Research Statement: Profile, Accomplishments, and Aims¹

I. Sebastian Buhai²

A. Research Profile and Scientific Contribution Highlights

I am primarily a Microeconometrician and Labor Economist, with further interests in Empirical Industrial Organization, and Applied Microeconomics in general. I have an uncommonly international career trajectory, with current main appointments/ affiliations at top universities and departments/ research centers from Sweden (Swedish Institute for Social Research=SOFI, at Stockholm University), Portugal (Center for Research in Economics and Management=NIPE, at University of Minho), and France (Centre pour la Recherche et ses Applications=CEPREMAP, domiciled at ENS/ PSE in Paris)—and previous positions at other top scientific departments/ institutions from Sweden, Denmark, Italy, USA, UK, and the Netherlands. My formal education trajectory is unusually multidisciplinary, with PhD and MPhil degrees in Economics from the Tinbergen Institute and Erasmus University Rotterdam, preceded by B.Sc. and B.A. degrees in Sciences (Theoretical Physics/ Mathematics) and respectively Social Sciences (Economics/ Law/ Political Sciences) from Utrecht University. I believe that a vast international network and an education/ training background having both highly specialized and broad liberal arts dimensions are the most productive assets of academics from ambitious institutions.

Most of my completed/ongoing research adapts or develops state-of-the-art Microeconometrics and Microeconomics methodology, with broad thematic applications in Labour Economics and Industrial Organization. Thematically, most of my research to date has studied labor and industrial market type of questions revolving around, inter alia, human capital accumulation and dynamics of worker careers; bargaining, rent-sharing, and wage formation; persistent earnings and employment disparities; firm performance, investment in tangibles/ intangibles, and employee welfare. Methodologically, my research expertise is particularly developed so far in relation to, on the one hand, game theory, real option theory, and search & matching theory; and on the other hand, theoretical and applied dimensions of crosssectional and panel-data econometrics, as well as structural modeling and causal inference in general. Equally relevant, I have extensive experience using public and proprietary data, from several countries/ sources, and considerable expertise with general programming and econometrics/ statistics/ data science software tools. The overlap between my teaching/ student supervision antecedents and my research interests is substantial, with my already having successfully taught a number of courses and/or supervised students on various topics in (Micro)econometrics, Empirical Industrial Organization, Economic Strategy, or Labour/ Education/ Personnel Economics, at graduate/ undergraduate levels, in shorter/ long formats, in 'classic' Economics departments and Business Schools, in several countries/ institutions. I am moreover enthusiastic about supervising students and/or teaching other courses linked to older and newer research interests, such as Dynamic Programming, Causality and Prediction in Economics, Effective Programming & Data Analysis, Real Options (in IO, Labor, Environmental Economics), Optimal Transport Methods in Economics, etc.

In terms of research excellence record/ potential, I have so far, *inter alia*, 4 (four) publications in leading mainstream journals — namely in **Econometrica** (its rank by the FR national agency of scientific research=CNRS: 1e), the **Journal of Business and Economic Statistics** (CNRS: 1), the **Scandinavian Journal of Economics** (CNRS: 2), and the **Journal of Economic Dynamics and Control** (CNRS: 1), being the main author for all of these. Next to other original research published in book/ monograph format and a couple of published and well cited research reviews, other 4 (four) ongoing projects (overviewed later in this document) presented in several invited seminars and major conferences will soon be submitted also to top journals; in parallel, I continue to work on a number of exciting projects in earlier stages of completion. Furthermore, I have a **research grant-winning record (all as PI) of almost 500,000 euro**, including therein two (2) very prestigious, highly competitive grants for individual career-development (of 2, and respectively 3 years). I am optimistic that my future research will also be funded by the most coveted (inter)national agencies/ programs.

¹ This version: **November 2024**; for the most up-to-date version: www.sebastianbuhai.com/Buhai_EcResearch_Statement.pdf. For a brief overview of my research profile, see: www.sebastianbuhai.com/Buhai_ResearchProfile_in_5slides.pdf. You could also consult some of the dedicated pages of my website, including www.sebastianbuhai.com/cv, www.sebastianbuhai.com/research, www.sebastianbuhai.com/media-coverage for more details and further information on my various scientific/ academic/ wider audience contributions, including links to drafts/ synopses of ongoing research work, course syllabi, science policy/ science popularization essays, etc.

² SOFI at Stockholm University (Stockholm, Sweden), NIPE at Minho University (Braga, Portugal), and CEPREMAP at the PSE/ENS Jourdan campus (Paris, France); full contacts and further information on www.sebastianbuhai.com.

One of my guiding research principles is to strive for scientific excellence, irrespective of whether I am engaging in fundamental or in applied research; an immediate implication is that both in my own research work, as well as in assessing the research of my peers, I have prioritized/ will always prioritize quality over quantity.³ Another guiding research philosophy is that I do not identify with any particular research 'ideology', opting to learn, apply, and develop new, eclectic methodological approaches; a consequence is that I have typically enjoyed collaborating with researchers from different (sub)fields or with different interests than mine. Moreover, I both practice and preach that research in Economics ought to aim for the—rigorous—combination of theory (derived models) and empirics (verification on data).

Last but not least, I have enthusiastically served the profession in numerous other research- and academic- relevant capacities—always deriving tremendous utility from doing so—such as, for instance: regular or *ad hoc* peer reviewer for scientific journals and publishing houses; expert evaluator for conferences or research grant calls; invited discussant of conference and workshop papers; invited panelist on science or socio-economic policies, for various international public/ private institution; initiator/ organizer/ manager of a few well-known international conferences or seminar series at top institutions. At the same time, I have long been an active member of a number of research centers, networks, and academic societies, in Economics and Science more generally. Furthermore, particularly in my country of birth—Romania, I have invested an enormous effort and time in disseminating/ interpreting/ discussing research/ policy for non-specialized audiences via mass-media or via public events, at the same time campaigning—and against all odds even (minimally) succeeding—to align some of the local, sometimes intentionally backward-looking, academic standards to the international standards of the top European/ US establishments that I am or have been part of so far.

B. Overview of Past, Ongoing, and Future Research

I. Past and selected ongoing research4

My completed and current research adapts state-of-the-art and/or develops novel Microeconometrics and Microeconomics methodology, with broad thematic applications in Labor Economics and Industrial Organization. While it is possible to structure my research also in a different way, I opted below for a division into five inter-related chapters, following the thematic overview exposed, e.g., on my public research webpage: www.sebastianbuhai.com/research.

a. Worker-firm dynamics under uncertainty and irreversibility

One large chapter of my research agenda so far has been dealing with worker-firm dynamics under uncertainty and (partly-) irreversible investments, including in this 'catchall' category the optimal decisions to hire or fire a worker, worker-firm bargaining and rent sharing, as well as within-firm and overall earnings inequality. Abstracting from details, the theoretical insight generally builds up on the intuitive idea that firms typically face considerable uncertainty when making major investment (or disinvestment) decisions, that being the case both when starting a new (scrapping an old) establishment and when expanding (shrinking) their workforce. Moreover, such decisions usually entail sunk costs that are—at least partially—irreversible. It is this interaction between irreversibility and uncertainty that creates an "option value of waiting" before, e.g., hiring new workers who require firm-specific human capital investment (before firing existing workers who have already acquired that irreversible investment). From that methodological standpoint, I have been applying real-option theory modeling, in the broad context of firm workforce adjustment under uncertain demand and costly adjustment, in my papers [2], [5], [7], [9], and [14]. Whereas in [2] we model the stochastic evolution of single worker-firm productivity matches, in [5], [7], [9] and [14] we extend in various ways that basic framework to large firms, with multiple workers. Except [14] which is fully theoretical, formalizing the real option model for the case of a monopsonist facing uncertain demand and adjusting its labor inputs at the extensive margin, the other mentioned papers also test empirically the envisaged theoretical models, using either panel data on individual worker histories as in [2], or on both firms and their workers, i.e. longitudinal Linked-Employer-Employee-Data (LEED), as in [5], [7], and [9]. Also using LEED, in [1] we rigorously verify some of the implications of such real-option models for worker careers.

³ To be sure, I praise all efforts seeking the optimization of the 'interest/ originality *versus* feasibility' relationship in any research—under the (explicit) constraint that corner solutions are avoided and (implicit) constraint that scientific rigor is never compromised.

To dig a tad deeper in the contribution of my papers mentioned above, while still keeping this a concise overview, in my (fully empirical) paper [1] we prove, adapting and extending state-of-the-art micro-econometric methods suitable for panel-data Mincer-type of wage regressions and respectively mixed-proportional-hazard models suitable for analyzing job durations, that initial predictions consistent with a real-option/ worker-firm bargaining model such as that developed in [7]—hypotheses concerning worker wage premia and worker separation hazards increasing and respectively decreasing in worker seniority, i.e., a conceptual addition to the internal labor market literature—are fully verified in exhaustive, economy-wide, LEED from two distinct labor markets. Furthermore, I judge the overall contribution of [2] as also critical from both a methodological point of view and having substantial implications in the context of the wage dynamics literature; inter alia, we show there that the incessant debate on 'wage returns to tenure' has virtually no meaning if the worker-firm matches are modeled through such a real-option theory lens, and that what were earlier interpreted as "returns" to the deterministic time spent in a firm ("tenure") are due almost entirely to, at least in the US PSID, to negative selection on the worker's outside option—which is shown by structurally estimating each of the parameters of our random-growth worker-firm productivity match model. While [5] partly adopts/adapts a similar theoretical framework, it tackles a different thematic: it combines the labor demand and early retirement literatures to show theoretically and test empirically, through a reduced-type model empirical exercise devised at both the individual worker and the aggregate firm-levels, for the subset of larger firms experiencing massive layoffs, that distressed firms will dismiss with predilection their lower-skilled employees eligible to retire early, given existing public early retirement in place. Part of the interest here is on the worker-firm dynamics at various retirement-eligible cutoffs, depending on Danish eligibility rules, which changed several times over the two-decade period considered. Next, the starting idea of [7] is to combine and extend [1] and [2], providing micro-foundations for, essentially, the ubiquitous incumbent rents and insider bargaining power. De facto, the strategy is to explicitly model the bargaining process generating the predictions tested in [1], solve the dynamic optimization problems of the firm and its workers, and then appropriately adapt the combined empirical setups of [1] and [2], showing that seniority profiles in wages are fully explained by the variation in the specific investment cost—estimated using the same LEED as in [1], stratified by narrow industry sectors. Finally, in project [9] I make a methodological contribution showing that in the presence of stochastic demand shocks, wage premia in the firm size are (severely) biased when estimated in the traditional way, e.g., fixedeffect Mincer-type regression; I then show how to correct for that bias when information on the firm output is available.

b. The importance of non-pecuniary job aspects for firm productivity and worker welfare

A second fairly large chapter within my research agenda hitherto has been to study the importance of various non-pecuniary job (dis)amenities for both firm productivity and for employee welfare, with the latter expressed via worker earnings, or job satisfaction (inferred either from job separations/ transitions data, or self-reported), or worker health outcomes, etc. For instance, in [3] we empirically investigate the impact of detailed work health and safety indicators on firm productivity, while in [6] I tackle a similar question from the employees' perspective, i.e. studying potential compensatory wage differentials for health and safety disamenities self-reported to be experienced at the workplace.

Article [3] contains novel empirical contributions to both the literature on occupational/ work health and safety environment and the one on the determinants of firm productivity, also extending existing methodology in this process. The goal of our empirical strategy herein is to estimate standard production functions augmented with detailed workplace health and safety indicators, aiming to tackle both potential simultaneity and unobservable inputs; we are able to do so by means of a uniquely suited data, obtained by merging exhaustive longitudinal LEED (including information on firm production inputs and outputs) to a representative cross-sectional survey on workplace conditions at the level of establishments, from Denmark. We are the first to show that some specific workplace health and safety dimensions, i.e., those concerning internal climate at the workplace and monotonous and repetitive work, have large and positive firm productivity effects. Although we also caution against the possible interpretation that other workenvironment factors would not matter for productivity, highlighting inherent data limitations in the study, our main conclusion is robust, and relevant beyond academe, e.g., for corporations and for relevant policy-making public bodies.

In paper [6], I study both worker preferences and possible wage compensation for risky health and safety dimensions at the workplace, using as main data the same longitudinal LEED as used in [3], only this time merged to a representative longitudinal worker survey on experienced job (dis)amenities. Inter alia, this analysis entails tackling the classical theme of the compensating wage differentials (CWD) from a novel empirical angle, given that we are able to estimate rich selection models that can account not only for worker and firm unobserved (time-fixed) heterogeneity, but also for the individuals' preference for risk (inferred from worker information on individual smoking behavior, being parents of

young children etc.). One of the major methodological advantages is that I am able to estimate and compare CWD results obtained in a classical hedonic wage empirical framework to analogous "MPW (marginal-willingness-to-pay)" results obtained from standard job hazard frameworks exploiting the individual worker histories in the same data. I propose a search and matching framework to rationalize the main results that CWDs via wage regression models, when properly accounting for worker heterogeneous tastes, are empirically equivalent to MWPs from job duration models.

c. Causes of persistent gender, racial, and other-social group inequality

In article [4], we offer our contribution to the literature on the potential causes of persistent employment and wage inequality between different social subgroups, by means of an innovative applied theory framework — namely, adapting for the context a simple, multi-stage, game-theoretical Nash equilibrium framework. We model occupational segregation between races or genders (or other exogenously-given social groups), when indirect job referrals matter in the labor market, and when there is social group-homophily, as extensively documented by many existing empirical investigations. Workers can specialize in one of two occupations, in which they can get jobs both exogenously and endogenously via their social network contacts; the workers only care about their employment prospects and about their wages. We first solve for the equilibria under two scenarios, homogenous-quality occupations vs. "good"/ "bad"-type of occupations, and then further calibrate and simulate our model as part of a social-welfare type of analysis.

One of our major, and fairly counterintuitive, results is that our game-theoretical equilibria, as well as both the first-and the second-best utilitarian optimal welfare policies, entail partial segregation — and, just like in reality, with one social group mixing over "good" and "bad" occupations, and the other one stuck in the "bad" occupation — with that latter outcome obtained under any realistic parameter choices in the our calibration & simulation exercises. This implies that in order to achieve occupational integration in this world, policies other than Pareto-preserving ones, such as, for instance, of the minimax type, should in fact be actively considered and implemented by concerned decision makers.

Another project overlapping with the topic of this chapter, but approaching it from a completely different angle, is my research in progress from project [11]. In there we are studying, *inter alia*, how task-biased technological changes (also referred to as "routinization" or "automatization") shape the labor workforce with respect to, for instance, employment and earnings disparities, along dimensions such as gender, age, or education. We are using census data — or linked-employer-employee-data registers where available (in the latter case we can also distinguish between intra-firm and inter-firm patterns in the evolution of the employment force) — from four countries so far: Denmark, France, Portugal and the US, in each case covering a very long time span. We assign each worker, in each year, to a (in majority) "abstract", "routine", or "manual" occupation tasks, following the extensive literature on job polarization. We then characterize the evolution of levels and shares of those worker categories in the entire private sector, per industries, and per targeted worker-demographic categories, revisiting critically the large previous literature that typically ignored the relevance of labor market institutions in different economies, in this context.

d. The impact of incentive pay schemes on wage growth and worker turnover

In [8], we make a contribution to the literatures on incentive pay, wage dynamics and worker turnover. Using linked employer-employee-data covering the entire private sector from Portugal, and information on the variable component of worker wages that typically covers incentive bonuses, we empirically estimate the causal effect of performance related pay (PP) on individual worker wage growth, both intra- and inter-firm earnings inequality, and worker turnover.

Our empirical strategy can account for the endogeneity of both the firm compensation policy and worker selection in PP-firms, the major problems that typically plague this type of empirical analyses, by exploiting an extremely rich set of worker and firm observables, as well as the longitudinal dimension of the data. We also apply our framework to separately study incentive pay in the case of managers. In addition, we document the evolution of PP as fraction of worker wages both over time, and across industries. A standard matching model with imperfect monitoring can rationalize part of our findings; we extend this model with learning on the job to fully rationalize our empirical results.

e. The role of firms for earnings inequality, employment adjustment patterns, and worker reallocation

A last chapter of my research agenda selected for this overview has been concerned with the role of firms for wage inequality, the structure of the resulting worker out- and in-flows, and the worker reallocation pattern, given the business cycle. One of my research contributions under this chapter is paper [5], mentioned and described also under

chapter **a.** above, hence I will not discuss it any further in here. A more general investigation of labor adjustment costs by various worker demographics, and in several ways an extension of the core ideas in study [5] is my ongoing work from [12]. The core idea in that study is to structurally estimate labour adjustment costs by worker age categories and worker skill levels by using a nested fixed-point algorithm approach and utilizing the universe of workers and firms in the Danish LEED, merged with information on the firm's production inputs and outputs. We can then isolate the shocks to the firm productivity from the evolution of the firms' inputs and outputs over time, directly mapping them into net firm workforce adjustments, while accounting at the same time both for adjustment in any other production inputs, as well as for the eventual public financing in place for former workers who end up unemployed, retired, disabled, etc.

Other projects in this same thematic category are [10] and [13]. In the more recently started research project [10], we study the role of firms for earnings inequality and worker reallocation mapping the entire set of firm-to-firm flows in the Portuguese LEED data, in order to rank firms by means of this aggregate worker revealed preference mechanism. The firm value summarizing the central tendency of worker flows then allows in-depth study of worker reallocation patterns within the labor market, focusing, for instance, on studying differentials in the worker gender (or: worker skill, age, etc.) reallocation patterns, or on the gender dispersion in both pay and the nonwage utility of working, etc. Remark for starters that even a systematic study of general worker reallocation patterns across firms, given the boom and bust cycles, would intrinsically be of crucial interest and is yet almost unavailable in the literature so far, with only a few recent exceptions—exceptions which however do not typically capitalize on using information on all the worker flows. The immediate extensions and applications are numerous. In [13] I take an IO-oriented standpoint, devising and estimating a model of firm growth by investment in new plants, accounting for the market competition in narrowlydefined industries. An expanding firm that opens a new establishment is facing uncertainty and risks that are only to some extent similar to those of a young firm that just enters a market. I seek to shed some light on this, using LEED from several EU countries, with extensive information on the population of firms as well as on that of their employees, over time. There is limited evidence for the US manufacturing sector that establishments founded by expanding firms are larger and more likely to survive than other entrants, but I am not aware of other systematic evidence, especially none whatsoever from European countries. Starting with offering novel descriptive evidence in this context, I then build an analytically tractable structural "firm-growth-by-plant-expansion" model estimable on this type of longitudinal LEED.

II. Future research plans (selective overview)

A growing number of questions concerning the broader labor topics (a. to e.) listed as titles of earlier subsections in this document cannot be convincingly answered without upgrading the existing theoretical and empirical toolkits. Part of my research plans for the mid/ longer run are therefore geared towards studying detailed features of joint dynamic labor and firm production markets, extending in several ways the theoretical and empirical setups from my past/ ongoing work. Such markets need, inter alia, theory modeling under more realistic crucial conditions, requiring, for instance, game-theoretical considerations given multi-agent interactions, real option considerations given underlying uncertainty and irreversible relation-specific investments, as well as search and matching- type of modeling given market frictions. In terms of empirical methodology, such markets are in need of rigorous analysis by means of state-of-the-art microeconometric methods, applicable to large register- or survey- based linked-employer-employee-data), with, for instance, detailed information on both worker demographics and firm production-side observables, and proper accounting for potential unobserved heterogeneity in higher-dimensional settings. Some of the broad thematic questions that I intend to tackle using this methodological apparatus and suitable data are about worker earnings and employment disparities, worker intra- and inter-firms reallocation, evolution and impacts of labor market oligopsony, etc. Within this broader thematic, specific research projects that I intend to pursue in the near future are the following:

Firm productivity, labor inputs, and job characteristics over the business cycle. Here, I seek to answer the following type of questions: a). How does a firm's internal organization of its labor inputs change with the business cycle? In other words, how do firms adjust the mix of worker skills, as well as job tasks, in the production process when product demand surges or dwindles?; b). How do pecuniary and non-pecuniary job attributes change with the business cycle? In other words, how do non-wage job characteristics, such as flexibility, safety, or security adjust, and how does wage compensation change, when demand for the firm's products shifts up or down? These themes are timely beyond academic curiosum, especially on the background of the unfolding economic (post)crisis. For instance, we do not know how preferences of workers for job amenities, and pricing of those job attributes by firms, are likely to be influenced by evolving economic conditions, which has obvious business and policy implications; it is, in fact, quite remarkable that there is

hardly any theoretical analysis or empirical evidence on workers and firms trading wages for job flexibility, security, or safety, within recessions. The empirical parts of this project are to be executed on detailed Danish linked-employer-employer-data (LEED henceforth) matched with a unique survey on work conditions, adding also detailed Portuguese LEED for the parts concerning only the analysis at point a). from above. Among other things, this project would obviously adapt and extend in various ways several studies described under chapters a)., b), and c) in the overview of my current research contained in the previous section.

The role of the firms for labor market inequality. Here, I seek to (further) investigate i). the role of firms in earnings and employment inequality; and ii). the role of the firms in employment adjustment and worker reallocation (accounting also for relevant publicly founded safety nets in place). Whereas the main factors accounting for earnings inequality have been traditionally thought to be skills and technology, they alone cannot account for the rise in earnings inequality during the last half-century; firms have always been intuitively considered important in accounting for wage dispersion, but this has not been investigated thoroughly until more recently, due to both lack of proper methodology and lack of suitable data. I propose to tackle i). and ii). building on methodological insights developed in some of the papers earlier described under chapter e). above (especially in my ongoing papers [10] and [12]), for instance, by computing and then utilizing the central tendency of worker flows within the entire economy, through means of exhaustive linked-employer-employeedata (LEED) such as the Danish and Portuguese data, in order to further qualify and quantify the role of the firms for income, nonpecuniary, and (un)employment disparities. For example, remark that extended with heterogeneity in worker preferences for jobs, this initially parsimonious setting then allows revisiting the type of questions addressed in [10] above, allowing now for potentially differences in worker preferences for wage versus nonwage amenities, by various subgroups, e.g., by worker gender, skill, or age categories (hence making a connection also to the research under chapter **b**. in the overview of my current research from above). The approach championed here is complementary to methodologies from recently published papers and ongoing research projects that study the importance of the firm for the growth of earnings inequality. A straightforward extension of our empirical structural model in [12] would permit us to separately identify and estimate using the same linked-employer-employee-data various, possibly interacting, firm employment adjustment costs.

References

- [1] Buhai, I.S., M.A. Portela, C.N. Teulings, and A. van Vuuren (2014), "Returns to Tenure or Seniority?", **Econometrica**, 82(2): 705–730. DOI: 10.3982/ECTA8688
- [2] Buhai, I.S. and C.N. Teulings (2014), "Tenure Profiles and Efficient Separation in a Stochastic Productivity Model", Journal of Business and Economic Statistics, 32:2, 245-258. DOI:10.1080/07350015.2013.866568
- [3] Buhai, I.S., E. Cottini, and N. Westergaard-Nielsen (2017), "How Productive is Workplace Health and Safety?"; Scandinavian Journal of Economics, 119(4): 1086-1104. DOI: 10.1111/sjoe.12184
- [4] Buhai, I.S. and M.J. van der Leij (2023), "A Social Network Analysis of Occupational Segregation", Journal of Economic Dynamics and Control, 147, 104593. DOI: 10.1016/j.jedc.2022.104593
- [5] Buhai, I.S. and H.M. von Gaudecker, "Firm Downsizing, Public Policy, and the Age Structure of Employment Adjustments"; discussion paper (currently in revision, given access to recently released information on reforms/ data)
- [6] Buhai, I.S., "Job Hazard Premia and Worker Risk Preferences"; presentation slides available
- [7] Buhai, I.S., C.N. Teulings and M.A. Portela, "Worker-Firm Dynamics with Seniority Bargaining"; slides available
- [8] Buhai, I.S. and M.A. Portela, "Performance Pay, Wage Dispersion, and Job Separation"; presentation slides available
- [9] Buhai, I.S. "Employee Wage, Employer Size, Stochastic Labor Demand"; in progress
- [10] Buhai, I.S., P. Guimaraes and M.A. Portela, "Role of Firms for Wage Inequality and Worker Reallocation"; in progress
- [11] Buhai, I.S., F. Langot, M.A. Portela and T. Sopraseuth: "Evolving Occupational Tasks: Theory Framework and Empirics using Data from Denmark, France, Portugal and USA"; in progress
- [12] Buhai, I.S. and H. Gaudecker: "Business Cycles and Labor Adjustments. Structural Framework"; in progress
- [13] Buhai, I.S., "Firm Growth by Plant Expansion: Theory and Evidence"; in progress
- [14] Buhai, I.S.: "A Real Option Theory of Labour Turnover"; in progress