_i \gtreqless 0,$$

$$\frac{\partial V_i^*}{\partial \beta_i} = r(q_i^* i, x_i^D, x_i^S) > 0. \tag{4}$$

These findings show that an increase in physician's degree of patient altruism or reputational concerns increase utility. An increase in physician's degree of profit orientation may increase, decrease, or have no impact on utility depending on whether profits exceed, fall short of, or are equal to targeted profits. Thus, if the physician (does not) exceeds their targeted profit, then a higher degree of profit orientation leads to higher (dis)satisfaction. Similarly, an increase in the physician's degree of altruism on societal benefit may increase, decrease, or have no impact on their utility depending on whether the provided care yields positive, negative, or no benefits towards society.

Our study focuses on the relationship between physicians' motivations and work satisfaction. Physicians' working conditions may play a role in understanding this relationship. We therefore investigate how different demand and supply factors that affect working conditions (increase in x_i^D and x_i^S) may impact the relationship between physician's motivations and utility. As mentioned above, demand variables include, for example, the patient population served, the extent to which they have chronic conditions or multimorbidity, and degree of deprivation. Supply variables include, for example, the capital endowment and facilities, and availability of diagnostic technologies. The effect of demand factors on utility is given, again using the envelope theorem, by:

$$\frac{\partial V_i^*}{\partial x_i^D} = \alpha_i \frac{\partial b^p(q_i^* i, x_i^D)}{\partial x_i^D} + \gamma_i \frac{\partial b^s(q_i^* i, x_i^D)}{\partial x_i^D} - \frac{\partial \varphi(q_i^* i, x_i^D, x_i^S)}{\partial x_i^D} + \beta_i \frac{\partial r(q_i^* i, x_i^D, x_i^S)}{\partial x_i^D} + \theta_i \frac{\partial \pi(q_i^* i, x_i^D, x_i^S)}{\partial x_i^D} \tag{5}$$

[1] If we differentiate for example with respect to α_i, we have $\frac{\partial V_i^*}{\partial \alpha_i} = \frac{\partial V_i^*}{\partial q_i} \frac{\partial q_i^*}{\partial \alpha_i} + b^p(q_i^*, x_i^D)$. Given that $\frac{\partial V_i^*}{\partial q_i} = 0$, the expression simplifies to $\frac{\partial V_i^*}{\partial \alpha_i} = b^p(q_i^*, x_i^D)$.

The effect of demand factors on utility is in principle indeterminate. Using the population served by a GP as an example, higher demand will increase the utility due to the altruistic component towards patients and possibly towards society (first two terms) but increases the disutility due to the additional workload (third term). Reputation could also be enhanced if serving a large pool of patients acts as a signal of good reputation (fourth term). The effect on profit is indeterminate. Higher demand could increase revenues but also increase the marginal cost of providing care (last term).

Similarly, the effect of supply factors on utility is given by:

$$\frac{\partial V_i^*}{\partial x_i^S} = \theta_i \frac{\partial \pi\left(q_i^* i, x_i^D, x_i^S\right)}{\partial x_i^S} + \beta_i \frac{\partial r\left(q_i^* i, x_i^D, x_i^S\right)}{\partial x_i^S} - \frac{\partial \varphi\left(q_i^* i, x_i^D, x_i^S\right)}{\partial x_i^S} \quad (6)$$

For example, better capital endowment can be costly and reduce profits (first term) but act as a signal of quality and enhance reputation (second term) and reduce the marginal disutility from providing care through less manual labour (third term). These examples highlight the importance of controlling for possible demand and supply factors when understanding the determinants of physician utility.

Last, δ_i captures individual's propensity to be satisfied, for example, due to differences in personality traits. Such propensity could be correlated with exogenous demand and supply factors if, for example, individuals who are more likely to be satisfied are more likely to have a preference for working in urban versus rural areas, or in more versus less deprived areas (though the sign of the correlation is a priori unclear).

3. Institutional setting

In Denmark most healthcare services are covered by a mandatory national health insurance, which is primarily financed through general taxation. Access to GPs, specialists, and hospitals working under a public contract is therefore generally free at the point of service (Birk et al., 2024). GPs play an important role in this system as they act as gatekeepers for more specialised care, implying that they are typically patients first point of contact. The GPs are primarily self-employed operating in either single-handed or partnership practices. They operate under a contract with a public employer, the Danish Regions, who are responsible for the organisation, financing, and structure of general practice. The Danish Regions are, among other things, responsible for deciding on the number of and location of general practices, which depends on which of the five regions the practice is located in.

General practices operate with a patient list, which they can close for uptake of new patients once they reach 1600 patients per GP. Patients can freely choose a practice with an open list. Practices can therefore not select their patients. However, more than half of general practices had closed for uptake of new patients in 2017 (Olsen et al., 2023), indicating a low degree of competition for patients. Under the national health insurance, around 40% of the practices' remuneration is risk-adjusted capitation payments, whereas the remaining 60% is fee-for-services. The practices receive no fees for prescribing medications or for referring their patients to other providers. Travel distances and waiting lists to other providers varies considerably across areas (Simonsen et al., 2020).

4. Data

This study makes use of both register and survey data. The register data comes from Statistics Denmark, The Danish Health Data Authority as well as various publicly available sources (section 4.2 provides further details). The survey data comes from a nationwide work life survey sent to all GPs registered with a private practice in Denmark. This survey was conducted from May to October 2019. In the invitation letter, the GPs were informed about the general topic of the survey. The survey included validated items covering both GPs' work satisfaction and key motivations described in the agency literature. Around 34.5% of the 3336 invited GPs completed the survey. Appendix B provides more details about the survey. To facilitate linkage with register data, our study population consists of the invited GPs, who were operating in a practice that did not close in 2019, resulting in 3208 GPs.

4.1. Work satisfaction and motivations

The survey item capturing work satisfaction asked how satisfied GPs were overall with their work on a scale from 0 to 10, including a 'I do not know' option. A similar scale has been adopted by, for example, a recent study on Danish employees' work satisfaction (Lydiksen et al., 2023) and by the OECD (2020) to measure individuals' life satisfaction. We impute 'I do not know' responses (less than 0.4% of observations) using the rounded average response across GPs.

The items capturing GPs' degree of profit orientation θ_i (also known as 'extrinsic motivation' (EM)), altruism towards the patient α_i (also known as 'patient (user) orientation' (PO)), and altruism towards society γ_i (also known as 'public service motivation' (PSM)), were previously validated in the literature. Appendix B provides details and lists the items. An example of an item capturing profit orientation was the extent to which the GP agreed with the statement that '*If I had been offered better pay, I would have done a better job*'. A study finds a link between GPs' profit orientation measured by these items and their generated amount of fee-for-services and consultations per enlisted patient (Oxholm et al., 2024).

An example of an item that we use to capture patient altruism was the extent to which the GP agreed with the statement that '*If the patient is satisfied, the job is done*', which potentially reflects not only patients' health benefits but all components in patients' utility function, such as their consumption of other goods and services. Though this broad definition of patient altruism departs from several health economics studies that focus solely on health benefits (see for example, Attema et al. (2023), Godager and Wiesen (2013), and Appendix A on related literature), we find it particularly suitable in the case of general practice where a holistic, patient-centred perspective is often taken. This broader patient welfare perspective has also been modelled theoretically (Farley, 1986) and relates to a non-paternalistic (pure) form of altruism (Simonsen et al., 2021). An incentivised laboratory experiment by Ge et al. (2022) supports this perspective by finding evidence that physicians care about non-health related factors such as their patients' consumption opportunities.

An example of an item capturing society altruism was the extent to which the GP agreed that '*I consider public service my civic duty*'. Our items used to proxy society altruism originate from public service motivation (Francois, 2000; Delfgaauw and Dur, 2008), which expresses a desire to serve public interests. Thus, this measure takes a broader (societal) perspective than the individual's wellbeing. Previous studies find relatively weak correlation between our measures of society and patient altruism among GPs (see for example, Yordanov et al. (2023) and Oxholm et al. (2024)). Studies based on these items also find a link between GPs' altruism towards the patients and society, respectively, and their prescribing behaviour (Oxholm et al., 2024; Jensen and Andersen, 2015) and provision of home visits (Jensen and Vestergaard, 2017). For example, more patient-altruistic GPs prescribe more antibiotics to patients, whereas more society-altruistic GPs prescribe a lower share of broad-spectrum antibiotics, reducing the risk of antibiotic resistance in the wider society (Oxholm et al., 2024; Jensen and Andersen, 2015).

An example of an item capturing reputational concerns was the extent to which the GP agreed that '*It is important for me to do my job well to achieve a high professional status*'. These items covering reputational concerns (REP) β_i, were created by the author group to capture GPs' reputational concerns among both patients and peers as well as their concern for their overall professional status. A lab-in-field experiment supports the notion that physicians value their reputation (status) as they respond to feedback on their relative performance (Huesmann

et al., 2026). A concern could be that the items for this motivational component relate closely to other motivational components' items (such as altruism). Our data reveals a relatively weak correlation between these motivational components as described in section 6.1.

For each motivational item the GPs rated their agreement with the item statement on a five-point Likert scale from completely disagree (1) to completely agree (5). We impute responses 'I do not know/want to answer' using the rounded average response across GPs (only 1.1% of responses to EM items, 0.5% of responses to PO items, 0.4% of responses to REP items, and 3.4% of responses to PSM items are in this category). Confirmatory factor analyses reveal that most items for EM, REP, and PSM exhibit a good internal consistency as Chronbach's alpha are 0.78, 0.76, and 0.79, respectively. Aligned with other studies (Oxholm et al., 2024; Yordanov et al., 2023), we find that PO has a low Chronbach's alpha of 0.48, which may be due to it being composed of only three items. However, previous studies have shown that PO, when including these three items, associates with GPs' care provision (Oxholm et al., 2024), we therefore keep all items in our analysis.

We construct a single measure of each of type of motivation by summarising the scores (from 1 to 5) within the motivational components (see Appendix B). This simple sum-score approach follows the literature (see e.g. Jensen and Andersen (2015); Andersen et al. (2011); Oxholm et al. (2024)), but in a supplementary analysis we assess the robustness of our findings to instead using the factor loadings generated from the confirmatory factor analyses as weights to create the sum scores (see Appendix C and Section 5.1). Following other studies on GPs' motivation (Yordanov et al., 2023; Oxholm et al., 2024), we ease the interpretation of the motivational measures by standardising them using the min-max approach (Milligan and Cooper, 1988). Each measure therefore ranges from zero to one, where zero represents the least motivated GP and one the most motivated GP.

4.2. Working conditions

We link the GP survey data to high-quality register data on demand and supply factors, which may impact both GPs' motivations and satisfaction. The demand factors (x_i^D) include the practices' list size per GP and their enlisted patients' health and socioeconomic statuses. List size per GP in a practice is generated using 2019-data from the Provider Register and Sundhed.dk. We generate indicators of enlisted patients' health statuses based on the Charlson's Comorbidity Index (Quan et al., 2011). Following other studies on Danish general practices (Oxholm et al., 2022; Yordanov et al., 2023), we generate one indicator that captures the proportion of enlisted patients with a comorbidity index of 1, whereas the other indicator captures the proportion of enlisted patients with a comorbidity index of at least 2. The index is based on recorded hospital diagnoses codes (ICD10-codes) in the National Patient Register from 2015 to 2019. As patients' diagnoses are only accessible from hospitals, we obtain a conservative estimate of patients' health statuses in general practices.

We generate seven indicators of enlisted patients' socioeconomic statuses, which are inspired by the Danish Deprivation Index (Vedsted and Sørensen, 2009). This index is designed to identify patients expected to be in high need of care in general practice and can thereby proxy the demand for care that GPs face in their practices. The index has been employed in other empirical studies capturing workload in Danish general practice (see for example, Olsen (2012) and Oxholm et al. (2025)). Examples of indicators are '*proportion of enlisted patients who are 18-59-year-olds on welfare payments*' and '*proportion of enlisted patients who are 0-16-year-olds in a family with low educational level*'. For these socioeconomic indicators we use data from Statistics Denmark's registers on patients' disposable family income, welfare payments, employment status, highest attained educational level, age, marital status, immigrant background in 2019. Appendix D provides a full list of our measures of demand factors.

The supply factors (x_i^S) include practices' region (capturing organisational factors) and its degree of rurality (capturing access to other healthcare providers). The Provider Register includes information on which of the five regions the practice is located in. The Provider Register also includes information used to identify their degree of rurality. The degree of rurality is determined using Statistic Denmark's grouping (DEGURBA), which is defined by the number of inhabitants of the largest city and the population density in the municipality (Statistics Denmark, 2022). The groups are '*densely populated area*', '*intermediate populated area*', and '*thinly populated area*'. Appendix D provides a full list of our measures of supply factors.

5. Methods

We wish to estimate how GPs' work satisfaction relate to different sources of motivation highlighted in the theoretical literature. As a first step, we therefore run the following regression model:

$$y_i = \omega_0 + \omega_1 EM_i + \omega_2 PO_i + \omega_3 PSM_i + \omega_4 REP_i + e_i, \quad (7)$$

where y_i is GP i's work satisfaction, EM_i (extrinsic motivation) is a measure of profit orientation, PO_i (patient orientation) is a measure of altruism towards the patient, PSM_i (public service motivation) is a measure of altruism towards society, REP_i (reputational motivation) is a measure of concern for reputation among peers and patients, and e_i is an idiosyncratic error term. We treat both our measure of work satisfaction (ranging from 0 to 10) and motivational measures (ranging from 0 to 1) as continuous in the regression. Our estimates of interest are $\widehat{\omega}_1, \widehat{\omega}_2, \widehat{\omega}_3,$ and $\widehat{\omega}_4$, which give the association between each source of motivation and GPs' work satisfaction. For example, if $\widehat{\omega}_2 > 0$ it implies that a higher degree of altruism towards patients associates with a higher degree of work satisfaction. If $\widehat{\omega}_2 = 0$ it implies that GPs' degree of altruism towards patients is unrelated to their work satisfaction.

As shown in our theoretical framework (in section 2), our estimates of interests could be explained by different working conditions. Working conditions can explain GPs' work satisfaction through their ability to generate profits, patient benefits, societal benefits, and reputational benefits. For example, if GPs treat patients who demand more care, this could lead GPs to obtain higher profits in a fee-for-service based system (as in Denmark). To address possible omitted variable bias, we augment (7) by adding a rich set of demand and supply factors that could affect the relationship between GPs' work satisfaction and motivations:

$$y_i = \rho_0 + \rho_1 EM_i + \rho_2 UO_i + \rho_3 PSM_i + \rho_4 REP_i + \boldsymbol{X_i^d} + \boldsymbol{X_i^s} + \epsilon_i, \quad (8)$$

where $\boldsymbol{X_i^d}$ is a vector of demand factors capturing enlisted patients' need for care, measured by the list size per GP in a practice and enlisted patients' average health and socioeconomic statuses. $\boldsymbol{X_i^s}$ is a vector of supply factors capturing both organisational factors and access to healthcare providers. Appendix D provides a full list of the demand and supply factors (see also section 4.2). The term ϵ_i is an idiosyncratic error term.

Our estimates of interest are $\widehat{\rho}_1, \widehat{\rho}_2, \widehat{\rho}_3,$ and $\widehat{\rho}_4$, which may be interpreted as the association between each of the motivations and GPs' satisfaction conditionally on our rich set of demand and supply factors. For example, if $\widehat{\rho}_2 = 0$ while $\widehat{\omega}_2 > 0$, it implies that our finding that higher patient altruism (PO) is associated with a higher GP work satisfaction (in equation (7)) is explained by their working conditions. For the estimated coefficients to yield causal interpretations of the relationship between motivations and work satisfaction, the assumption of conditional mean independence must hold for the motivation measures. We cannot ascertain that all relevant external factors are controlled for. However, we use the Oster (2019)'s approach to evaluate the implication of potential omitted variable bias by comparing the stability of the estimates across equations (7) and (8), and by subsequently adjusting for the potential influence of unobservable variables. The Oster test is thus a

sensitivity analysis to assess how robust results are to omitted variable bias; it does not address other sources of endogeneity.

We estimate equations (7) and (8) using OLS regressions. Standard errors are clustered at general practice level to account for similar working conditions among GPs operating in the same practice. We also investigate potential issues with multicollinearity by calculating the variance inflation factors, which reveal no indications of such issues (all scores are below 5).

5.1. Robustness checks

We perform several supplementary analyses to assess the robustness of our findings. We start by modelling our measures of motivation in different ways. First, we calculate our measures of motivation using the items' factor loadings from confirmatory factor analysis of each motivational component as weights when generating the sum scores (see Appendix C). Second, we exclude GPs who responded 'I do not know/not relevant' to the items. Third, we allow for a non-linear relationship between GPs' motivations and work satisfaction by applying dichotomised measures of motivation in our regressions. These measures capture whether GPs are among the most motivated using either the 50th- or 75th-percentile of the sample distribution as a cut-off.

In addition, we estimate equations (7) and (8) separately for each measure of motivation to assess the importance of potential correlations between our measures of motivation for our findings. Next, we investigate if the relationship between motivations and work satisfaction varies for different sub-groups of the GP population defined by their working conditions, as predicted by our theory model (section 2). We include these sub-group dummies as interaction terms in our regressions. Due to small sample size, we refrain from including interactions between all working conditions and motivations. Instead, we define our sub-groups of GPs based on three working conditions capturing both demand and supply factors: working in a practice located in a thinly populated area (sub-group 1), working in a practice with a 'proportion of severely ill patients enlisted' above the median level for all GPs (sub-group 2), working in practice with a 'proportion of enlisted patients who are +70-year-olds with a low disposable family income' that is above the median level of all GPs (sub-group 3).

Other potential omitted variable biases could be caused by unobserved GP characteristics related to motivations. A study by Yordanov et al. (2023) shows a small correlation between our measures of motivation and GPs' age and gender. We therefore investigate the importance of these GP characteristics for the relationship between motivations and work satisfaction by controlling for them in equations (7) and (8). To account for potential non-linear effects between GPs' age and work satisfaction, we categorised the GPs into three equal size groups based on the study population's age. The groups proxy early career stage (up to age 46.6 years old), midcareer stage (from age 46.7 to 57.0 years old), and late career stage (from 57.1 years old and up). We construct a dummy of whether the GP is male.

Similarly to our main analyses, we estimate all supplementary analyses using OLS with standard errors clustered at practice level.

6. Results

6.1. Descriptive statistics

Table 1 presents descriptive statistics for our dependent variable (work satisfaction) and explanatory variables (motivations and working conditions) for our sample of Danish GPs completing the work-life survey in 2019. The average work satisfaction is 7.62 (on a scale from 0 to 10), whereas the average motivational score (on a scale from 0 to 1) varies across components. As the motivational components are based on different items varying in their phrasing, we refrain from directly comparing these scores. Table 2 further shows that the motivations are statistically significantly correlated but to a low degree, indicating that they do not measure the same sources of motivation.

Table 1
Descriptive statistics in 2019.

	Mean	SD
Work satisfaction	7.62	1.70
Motivations		
Profit orientation (extrinsic motivation, EM)	0.47	0.23
Altruism towards patients (patient orientation, PO)	0.66	0.16
Altruism towards society (public service motivation, PSM)	0.53	0.15
Reputational concerns (REP)	0.75	0.20
Working conditions: Demand factors		
List size per GP in the practice	1620	418
Health statuses		
Proportion of enlisted patients who have ….		
Charlson's Comorbidity Index equal to 1	0.036	0.008
Charlson's Comorbidity Index greater than 1	0.050	0.012
Socioeconomic statuses		
Proportion of enlisted patients who are …		
20-59-year-olds and unemployed for at least 6 months	0.007	0.004
25-59-year-olds without vocational education	0.106	0.024
18-59-year-olds on welfare payments	0.061	0.020
0-16-year-olds in family with low educational level	0.011	0.006
Immigrants and descendants from non-Western countries	0.076	0.071
+30-year-olds who are single	0.150	0.031
+70-year-olds with a low disposable family income	0.037	0.020
Working conditions: Supply factors		
Organisational factors		
Practice is in …		
Capital Region of Denmark	0.25	0.43
Region Zealand	0.12	0.33
Region of Southern Denmark	0.26	0.44
Central Denmark Region	0.30	0.46
North Denmark Region	0.07	0.25
Access to healthcare providers		
Practice is in a(n) …		
Densely populated area	0.32	0.47
Intermediate populated area	0.32	0.47
Thinly populated area	0.36	0.48
Number of observations (GPs)	1134	

Notes: Work satisfaction is measured on a scale from 0 to 10. Motivations are measured on a scale from 0 to 1 (see section 4.1). The indicators of health statuses are based on Charlson's Comorbidity Index (Quan et al., 2011). The indicators of socioeconomic statuses are based on the Danish Deprivation Index (DADI) (Vedsted and Sørensen, 2009), which proxies patients' expected needs for general practice care. The DADI indicator '25-65-year-olds with low disposable family income' has been omitted due to a variation inflation score above 10 in the main regressions. The definition of density of population is based on Statistics Denmark (2022) (DEGURBA).

Table 2
Pairwise correlations between our measures of motivation.

	EM	PO	PSM	REP
Profit orientation (extrinsic motivation, EM)	1.00			
Altruism towards patients (patient orientation, PO)	0.11*	1.00		
Altruism towards society (public service motivation, PSM)	−0.07*	0.12*	1.00	
Reputational concerns (REP)	0.24*	0.10*	0.09*	1.00

Notes: *p < 0.05.

Table 1 groups the working conditions into demand and supply factors, respectively. Among the demand factors is the list size per GP in a practice, indicators of enlisted patients' health statuses, and indicators of enlisted patients' socioeconomic statuses. The average list size per GP is slightly above 1600 individuals, which is the limit for when a practice is allowed to close their list for uptake of new patients (see section 3). The indicators capturing enlisted patients' health statuses show that on average around 9% have a Charlson's Comorbidity index of at least 1. The seven indicators capturing enlisted patients' socioeconomic statuses show that the average proportion with a low socioeconomic status varies across indicators from 0.7% (for the indicator '20-59-year-olds and

Table 3
The link between GPs' motivations and work satisfaction.

Outcome: Work satisfaction	(1)	(2)
Profit orientation (EM)	−0.589**	−0.606**
	(0.257)	(0.261)
Altruism towards the patient (PO)	0.114	0.150
	(0.366)	(0.364)
Altruism towards society (PSM)	0.951**	1.003***
	(0.379)	(0.379)
Reputational concerns (REP)	0.743***	0.702***
	(0.270)	(0.270)
List size per GP in the practice		0.000167
		(0.000200)
Charlson's Comorbidity Index equal to 1		−11.82
		(9.587)
Charlson's Comorbidity Index greater than 1		−13.77
		(8.546)
20-59-year-olds and unemployed for at least 6 months		32.76
		(24.89)
25-59-year-olds without vocational education		1.777
		(4.757)
18-59-year-olds on welfare payments		1.319
		(6.091)
0-16-year-olds in family with low educational level		21.98
		(17.35)
Immigrants and descendants from non-Western countries		−3.981***
		(1.514)
+30-year-olds who are single		−2.160
		(2.785)
+70-year-olds with a low disposable family income		1.996
		(4.479)
Region Zealand		−0.194
		(0.221)
Region of Southern Denmark		−0.0894
		(0.214)
Central Denmark Region		−0.371*
		(0.219)
North Denmark Region		−0.349
		(0.294)
Intermediate populated area		0.0548
		(0.182)
Thinly populated area		−0.161
		(0.209)
Constant	6.758***	7.624***
	(0.343)	(0.629)
Number of observations (GPs)	1134	1134
R^2	0.020	0.052

Notes: This table shows estimates of two regressions of GPs' motivations on their work satisfaction, which are denoted equations (7) and (8) in section 5. Equation (7) is a regression that does not include any control variables, whereas equation (8) controls for working conditions measured by demand and supply factors. The estimates are based on OLS regressions with standard errors clustered at practice level. Standard errors are reported in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

unemployed for at least 6 months') to 15% (for the indicator '+30-year-olds who are single'). Supply factors include indicators capturing organisational factors and access to health care providers. In terms of organisational factors, the lowest proportions of GPs are in North Denmark Region and Region Zealand. In terms of access to other providers, we find that the GPs are split in three almost equal size groups of rurality of their location (captured by the density of population).

Our sample of GPs consists of around 35.3% of our study population of GPs (see Appendix E). A natural question is therefore whether our sample of GPs is representative of the study population. Appendix E shows the results of representativity tests on GPs' working conditions (work satisfaction and motivations cannot be tested as they are only available for GPs responding to the survey). Our sample of GPs' working conditions differ slightly on some indicators from the study population. They have on average slightly fewer enlisted patients per GP, and these patients have slightly better socioeconomic statuses. They also operate more in rural areas (thinly populated), which is also reflected by them to a lesser extent working in the Capital Region of Denmark and to a larger extent in Central Denmark Region.

Table 4
The link between GPs' motivations and work satisfaction (bias adjusted Oster estimates).

Outcome: Work satisfaction	(1)	(2)	(3)
Profit orientation (EM)	−0.589**	−0.606**	−0.615**
Altruism towards the patient (PO)	0.114	0.150	0.168
Altruism towards society (PSM)	0.951**	1.003***	1.029***
Reputational concerns (REP)	0.743***	0.702***	0.682**
	R^2=0.020	R^2 = 0.052	R^2_{max} = 0.068

Notes: Columns (1) and (2) provide the estimates for the uncontrolled and controlled regression models, respectively (as reported in Table 3). Column (3) shows the bias adjusted Oster estimates based on OLS regressions with the same set of observable variables as in the controlled model (column 2). As recommended by Oster (2019), we assume that the degree of selection on unobservable variables is the same as the selection on the observable variables ($\delta = 1$) and that R^2_{max} is equal to 1.3 multiplied by R^2 for the controlled regression model. The test statistics for the bias adjusted estimates are based on bootstrapped standard errors (1000 reps). *p < 0.10, **p < 0.05, ***p < 0.01.

6.2. Regression results

We now turn to the regressions results, which show the associations between GPs' motivations and work satisfaction. Table 3 shows the regression results both with and without controlling for demand and supply factors related to GPs' working conditions (equations (7) and (8) in section 5). We find that GPs' degree of profit orientation, societal altruism, and reputational concerns are statistically significantly associated with their work satisfaction, whereas there is no statistically significant association when considering their patient altruism (see column 1). More specifically, for altruism towards society we find that a one standard deviation (SD) increase in altruism (equal to 0.15) is associated with an increase of 0.14 in work satisfaction,[2] corresponding to 8.4% of one SD in satisfaction. For reputational concerns, a one SD increase in motivation (equal to 0.20) relates to a 0.15 increase in work satisfaction, which is 8.7% of one SD in work satisfaction. In contrast, we find that for profit-orientation a one SD increase in profit-orientation (equal to 0.23) is associated with a reduction in work satisfaction by 0.14, which is equivalent to 8.0% of one SD in work satisfaction.

The estimated relationships between GPs' motivations and work satisfaction are robust to taking GPs' working conditions into account (see column 2). In fact, most observable working conditions are statistically insignificant. Our subgroup analyses (described in Section 5.1) further confirm no statistically significant interactions between working conditions and different sources of motivation (except for a positive relationship between reputation and severely ill patients (sub-group 2), results are available upon request).

Following the approach by Oster (2019), we also find that the estimates are stable to adjustments for the potential influence of unobserved variables (see column 3 in Table 4). As recommended by Oster (2019), we assume that the degree of selection on unobservable variables is the same as the selection on the observable variables ($\delta = 1$) and that R^2_{max} is equal to 1.3 multiplied by R^2 for the regression model including controls for GPs' working conditions (column 2 in Table 3).

6.3. Robustness checks

We perform several supplementary analyses to further investigate the robustness of our findings. First, we find that our results are largely robust to different ways of measuring motivation, such as weighting

[2] This can be calculated by multiplying the estimate for public service motivation (PSM), which is equal to 0.951, with the SD of PSM (equal to 0.15).

motivational items based on the confirmatory factors analyses (Appendix F), excluding 'I do not know/want to answer' responses (Appendix G), and dichotomising at either the 50th- or 75th-percentiles of the distribution of the motivations (Appendices H and I). Appendix J shows that our findings are robust to not controlling for other motivations, which aligns with our previous finding of a low correlation between these measures (in Table 2). Appendix K shows that controlling for GP gender and age does not impact the estimated relationships between motivations and work satisfaction.

7. Discussion

Our empirical analyses confirm the theoretical assumption that different sources of motivation contribute to physicians' utility (proxied by their work satisfaction). This aligns with empirical studies showing that (utility maximising) physicians respond to incentives appealing to different sources of motivations (e.g. Scott et al. (2011); Kolstad (2013); Olsen et al. (2009); Aars et al. (2024)) and that the existence of such incentives may relate to their work satisfaction (de Oliveira Vasconcelos Filho et al., 2016; Tung et al., 2020; Linzer et al., 2017).

We further find that the nature of the relationship between motivation and work satisfaction depends on the source of motivation. The association is positive for societal altruism and reputational concerns, whilst it is negative for profit-orientation and statistically insignificant for patient altruism. As it is generally assumed that physicians' utility increases in motivations (Ellis and McGuire, 1986; Olivella and Siciliani, 2017; McGuire and Pauly, 1991), it may seem surprising that profit orientation is negatively related to work satisfaction and that patient altruism is unrelated to work satisfaction. There could be several explanations for these findings. As shown in our theory model (section 2), if physicians' target profit is not met, then being more profit orientated may cause more dissatisfaction. The chosen profit target and the ability to reach it could potentially also relate to unobserved working conditions. We do not have information on GPs' individual profit target, though the notion of physicians' profit target has been established in previous theory literature (McGuire and Pauly, 1991) and has also been identified empirically (Rizzo and Zeckhauser, 2003).

Targets could potentially also play a role for the non-financial components in the utility function. Our finding of a lack of statistically significant relationship between patient altruism and work satisfaction could thus be due to physicians not reaching a targeted patient benefit, such as those stated for outcome measures in clinical guidelines. Another explanation for our findings could be that more profit-orientated or patient-altruistic physicians could generally have a personality trait of being less satisfied. It could also be that these physicians are more willing to compromise their work satisfaction to improve non-work-related aspects of life, implying that they experience higher non-monetary costs of care. One could also argue that the statistically insignificant finding for patient altruism could be explained by our survey-based measure not sufficiently capturing this source of motivation. Reassuringly, previous studies using the same measure to proxy patient altruism find that it is associated with GPs' care (Oxholm et al., 2024; Jensen and Andersen, 2015), though we recognise that the health economics literature has measured and defined patient altruism in different ways (see Appendix A on related literature and also Attema et al. (2023) and Ge et al. (2022)). Another possible concern is that patient altruism is correlated with other sources of motivation such as reputation. Reassuringly, the motivations are relatively weakly correlated (see Table 2) and the estimates remain stable without adjusting for other motivations (see Appendix J1-J4).

Our empirical findings also show that demand and supply factors do not explain the relationship between physicians' motivations and work satisfaction. We also observe no associations between these working conditions and work satisfaction. This contrasts findings from other studies. For example, studies from both Australia and Scotland show that GPs operating in rural areas have a higher work satisfaction (Eaton-Hart et al., 2023; Ulmer and Harris, 2002). Other related examples include studies from Denmark, finding statistically significant associations between GPs' degree of burnout and their patients' multimorbidity and deprivation (Pedersen et al., 2020; Pedersen and Vedsted, 2014). However, our finding aligns with a study of English GPs, which find no significant differences in GPs' overall work satisfaction and population deprivation (Anderson et al., 2025). Our study includes a large number of objectively measured demand and supply factors, such as enlisted patients' health and socioeconomic statuses, list size per GP in a practice, and geographical characteristics linked to access to healthcare providers and organisational structures. Although we cannot be certain that unobserved factors remain, we show that the estimates are robust to including these many controls and also to adjusting for the potential influence of unobserved variables using the suggested approach by Oster (2019).

Our study has several policy implications. Healthcare systems are struggling to retain and recruit physicians in different parts of their system (OECD, 2023). A factor they should consider is physicians' work satisfaction, because studies find it to be important for retention in the profession (Andersen et al., 2018). Our findings suggest that policymakers may design more effective policies targeted the group of less satisfied physicians by being aware that these appear to be more profit orientated and less altruistic towards society or reputationally concerned. Motivating those with lower work satisfaction can be used to ensure that physicians' utility from working meets or exceeds outside options (Jullien, 2000), such that they remain in the workforce. For the more profit orientated physicians, financial rewards may be a successful remedy for retainment. However, Yordanov et al. (2023) find that only a small segment of Danish GPs are mainly profit-orientated. Our findings also suggest that policies appealing to physicians' altruism and reputational concerns rather than their profit orientation may attract more satisfied individuals to the profession. Examples of such policies include the provision of continuous feedback and guidelines highlighting benefits and achievements from physicians' care. One could envisage that such policies prove more cost-effective relative to financial incentives in creating a sustainable workforce in the long run.

Our study has some limitations. In our empirical analyses, we minimise the risk of omitted variable bias by using a comprehensive set of control variables. However, we cannot rule out that unobserved factors remain. For example, due to data limitations patients' health statuses are based on diagnoses recorded in hospitals, which may not capture all diagnoses of patients treated in general practice (see section 4.2). Another example could be if a GP experiences a shock (e.g. a family member falling ill) that affects both their propensity to be satisfied (δ_i) and the importance of each source of motivation (e.g. generating profits become more important). In our model, this would generate a correlation between the individual propensity to be satisfied (δ_i) and the importance of each source of motivation. As the GPs' individual propensity to be satisfied is unobservable, our empirical analysis implicitly assumes that it is independent of different sources of motivation.

Another limitation is that our measures of motivations and work satisfaction are based on self-reported responses to a nation-wide survey. Although survey data has several advantages, such as providing direct and validated measures of motivations and work satisfaction, these data may suffer from biases, such as social desirability bias and limited external validity. Our measures of motivations are also not elicited from trade-offs as in, for example, laboratory experiments (Godager and Wiesen, 2013); however, they accommodate the co-existence of different motives, which is supported by both theory (in section 2) and a real-world setting, where generating profits (such as fee for service) may also improve patient benefits from care. Another limitation is that we have chosen to proxy physicians' utility by using a single item of overall work satisfaction, which is known to be a multidimensional and complex concept (see e.g. Williams et al. (1999); Bovier and Perneger (2003)). A further limitation is that work satisfaction does not encompass utility derived from non-work-related aspects of life. Oxholm

et al. (2024) find that more profit orientated physicians generate more fee-for-service per patient. One could therefore hypothesize that these profit orientated physicians have a higher non-work-related satisfaction, and thereby utility, due to better access to financial means. As previously mentioned, we may also not sufficiently capture all factors that may impact the relationship between physicians' motivations and work satisfaction.

Despite these limitations, this study provides a theoretical framework together with novel empirical evidence of the relationship between different sources of motivation and physicians' work satisfaction. The evidence supports that these elements are important components of physicians' utility function.

Ethical approval statement

Complying with European data protection rules, the Research & Innovation Organisation at University of Southern Denmark registered the data processing activities for this project on behalf of the Danish Data Protection Agency (file number 10.482). The Regional Scientific Ethical Committees for Southern Denmark assessed the study and concluded that no further ethical approval was needed cf. section 14, subsection 1 in the Act on Research Ethics Review of Health Research Projects (file number 20192000-99).

CRediT authorship contribution statement

Anne Sophie Oxholm: Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Line Bjørnskov Pedersen:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Dorte Gyrd-Hansen:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Luigi Siciliani:** Conceptualization, Funding acquisition, Methodology, Writing – original draft, Writing – review & editing.

Acknowledgements

We are thankful to the GPs who participated in the work life survey in Denmark in 2019. We are also grateful for the financial support by the Carlsberg Foundation [Grant number CF22-0474] and the Novo Nordisk Foundation [Grant number NNF18OC0033978].

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2026.119263.

Data availability

The authors do not have permission to share data.

References

Aars, O.K., Godager, G., Kaarboe, O., Moger, T.A., 2024. Sending emails to reduce medical costs? The effect of feedback on general practitioners' claiming of fees. J. Behav. Exp. Econ. 109, 102178.
Allen, T., Gyrd-Hansen, D., Kristensen, S.R., Oxholm, A.S., Pedersen, L.B., Pezzino, M., 2022. Physicians Under Pressure: Evidence from Antibiotics Prescribing in England. Medical Decision Making, 0272989X211069931.
Andersen, L.B., Pallesen, T., Holm Pedersen, L., 2011. Does ownership matter? Public service motivation among physiotherapists in the private and public sectors in Denmark. Rev. Publ. Person. Adm. 31, 10–27.
Andersen, M.K., Pedersen, L.B., Waldorff, F.B., 2018. Retirement, job satisfaction and attitudes towards mandatory accreditation: a Danish survey study in general practice. BMJ Open 8, e020419.
Anderson, M., Gibson, J., Walker, B., Hutchinson, J., Checkland, K., Sutton, M., 2025. Deprivation and general practitioners' working lives: repeated cross-sectional study. J. R. Soc. Med., 01410768251330076
Attema, A.E., Galizzi, M.M., Gros, M., Hennig-Schmidt, H., Karay, Y., L'Haridon, O., Wiesen, D., 2023. The formation of physician altruism. J. Health Econ. 87, 102716.
Besley, T., Ghatak, M., 2005. Competition and incentives with motivated agents. Am. Econ. Rev. 95, 616–636.
Birk, H.O., Vrangbæk, K., Rudkjøbing, A., Krasnik, A., Eriksen, A., Richardson, E., Jervelund, S.S., 2024. Denmark: Health system review. Health Syst. Trans. 26, 1–186.
Blomqvist, Å., 1991. The doctor as double agent: information asymmetry, health insurance, and medical care. J. Health Econ. 10, 411–432.
Bénabou, R., Tirole, J., 2003. Intrinsic and extrinsic motivation. Rev. Econ. Stud. 70, 489–520.
Bovier, P.A., Perneger, T.V., 2003. Predictors of work satisfaction among physicians. Eur. J. Publ. Health 13, 299–305.
Brosig-Koch, J., Hennig-Schmidt, H., Kairies-Schwarz, N., Kokot, J., Wiesen, D., 2024. A new look at physicians' responses to financial incentives: quality of care, practice characteristics, and motivations. J. Health Econ. 94, 102862.
De Oliveira Vasconcelos Filho, P., De Souza, M.R., Elias, P.E.M., D'Ávila Viana, A.L., 2016. Physicians' job satisfaction and motivation in a public academic hospital. Hum. Resour. Health 14, 1–11.
Delfgaauw, J., Dur, R., 2008. Incentives and workers' motivation in the public sector. Econ. J. 118, 171–191.
Eaton-Hart, J.H., Gillies, J.C., Mercer, S.W., 2023. How do the working lives of general practitioners in rural areas compare with elsewhere in Scotland? cross-sectional analysis of the Scottish school of primary care survey. Rural Remote Health 23, 8100-8100.
Ellis, R.P., Mcguire, T.G., 1986. Provider behavior under prospective reimbursement: cost sharing and supply. J. Health Econ. 5, 129–151.
Farley, P.J., 1986. Theories of the price and quantity of physician services: a synthesis and critique. J. Health Econ. 5, 315–333.
Francois, P., 2000. 'Public service motivation'as an argument for government provision. J. Publ. Econ. 78, 275–299.
Ge, G., Godager, G., Wang, J., 2022. Exploring physician agency under demand-side cost sharing—An experimental approach. Health Econ. 31, 1202–1227.
Godager, G., Wiesen, D., 2013. Profit or patients' health benefit? Exploring the heterogeneity in physician altruism. J. Health Econ. 32, 1105–1116.
Huesmann, K., Ndiaye, Y.S., Waibel, C., Wiesen, D., 2026. How the design of ranking systems and ability affect physician effort. Manag. Sci. 72, 1198–1213.
Jensen, U.T., Andersen, L.B., 2015. Public service motivation, user orientation, and prescription behaviour: doing good for society or for the individual user? Public Adm. 93, 753–768.
Jensen, U.T., Vestergaard, C.F., 2017. Public service motivation and public service behaviors: testing the moderating effect of tenure. J. Publ. Adm. Res. Theory 27, 52–67.
Jullien, B., 2000. Participation constraints in adverse selection models. J. Econ. Theor. 93, 1–47.
Kolstad, J.T., 2013. Information and quality when motivation is intrinsic: evidence from surgeon report cards. Am. Econ. Rev. 103, 2875–2910.
Linzer, M., Sinsky, C.A., Poplau, S., Brown, R., Williams, E., Investigators, H.W.P., 2017. Joy in medical practice: clinician satisfaction in the healthy work place trial. Health Aff. 36, 1808–1814.
Lydiksen, N., Gotfredsen, A., Ladenburg, J., Stenbro, H., 2023. Job satisfaction and firm earnings—Evidence from matched survey and register data. Lab. Travail 37, 197–221.
Mcguire, T.G., Pauly, M.V., 1991. Physician response to fee changes with multiple payers. J. Health Econ. 10, 385–410.
Milligan, G.W., Cooper, M.C., 1988. A study of standardization of variables in cluster analysis. J. Classif. 5, 181–204.
Moscelli, G., Mello, M., Sayli, M., Boyle, A., 2024. Nurse and doctor turnover and patient outcomes in NHS acute trusts in England: retrospective longitudinal study. Br. Med. J. 387.
OECD, 2020. How's life? 2020: Measuring Well-being. In: OECD Publishing, Paris. https://doi.org/10.1787/9870c393-en.
OECD, 2023. Ready for the next Crisis? Investing in Health System Resilience. OECD Publishing.
Olivella, P., Siciliani, L., 2017. Reputational concerns with altruistic providers. J. Health Econ. 55, 1–13.
Olsen, K.R., 2012. Patient complexity and GPS'income under mixed remuneration. Health Econ. 21, 619–632.
Olsen, K.R., Gyrd-Hansen, D., Boegh, A., Hansen, S.H., 2009. GPs as citizens' agents: prescription behavior and altruism. Eur. J. Health Econ. 10, 399–407.
Olsen, Kim Rose, Skovsgaard, Christian Volmar, Oxholm, Anne Sophie, Vestergaard, Mogens, 2023. List size disequilibria and service provision in general practice. Nordic Journal of Health Economics 6 (1), 147–161. (Accessed 21 December 2023).
Oster, E., 2019. Unobservable selection and coefficient stability: theory and evidence. J. Bus. Econ. Stat. 37, 187–204.
Oxholm, A.S., Allen, T., Gyrd-Hansen, D., Jarbøl, D.E., Sydenham, R.V., Pedersen, L.B., 2022. Work pressure and job dissatisfaction: challenges in Danish general practice. Nord. J. Health Econ. 10 (1), 46–60.
Oxholm, A.S., Andersen, M.K., Waldorff, F.B., Wehberg, S., Pedersen, L.B., 2025. The role of providers' intrinsic motivation for quality of care and responses to a non-financial incentive. Soc. Sci. Med., 118378
Oxholm, A.S., Gyrd-Hansen, D., Jacobsen, C.B., Jensen, U.T., Pedersen, L.B., 2024. The link between physician motivation and care: the link between physician motivation and care. Eur. J. Health Econ. 25 (3), 525–537.
Pedersen, A.F., Nørøxe, K.B., Vedsted, P., 2020. Influence of patient multimorbidity on GP burnout: a survey and register-based study in Danish general practice. Br. J. Gen.

Pract. 70 (691), e95–e101. https://doi.org/10.3399/bjgp20X707837. PMID: 31932298; PMCID: PMC6960003.
Pedersen, A.F., Vedsted, P., 2014. Understanding the inverse care law: a register and survey-based study of patient deprivation and burnout in general practice. Int. J. Equity Health 13, 121.
Quan, H., Li, B., Couris, C.M., Fushimi, K., Graham, P., Hider, P., Januel, J.-M., Sundararajan, V., 2011. Updating and validating the Charlson comorbidity index and score for risk adjustment in hospital discharge abstracts using data from 6 countries. Am. J. Epidemiol. 173, 676–682.
Rizzo, J.A., Zeckhauser, R.J., 2003. Reference incomes, loss aversion, and physician behavior. Rev. Econ. Stat. 85, 909–922.
Scott, A., Sivey, P., Ouakrim, D.A., Willenberg, L., Naccarella, L., Furler, J., Young, D., 2011. The effect of financial incentives on the quality of health care provided by primary care physicians. Cochrane Database Syst. Rev. (9). https://doi.org/10.1002/14651858.CD008451. Art. No.: CD008451.
Simonsen, N.F., Kjær, T., Gyrd-Hansen, D., 2021. Pure altruism and misjudgement: a bad combination? J. Health Econ. 80, 102550.
Simonsen, N.F., Oxholm, A.S., Kristensen, S.R., Siciliani, L., 2020. What explains differences in waiting times for health care across socioeconomic status? Health Econ. 29, 1764–1785.
STATISTICS DENMARK, 2022. Degree of urbanisation (DEGURBA) [Online]. Available: https://www.dst.dk/en/Statistik/dokumentation/nomenklaturer/degurba-dst. (Accessed 5 April 2022).
Tung, Y.-C., Chou, Y.-Y., Chang, Y.-H., Chung, K.-P., 2020. Association of intrinsic and extrinsic motivating factors with physician burnout and job satisfaction: a nationwide cross-sectional survey in Taiwan. BMJ Open 10, e035948.
Ulmer, B., Harris, M., 2002. Australian GPs are satisfied with their job: even more so in rural areas. Fam. Pract. 19, 300–303.
Vedsted, P., Sørensen, T.H., 2009. Praksisscore på DAMP baseret på praksispopulationer i 2006. Differentieret Almenmedicinsk Patientindeks (DAMPindeks) MODEL I og MODEL II. Revideret Fjerde Udredning for Fagligt Udvalg Vedr. Almen Praksis Praktiserende Lægers Organisation og Regionernes Lønnings- og Takstnævn.
Williams, E.S., Konrad, T.R., Linzer, M., Mcmurray, J., Pathman, D.E., Gerrity, M., Schwartz, M.D., Scheckler, W.E., Van Kirk, J., Rhodes, E., 1999. Refining the measurement of physician job satisfaction: results from the physician worklife survey. Med. Care 37, 1140–1154.
Yordanov, D., Oxholm, A.S., Gyrd-Hansen, D., Pedersen, L.B., 2023. Mapping general practitioners' motivation: it is not all about the money. A nation-wide cross-sectional survey study from Denmark. Br. J. Gen. Pract. 73, e687–e693.