Physicians' Occupational Licensing and the Quantity-Quality trade-off
Extended Abstract

The shortage of physicians is a long-standing and increasingly urgent global concern. Currently, providing adequate healthcare access requires at least an additional 7 million physicians (Haakenstad et al., 2022). A deficit of 125 thousand doctors is projected by 2034 for the United States alone (Association of American Medical Colleges, 2024). To address this growing problem, a first-order and feasible policy intervention is to revisit physician licensing policies. These policies, widely implemented across the globe, aim to ensure quality and resolve asymmetric information but fundamentally weigh a quantity-quality trade-off: While licensing may improve quality and, therefore, improve health outcomes, it also decreases supply.[1]

Licensing policies are playing an increasingly relevant role in the healthcare sector due to the increased physician migration worldwide. In the United States, the number of physicians born and educated abroad has increased by 30 percent since 2004 and now makes up 20 percent of the overall count (Association of American Medical Colleges, 2023).[2] Still, it is estimated that only one third of employed foreigned doctors are on track to practice medicine and that licensing plays a critical role in explaining this fact. Despite the quantity-quality trade-off embedded in physician licensing, little is known about how to design an optimal licensing policy and whether and how it should adjust to changes in the fundamentals of the labor market for physicians, such as increased physician migration.

In this paper, we first provide a simple theoretical framework to study the optimal licensing policy and highlight the key economic fundamentals that govern the quantity-quality trade-off. Informed by the theory, we then provide an empirical framework to evaluate the optimality of the current licensing policy for public sector doctors in Chile with the objective of minimizing inpatient mortality.

Chile provides an ideal setting to study physician licensing and how its design depends on labor market fundamentals. First, the labor market fundamentals have changed significantly. The number of test-takers for the national licensing exam increased fivefold between 2009 and 2018, largely fueled by a fourfold increase in the number of foreign test-takers, as well as an increase in local freshly-minted medical school graduates. In tandem with the surge in test-takers, passing rates decreased

[1] More broadly, occupational licensing is an increasingly prevalent labor market regulation, currently covering 22 and 25 percent of all workers in European Union (Koumenta and Pagliero, 2019) and in US (Cunningham, 2019), respectively.

[2] Similarly, in OECD countries, foreign-trained physicians constitute roughly 30 percent of the physician workforce, representing an increasingly growing share (Socha-Dietrich and Dumont, 2021).

from 92 percent to 58 percent in the period. Second, the Chilean licensing exam has characteristics and purposes similar to those applied in different countries. Passing the exam is mandatory for working in the public sector and results in the automatic revalidation of a foreign medical degree.[3] Finally, Chile has rich data on patients' outcomes, hospital staffing, and physician's performance in the licensing exam.

Our theoretical framework highlights the quantity-quality trade-off embedded in optimal licensing in our context. There is a production function for hospital care, where the quantity and quality of physicians are key inputs. The government has a licensing technology that provides a noisy signal of a physician's quality, and grants licenses to those with a signal above a threshold. The optimal licensing threshold equalizes the marginal quality and quantity effect on patients' outcomes of changing the threshold. These effects depend on the parameters of the production function and the quantity and quality elasticities (with respect to the licensing threshold), which in turn depend on the distribution of quality in the population of test-takers and the precision of the licensing technology (i.e., signal-to-noise ratio). We show that, generally, higher returns to quality, lower returns to quantity, and a lower signal-to-noise ratio decrease the optimal licensing threshold.

In the empirical application, we expand the model to multiple hospitals, allowing for signal-to-noise ratios that depend on the physician's region of training, and a labor matching function between physicians and hospitals. These matching functions depend on physicians' and hospitals' preferences and, therefore, vary with physicians' quality as well as their training region. Importantly, they accommodate for potential differences in preferences for location between local graduates and foreign-trained doctors, an important feature in light of previous work (Goodfellow et al., 2016). To accommodate the competitive effects of changes in the labor supply, these matching functions also depend on the inflow of physicians to the system. Leveraging our empirical model, we derive sufficient statistics that govern the impacts of changing the optimal licensing threshold, i.e., the quantity and quality parameters of the production function and the quantity and quality elasticity of labor with respect to the licensing threshold.

Our data includes administrative payroll records for the universe of public sector employees in Chile, paired with individual-level outpatient outcomes for the years 2011 to 2019. Key to our analysis, we also observe the universe of test takers and their scores. To estimate the production function, we leverage the increase in the labor supply of physicians brought about primarily by immigration triggered by "shocks" in the countries of origin but also by the expansion of medical schools in Chile. Concretely, we estimate the impact of changing the quantity and quality of

[3]Similar tests are the USMLE in the US, the NCE in France, and the NMLE in Japan.

physicians on hospital outcomes using a shift-share IV design (Altonji and Card, 1989; Autor et al., 2013; Borusyak et al., 2022) that sidesteps identification issues related to the endogeneity of inputs.[4] The production function estimates reveal that quantity and quality matter for inpatient mortality. We find that a 10% increase in the number of physicians, holding quality constant, leads to a 9% decrease in mortality, while a 10% increase in the average licensing score of physicians, holding quantity constant, leads to an 8.3% decrease in mortality.

The quantity and quality elasticities are a function of the matching probabilities and the distribution of scores in the population, which can be estimated directly from the data. The elasticities also depend on the signal-to-noise ratio, which we estimate using repeated test-takers and a method of moments estimator. We estimate conditional matching probabilities and find economically meaningful differences in the matching probabilities of national and foreign doctors. Consistent with earlier literature, foreign physicians are more likely to match with rural and underserved hospitals. The signal-to-noise ratios are also heterogeneous by origin, with a higher precision for nationals than foreigners.

Equipped with estimates of sufficient statistics derived from our model, we evaluate the net benefits of marginally lowering the licensing threshold. Our results imply that, at the current threshold, the marginal quality effect is higher than the marginal quantity effect. On the net, lowering the threshold would decrease aggregate mortality at the margin. Although patients from most hospitals benefit from the policy, the effects of changing the licensing policy are heterogeneous, and the highest benefits accrue to smaller hospitals with higher physician scarcity at baseline.

We finish by showing that the change in labor market fundamentals recently experienced in Chile has increased the net benefits of reducing the threshold, even if the number of test takers and physicians practicing has increased in the absence of a reform. Increased labor supply led to an increase in the number of marginal physicians that would be licensed under a lower threshold, as new doctors have lower scores than the previous stock of physicians. Consequently, the quantity and quality elasticity of lowering the threshold are higher. However, the increased quantity effect dominates the increased quality effect. This result highlights how evolving market fundamentals alter the optimal design of licensing policies.

Our paper contributes to several strands of the literature. We add to a longstanding debate regarding the desirability of occupational licensing in health care (Friedman and Kuznets, 1945; Friedman, 1962; Kleiner, 2014, 2016; Kleiner et al., 2016). Relative to this literature we provide a framework to understand the quantity/quality trade-off embedded in licensing and empirically

[4] Arguably, these are less of concern in the context of public sector staffing decisions.

evaluate the stringency of licensing policies in relevant health outcomes. More broadly, our paper adds to the research that studies occupation licensing in other settings, such as the public sector (Kleiner and Wang, 2023); public schools Angrist and Guryan (2008); Kleiner (2011); Larsen et al. (2020); and the aggregate effect on welfare across occupations (Kleiner and Soltas, 2023).

We also contribute to a limited literature studying whether physician quantity matters for health outcomes. Other papers have shown a correlation between location mortality and the number of physicians (Finkelstein et al., 2021) or focus on primary care physicians (Carrillo and Feres, 2019). Relative to this literature we use exogenous variation to show physician quantity matters for health outcomes in tertiary care. Our work also complements previous research on whether physician quality matters. Other papers have studied elite medical training (Doyle et al., 2010), graduation medical exams (Guarin et al., 2021), and value-added (Fletcher et al., 2014; Ginja et al., 2024). To the best of our knowledge, there is no empirical evidence that licensing improves the quality of care and that licensing scores predict health outcomes. Relatedely, we also contribute to a scant literature in the estimation of the production functions in healthcare (Gaynor et al., 2015; Grieco and McDevitt, 2017). Relative to this literature, we are able to make progress by exploiting exogenous variation in inputs to estimate the returns to quantity and quality on mortality.

References

Altonji, J. and D. E. Card (1989). *The effects of immigration on the labor market outcomes of less-skilled natives*. Industrial Relations Section, Princeton University.

Angrist, J. D. and J. Guryan (2008). Does Teacher Testing Raise Teacher Quality? Evidence from State Certification Requirements. *Economics of Education Review 27*(5), 483–503.

Association of American Medical Colleges (2023). 1 in 5 U.S. Physicians Was Born and Educated Abroad: Who Are They and What Do They Contribute? Accessed: 2024-07-30.

Association of American Medical Colleges (2024). The Complexities of Physician Supply and Demand: Projections From 2021 to 2036. Technical report, AAMC, Washington, DC.

Autor, D. H., D. Dorn, and G. H. Hanson (2013). The china syndrome: Local labor market effects of import competition in the united states. *American economic review 103*(6), 2121–2168.

Borusyak, K., P. Hull, and X. Jaravel (2022). Quasi-experimental shift-share research designs. *The Review of economic studies 89*(1), 181–213.

Carrillo, B. and J. Feres (2019). Provider Supply, Utilization, and Infant Health: Evidence from a Physician Distribution Policy. *American Economic Journal: Economic Policy 11*(3), 156–96.

Cunningham, E. (2019). Professional Certifications and Occupational Licenses: Evidence from the Current Population Survey. *Monthly Labor Review*.

Doyle, J. J., S. M. Ewer, and T. H. Wagner (2010). Returns to Physician Human Capital: Evidence from Patients Randomized to Physician Teams. *Journal of Health Economics 29*(6), 866–882.

Finkelstein, A., M. Gentzkow, and H. Williams (2021). Place-Based Drivers of Mortality: Evidence from Migration. *American Economic Review 111*(8), 2697–2735.

Fletcher, J. M., L. I. Horwitz, and E. Bradley (2014). Estimating the Value Added of Attending Physicians on Patient Outcomes. Working Paper 20534, National Bureau of Economic Research.

Friedman, M. (1962). *Capitalism and Freedom*. University of Chicago Press.

Friedman, M. and S. Kuznets (1945). *Income from Independent Professional Practice*. NBER.

Gaynor, M. S., S. A. Kleiner, and W. B. Vogt (2015). Analysis of hospital production: An output index approach. *Journal of Applied Econometrics 30*(3), 398–421.

Ginja, R., J. Riise, B. Willage, and A. Willén (2024). Does Your Doctor Matter? Doctor Quality and Patient Outcomes . *Journal of Political Economy Microeconomics*.

Goodfellow, A., J. G. Ulloa, P. T. Dowling, E. Talamantes, S. Chheda, C. Bone, and G. Moreno (2016). Predictors of Primary Care Physician Practice Location in Underserved Urban or Rural

Areas in the United States: A Systematic Literature Review. *Academic Medicine: Journal of the Association of American Medical Colleges 91*(9), 1313–1321.

Grieco, P. L. and R. C. McDevitt (2017). Productivity and quality in health care: Evidence from the dialysis industry. *The Review of Economic Studies 84*(3), 1071–1105.

Guarin, A., C. Posso, E. Saravia, and J. Tamayo (2021). The Luck of the Draw: The Causal Effect of Physicians on Birth Outcomes. Technical report.

Haakenstad, A., C. M. S. Irvine, M. Knight, C. Bintz, A. Y. Aravkin, P. Zheng, V. Gupta, M. R. M. Abrigo, A. I. Abushouk, O. M. Adebayo, G. . Agarwal, and R. Lozano (2022). Measuring the Availability of Human Resources for Health and Its Relationship to Universal Health Coverage for 204 Countries and Territories from 1990 to 2019: A Systematic Analysis for the Global Burden of Disease Study 2019. *The Lancet 399*(10341), 2129–2154.

Kleiner, M. M. (2011). Enhancing Quality or Restricting Competition: The Case of Licensing Public School Teachers. *Journal of Law and Public Policy 5*(2), 1–15.

Kleiner, M. M. (2014). Occupational Licensing in Health Care. In A. Culyer (Ed.), *Encyclopedia of Health Economics*. Elsevier.

Kleiner, M. M. (2016). Battling over Jobs: Occupational Licensing in Health Care. *American Economic Review 106*(5), 165–70.

Kleiner, M. M., A. Marier, K. W. Park, and C. Wing (2016, 5). Relaxing Occupational Licensing Requirements: Analyzing Wages and Prices for a Medical Service. *The Journal of Law and Economics 59*(2), 261–291.

Kleiner, M. M. and E. J. Soltas (2023, 02). A Welfare Analysis of Occupational Licensing in U.S. States. *The Review of Economic Studies 90*(5), 2481–2516.

Kleiner, M. M. and W. Wang (2023). The Labor Market Effects of Occupational Licensing in the Public Sector. Working Paper 31213, National Bureau of Economic Research.

Koumenta, M. and M. Pagliero (2019). Occupational Regulation in the European Union: Coverage and Wage Effects. *British Journal of Industrial Relations 57*(4), 818–849.

Larsen, B., Z. Ju, A. Kapor, and C. Yu (2020). The Effect of Occupational Licensing Stringency on the Teacher Quality Distribution. Working Paper 28158, National Bureau of Economic Research.

Socha-Dietrich, K. and J. Dumont (2021). International Migration and Movement of Doctors to and Within OECD Countries - 2000 to 2018: Developments in Countries of Destination and Impact on Countries of Origin. Technical Report 126, OECD Publishing, Paris.