The Effect of Regulation on Inventor Mobility and Productivity

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Abstract

Using new data on the compliance burden of regulation, I study how US administrative agencies affect innovation activities in public firms, which spend the most on R&D and produce the majority of innovation. I present evidence that firm-specific regulatory burden reduces patent output of public firms, but find little change in innovation capital (R&D). To examine innovation labor, I conduct inventor-level analyses, and provide evidence that inventors leave their firms and industries to avoid high burden environments. These turnover events sharply decrease subsequent individual productivity. In sum, I find that regulatory burden constrains innovative firms and reallocates high skilled labor to lower burden environments, disrupting corporate innovation processes.

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1 Introduction

Companies develop innovation because patents confer legal monopolies and strategic advantages in product markets (Arrow (1962)). Regulators grant these temporary monopolies because innovation is a significant driver of economic growth (Solow (1957)). However, regulators also have broader concerns beyond maximizing quantity of innovation, such as consumer welfare and competition. Government agencies, e.g. the FDA, FTC, and EPA, address these concerns by creating regulations, which constrain firm behavior and create reporting requirements on firm activities. New data on the burdens of individual regulations allow researchers to measure the costs of these constraints with novel granularity, as opposed to using national law enactments as coarser treatments to subsets of companies. In this paper, I examine how firm-specific regulatory burden affects all public, innovative firms, and disaggregate their patenting function into capital and labor to discern channels. I find that higher regulatory burden decreases patenting output, and that the channel is reduced labor productivity.

Regulatory economics literature has examined how specific policy interventions affect young and small innovative firms, as these firms produce most breakthrough technologies (Rosen (1991), Akcigit and Kerr (2018), Bowen et al (2022)). For example, de-burdening young firms from certain disclosure requirements and small-business labor regulations increases R&D spending (Dambra and Gustafson (2021), Aghion et al (2022)). Aghion et al (2022) also find increased patenting in their sample of French firms with fewer than 50 employees, once they are de-burdened of a subset of labor regulations. However, mature, public firms produce the majority of innovation and spend more on R&D (Stoffman et al

(2022), Rosen (1991)). The impact of regulatory burden on these large firms is of significantly greater consequence to regulators and firm value.

The Paperwork Reduction Act of 1980 requires all government agencies to estimate the burden, in terms of responses and hours, of new regulations. Kalmenovitz (2023) collects active regulations, and creates indices measuring the regulatory intensity to which a firm is exposed. I use the Amount of Time (”Time Burden”) for my main variable of interest, and in Robustness tests examine alternative measures (Paperwork Burden, measured by number of responses required by a firm's regulations, and Regulation Burden, measured as number of regulations). Inventors are workers with high marginal product of labor, similar to academics, and so the time spent on compliance work is likely the most economically salient measure. This Time Burden measure constitutes an estimate of the overall regulatory burden placed on firms by the administrative state of the federal government.

I begin by studying the impact of regulatory burden on patent quantities. Ex-ante, the effect is not clear. It is possible that regulation has no discernible impact on patents, since innovators are not burdened by paperwork regulations, and rather delegate those tasks to compliance specialists within the firm.

Reading the text of certain regulations casts doubt on this story, as the data collections can require detailed disclosures about the innovations known only to experts (e.g. intermediate clinical drug trial reports). The alternative hypothesis is that regulatory burden disrupts innovative firms, constraining or delaying their technological progress. While governments do invest significant resources into innovation (e.g. 2023 CHIPS Act, NASA), agencies typically prioritize consumer and worker safety (e.g. FDA), competition amongst firms (e.g. FTC), and public goods (e.g. EPA). To satisfy these competing priorities, agencies require, among other things, disclosure of information about firm activities. ”Less innovation” is an indirect cost to the regulator, but even when explicitly considered, the benefits discussed prior likely exceed this in their utility function. This means that evidence of empirically fewer patents is important to know and understand, but the evaluation of that evidence is ultimately normative.

I find that overall regulatory burden decreases patents produced by public firms, with a one standard deviation increase in Time Burden decreasing patents per inventor by 5.2%. This is equivalent to 1 fewer patent per 100 inventors working at a firm per year. In heterogeneity analyses, I find this effect is not driven by small or young firms, indicating that these findings are distinct from those identified by prior literature. I control for time-invariant firm characteristics, time-varying industry-specific shocks, and important time-varying firm characteristics, like size, age, and cash on hand.

To identify what drives this decrease in innovation output, I examine the inputs to patent production. Hypothesis H2 is that regulatory burden will affect the labor component of the innovation production function more than capital, particularly among innovative firms. Kalmenovitz (2023) finds no significant relation between regulatory burden and innovation spending in public firms, and this should hold more strongly in innovative firms. Firms which depend on their patenting outcomes more heavily for revenue (e.g. drug companies) should not decrease innovation spending. However, their inventors have finite time, and so will be more directly impacted by regulatory burden increases. I find little evidence of regulatory burden crowding out R&D spending.

Given that innovation capital does not significantly decline, I attribute the decreases in patenting to reductions in labor productivity, as more inventor time is consumed by administrative paperwork about their innovation process. If these burdens are unattractive, inventors may "exit" their firm or industry to escape the paperwork associated with their old projects. Using detailed data on the location and assignee of patent inventors, I track individual inventors across their careers at public firms, identifying each inventor's productivity and employer over time. To examine the "exit" hypothesis, I regress an indicator for an inventor changing firms (industries) on regulatory burden. I find that increases in Time Burden are associated with increases in inventor turnover, as well as inventors moving to different industries. A one standard deviation increase in Time Burden increases the probability of an inventor switching firms by 37% (1.3 pp). Put differently, the average annual increase in Time Burden increases the probability of a job change by about 5%. This same increase is associated with an 11% increase in the likelihood of moving to a different industry. I find this effect to be stronger in 'Star Inventors', those who produce the most patents and have the highest outside option. These inventors overwhelmingly move to lower burdened jobs and industries. In all specifications, I control for time-invariant inventor and firm characteristics, time-varying industry trends, as well as time-varying firm characteristics. I also control for inventor experience, measured as the number of years in sample (logged).

I also find evidence of reductions in inventor productivity; a 1 standard deviation increase in Time Burden decreases patent counts by 4.5%. When splitting inventors by Star and Non-Star, I find this reduction is concentrated in the Star Inventors, and find that a 1 standard deviation increase in Time Burden is associated with 13.5% lower output. The effect is insignificant in Non-Stars. Given that Stars are the most productive inventors, these declines are particularly important, and may be informative about who precisely is burdened by regulation. I also examine how turnover affects productivity. I regress inventor productivity on indicators for whether the inventor moved to a lower or higher burden job in the previous year. Both types of job change are significantly disruptive, resulting in a 11-12% decline in patent counts on average. The effect is present in Stars and Non-Stars, but is significantly larger (19.5% to 26.8%) in Star inventors. Collectively, I interpret these results as regulatory burden spurring workers to reallocate from high burden environments to low burden environments, and that this reallocation disrupts their productivity (patent production).

Government intervention in markets is not exogenous, whether we consider SEC enforcement or administrative burden. Regulators observe firm behavior and change rules in response, which prompts new actions from firms. This simultaneity leads to a bias of debatable sign and magnitude. To empirically address this, I construct a Bartik instrument using time-varying industry-level regulatory burden and the initial business segmentation of a firm as its pre-existing "share" of regulatory burden. Consider a firm which generates sales evenly from two different industries in its first year as a public company. The Bartik instrument would be the average regulatory burden of those two industries each year the firm is public, holding constant the 50-50 weighting of industry regulatory burden, even as the firm's sales proportion changes over time. I instrument firm-specific regulatory burden with this constructed Bartik instrument, and regress patenting outcomes on the residual in a control function specification following Lin and Wooldridge (2019). My results rely on the differential impacts of industry-wide regulatory trends on an individual firm's regulatory burden, arising from the firm's deviations from average initial industry segmentation. Using this instrument, I find increased inventor mobility.

My paper contributes to the innovation and regulatory economics literature. Bhattacharya et al (2017) find that political regime has little effect on R&D and patenting at the country and country-industry-level, while policy uncertainty has a chilling effect on both long-term investment and patenting. Fabrizi et al (2018) find that market-based policies in Europe have positive impacts on green patenting, while Dambra and Gustafson (2021) and Aghion et al (2022) find that de-burdening small and young firms of expensive disclosure and labor requirements frees firm resources for increased R&D spending and subsequent patenting. I add to this literature by studying the effect of paperwork burden on mature public firms, an understudied but critical group, and use unique data which affects individual contributors within the firm. I present evidence that compliance burden decreases corporate innovation output, and I attribute this reduction entirely to decreased labor productivity. Consistent with the notion that paperwork burden affects the individual contributors (labor), I find no statistical differences between small and large firms, setting my findings apart from prior literature. This grows our understanding of how compliance costs are internalized by the firm. Kalmenovitz (2023) finds that SGA is increasing in regulatory burden, and I document an indirect cost of this compliance is reducing the productivity of a firm's high skilled labor.

My paper also contributes to the extensive literature on inventor mobility. Disruptive events like bankruptcies (Baghai et al (2019) Baghai et al (2021)), mergers (Li and Wang (2020), Cunningham et al (2021)), hedge fund activism (Brav et al (2018)), credit shocks (Hombert and Matray (2017)), and terrorist attacks (Fich et al (2022), as well as micro-events like taxation (Akcigit et al (2016), Moretti and Wilson (2017)), and non-compete agreements (Marx et al (2009)), among others, spur inventor mobility. I add to this literature by presenting causal evidence that inventors move to new jobs and different industries to escape paperwork burden from the government. This aversion to paperwork is concentrated in Star Inventors, who individually produce the most innovation and raise the productivity of Non-Stars at the firm (Zacchia (2018)). I document another factor firms must incorporate to hire and retain top talent, even among high skilled labor.

2 Data

Innovative firms are defined as those which produce patents (Acs et al. 2002, Huang et al., 2021), and these patents are important to firm value (Kogan et al (2017), Glaser (2018)), stock returns (Stoffman et al. (2022)), and economic growth (Solow (1957)), among others. To identify innovative public firms in the Compustat-CRSP universe, I use the patent-CRSP permco linktable provided by Stoffman et al (2022), which extends the database created by Kogan et al (2017). I keep records between 1993 and 2020, which contain all patents applied for and granted by the US Patent and Trademark Office (USPTO). 2020 is used as the end year, because patents take about 3 years to be granted. I use the filing year of the patent (as opposed to the grant year) to aggregate patents, because this better proxies for when the innovation is actually created (Griliches et al (1987)). Using filing year also mitigates concerns about the timespan between file date and grant date, which has risen to about 3 years on average. For details on the process of matching patents to firms, controlling for acquisitions, joint ventures, patent sales, etc., I defer to the data and internet appendices of Stoffman et al (2022) and Kogan et al (2017). I aggregate patent counts to the firm-year level, and scale by 1) the number of employees at the firm and 2) the number of inventors. Each scaling variable controls for the size disparity among innovative firms. The latter better captures productivity of those directly responsible for innovation at the firm. Due to the skew of patent production, I use a Poisson model with higher dimensional fixed effects, but my findings are robust in unlogged OLS versions of each (Cohn et al (2022)).

To be in my final sample, I require that a firm produce a patent during the sample period 1993 to 2020, report inventors associated with its patents, and have nonmissing values of key independent variables from Compustat. I also require information from Compustat's Business segment database, discussed in more detail in the Empirical Design section. I exclude 2021 so as to avoid firm-years with the most severe truncation bias in patent counts and citations (Hall et al. (2005)). I also exclude financial firms (SIC codes 6000-6999), utilities firms (SIC codes 4900-4999), and government entities (SIC codes greater than or equal to 9000), though results are robust to their inclusion.

To measure regulatory burden, I use a novel dataset constructed by Kalmenovitz (2023). The author collects data from the Federal Register from 1993 to present, and uses textual analysis to associate government regulations to firms' 10-K filings. After the passing of the Paperwork Reduction Act of 1980, the US Federal Government is required to estimate the burden of a given regulation on those to which it pertains across several dimensions, namely number of responses and amount of time. Kalmenovitz (2023) then creates indices of firm-level regulatory burden across these dimensions, namely 1) The number of regulations governing a firm, 2) The number of responses required of a firm to comply with its regulations, and 3) The amount of time a firm likely spends to comply with its regulations. Because these regulations pertain to firms as an entity, as opposed to just innovators specifically, the indices represent a superset of innovation-specific regulations.

As my focus is innovation, I hypothesize that Time Burden will be particularly salient.

Multiple regulations may be satisfied by a single, short form. However, "hours" should better proxy for an inventor's potential burden, as their knowledge work a) has a high marginal product of labor and b) is analogous to academic research. Kalmenovitz (2023) reports that the fraction of US working hours comprised of regulatory compliance rose from about 2.5% in 1990 to about 4% in 2020. This means that in 2020, 10 billion working hours were spent complying with regulatory burden. Therefore, Time Burden is not just economically meaningful from a theoretical perspective, but it is also a significiant portion of American job responsibilities.

To reduce concerns of reverse causality, all independent variables are lagged by 1 year. Summary statistics are reported in Table 1 Panel A. The final dataset contains 43,004 firm-years and 3,675 unique firms.

The USPTO and Patentsview (a private-public partnership) also track the inventors associated with a patent, using disambiguation algorithms to create unique inventor identifiers. With the Kogan et al (2017) and Stoffman et al (2022) patent-CRSP crosswalk, I can then track inventor productivity, employer, and location throughout their careers. Because inventors are only observed at times when they produce patents, I follow prior literature (Baghai et al (2019)) and use a midpoint assumption for employers. If Inventor A works for Firm A in Year t and Firm B in Year $t+5$, then I assume she works for Firm A in Years $t+1$ and $t+2$, and the remainder at Firm B. I then fill zeros for patent count in the intervening years. These assumptions are necessarily conservative. If an inventor only produces a patent in 1 year, but continues to work for the firm, I cannot observe those later "unproductive" years or create a time series for this inventor. Similarly, I cannot observe an inventor who works for 1 firm and moves to another, but never produces a patent for the second firm. There are 408,000 inventors associated with the above firms over my sample period, and 2.68M inventor-years, summarized in Table 1 Panel B.

3 Research Design

The distribution of patents in panel data has significant positive skew, as well as significant mass at zero. Cohn et al (2022) demonstrate that count, count-like, and rate outcomes with significant mass at zero are best modeled using Poisson with higher dimensional fixed effects. This has become computationally feasible due to Correia, Guimarães, Zylkin (2019a,b). Thus, in all patent outcome variable specifications at the firm-level, I use Poisson with firm fixed effects, industry-by-year (Fama French 48) fixed effects, and time-varying firm-level controls.

$$log(\mathbb{E}[y_{i,t}]) = \beta_1 \text{Time Burden}_{i,t-1} + \beta \mathbf{X}_{i,t-1} + \alpha_i + \alpha_{jt}$$

All independent variables are lagged by 1 year to reduce concerns of reverse causality. Controls include total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs, firm age (logged), and industry concentration (measured at the Fama French 30 level, so as to not be collinear with industry-by-year FE). Debt, cash, tangible assets, CAPEX, and Op. Costs are scaled by prior year total assets. Standard errors are clustered at the firm-level, as the variation in Time Burden occurs at the firm-year level and this reduces autocorrelation concerns. All variables are winsorized at the 1^{st} and 99^{th} percentiles.

For inventor-level specifications, I include all of the control variables and fixed effects as in firm-level specifications. I also include an inventor's experience (logged) and inventor-level fixed effects. This additional level of fixed effects controls for time-invariant inventor-level characteristics, for which I to a large extent cannot observe, like gender, race, education, ability, initial wealth, sociability, etc. Controlling for these characteristics is not particularly important when looking at the average effect on all inventors. However, they are crucial for determining the differential impacts on Star vs Non-Star inventors. Star Inventors are defined in the literature as the most productive inventors, and here I report analyses using the top decile of productivity (Baghai et al (2019)), though results are robust to other splits. Stars are significantly more likely to be male, white, and have elite education, among other things, than Non-Star Inventors, so controlling for those effects using a within-transformation is necessary. Standard errors remain clustered at the firm-level, because the level of variation remains at the firm-year level. Clustering at the firm-year level (equivalent to EHW standard errors in a firm-year panel) or inventor-level greatly overstates statistical significance (Bertrand et al (2004)). All variables are winsorized at the 1^{st} and 99^{th} percentiles.

In robustness tests, I report OLS regressions of main specifications with similar findings. I do not report OLS of log1plus outcomes, given the Cohn et al (2022) critique, though in unreported analyses they yield similar results to OLS of unlogged outcomes.

4 Results

4.1 Firm-level Analyses

In Table 2, I test my first hypothesis, and examine how regulatory burden affects innovation output using the amount of time a firm spends on compliance (Time Burden). In Column (1), I report the effect of Time Burden on Patents scaled by Inventors with no controls or fixed effects; a 1 standard deviation increase in Time Burden is associated with a 5% reduction. In Column (2), I add in firm fixed effects, industry-by-time fixed effects, and time-varying firm controls, and show that the effect becomes slightly more negative, a 5.2% reduction. Economically speaking, this is a reduction of slightly more than 1 patent per 100 inventors working at a firm, a non-trivial reduction. In Column (3), I repeat the specification in Column (2), but use Patents per 1000 Employees as a dependent variable. I find a significant decline in patenting, though somewhat weaker, consistent with the notion that inventors are more important to the innovation process than the average employee. A 1 standard deviation increase in Time Burden is associated with a 4.6% decline in Patents per 1000 Employees, or about 1 patent for every 3000 employees at a firm. In Columns (4) and (5), I test whether my findings are driven by smaller or younger firms. I define "Young" as 5 years or fewer in Compustat, consistent with Dambra and Gustafson (2021). For size, I report a median split on total assets (unlogged), though results are robust to other binning procedures. I find no statistical differences between small and large firms, nor any differences between young and mature firms. I also examine whether the effect is driven by financial constraints, defining "distressed" as an Altman's Z-score of less than 1.81 (Altman (1968), Eisdorfer (2008)). I find no differences in how compliance burden affects likely distressed firms or unindistressed firms. The effect of Time burden is thus distinct from those identified in prior literature, and consistent across firms. In unreported analyses, there are no differences between groups with Patents per 1000 Employees as the dependent variable. In sum, increases in Time Burden, overall, are associated with decreases in the quantity of firm innovation.

In Table 3, I examine the effect of Time Burden on innovation capital, or R&D Spending. Kalmenovitz (2023) finds no significant change in the R&D spending of all public firms (not just innovative firms) in response to regulatory burden changes, and prior literature has found that recent IPO firms (Dambra and Gustafson (2021)) and French firms with fewer than 50 employees (Aghion et al (2022)) increase R&D spending in response to deburdening. In my sample of patent-producing firms, I find no evidence of changes in R&D spending, on average or within subsets of firms (size, age, and financial distress as defined previously). This suggests that regulatory burden causes minimal changes, if any, in the capital that innovative firms commit to innovation. Further, the effect size is not economically meaningful, interpreted as 1 standard deviation increase in Time Burden is associated with a 0.6% (0.05pp) decline in R&D spending. All results are consistent when following each of the Koh and Reeb (2015) strategies for handling missing R&D values in Compustat. Firms, in aggregate, do not appear to commit additional resources to innovation, in response to increases in regulatory burden. In other words, for every dollar firms commit to inventors and innovation resources, they receive fewer patents due to Time Burden. This indicates that Time Burden likely affects the labor component of the innovation production function.

4.2 Inventor-level Analyses

In Table 4, I begin inventor-level analyses. My variable of interest varies at the firm-level over time, meaning that I assign the same Time Burden to each inventor at a given firm in a given year. Given this level of variation, standard errors remain clustered at the firm-level for all of the inventor specifications, as clustering at the firm-year or inventor-level greatly overstates significance (Bertrand et al (2004)).

If regulatory burden is unattractive to complete and it takes time away from innovating, we should expect inventors to change jobs to avoid this disutility, whether this means moving to firms with less regulation-intense projects or to entirely different industries with lower burden. In Columns (1) and (2), the dependent variable, respectively, is an indicator for whether the inventor changes from one public firm to another, or from one industry to another. Not observing movements to private firms or workforce exits is an unfortunate limitation of the data, but it biases against finding any result as it undercounts mobility events. I include inventor fixed effects to absorb unobserved time-invariant characteristics, like race, gender, education, initial wealth, ability, sociability, etc., as well as firm and industry-by-year fixed effects, and time-varying firm and inventor controls. I find that inventors are significantly more likely to change jobs; a one standard deviation increase in Time Burden at the firm increases the likelihood of a job change by 37% (1.3pp). Because it is unlikely that an inventor experiences such a large increase, I also interpret the coefficients as when an inventor experiences the average annual increase in Time Burden. This regulatory increase is associated with a 5% higher probability of a job change. This same increase is associated with an 11% increase in the likelihood of moving to a different industry.

Innovation literature often differentiates between "Star" inventors and "Non-Star" inventors, because Stars are known to drive productivity at the firm, make other inventors at the firm more productive, and have higher outside option (Zacchia (2018)). I define "Star" as in Baghai et al (2019), where an inventor is a "Star" if they are in the top decile of patenting production. In Table 4 Columns (3)-(4), I find significantly stronger evidence that Stars change jobs to avoid regulatory burden, leveraging their market power to avoid burden. I find similar, albeit weaker, evidence that Non-Stars also switch jobs and industries. The coefficients are highly significantly different (p-values reported in the footer), meaning that Star Inventors are significantly more responsive to burden increases than Non-Stars. When Stars experience the average annual Time Burden increase, they are approximately 11% more likely to switch jobs. This provides evidence of regulatory burden affecting the labor component of innovation, in that firms are less able to retain their most productive (and important) inventors as regulatory burden increases. In Appendix Table A6, I show that inventors are more likely to move to a lower burden job than higher burden job, and this effect is no different between Stars and Non-Stars.

In Table 5, I examine how individual inventor productivity is affected, using both inventor-level patent counts and citation-weighted patents (Trajtenberg (1990)). Results are consistent across both outcomes. Coefficients are reported as incidence rate ratios, meaning that a coefficient less (greater) than 1 indicates a decrease (increase) in productivity. If inventors are changing jobs to avoid regulatory burden, they may become more productive due to lower burden. Increases in productivity could also be attributable to their moving to firms and industries with which they have a better match, which would make disentangling the effect of burden more difficult. Decreases in productivity, however, would indicate individual inventors can produce fewer patents when faced with higher burden or that they move to firms with which they have lower quality matches. On average, I find that Time Burden has a statistically significant, negative effect on productivity in Column (1) and (5). A 1 standard deviation increase in Time Burden decreases individual-level productivity in the following year by 4.5-7.9%. This provides evidence that the channel of Time Burden's effect at the firm-level is labor productivity. Grouping inventors into Stars and Non-Stars in Column (2) and (7) demonstrates where this overall negative effect is concentrated. Stars experience significant productivity declines after increases in Time Burden; a 1 standard deviation increase in Time Burden is associated with a 13.5% (11.7%) decline in a Star's patent count (citation-weighted patents) the following year. Non-Stars, on the other hand, are insignificantly affected. This differential impact is interesting (and statistically different from each other), suggesting that compliance activities may be completed more by Stars, either due to their leading more innovation projects or greater knowledge of individual projects. However, Stars' comparative advantage in innovation activities should mean that burden is delegated to less productive inventors, if at all possible.

In Table 5 Columns (3) and (8), I examine how turnover affects productivity, regressing productivity measures on indicators for switching to a Lower Burden Job or switching to a Higher Burden Job in the previous year. I find that both types of job change are disruptive, reducing patent counts by 11.2-11.7%, though there is no statistical difference between the estimates. This is evidence that turnover is costly, both to inventors' careers and to the firms for which they work. In Columns (4) and (9), I examine just Stars and find that their productivity declines are much steeper than Non-Stars. The coefficients on Higher Burden Job Change are smaller than those of Lower Burden Job Change, indicating a greater Star productivity decline, and the differences are significant at conventional levels. In patent terms, a Star Inventor produces 2.5 patents per year on average, but a job change reduces this productivity to 1.6-1.9 patents per year. Non-Stars (Columns (5) and (10)), however, have greater productivity declines when they move to Lower Burden Jobs, and the difference is statistically significant. This again suggests that completion of burden falls more heavily on Stars, and that completion of innovation activities may be delegatable from Stars to Non-Stars.

5 Robustness

5.1 Bartik Instrument

Regressing innovation outcomes on regulation suffer some endogeneity concerns, most notably reverse causality. We often think of regulations being created to address innovations, and then inventors innovating around these new regulations in a game of cat-and-mouse. One can think of current regulatory skirmishes, like the SEC tightening oversight of crypto securities and the NHTSA investigating self-driving cars, or older disagreements about the early internet environment. To empirically address this concern, I construct a Bartik instrument from the regulatory burden data. Bartik Instruments are traditionally rather strong (with partial F-statistics roughly the square of the t-statistic on the instrument in the first stage) (Breuer (2022)), and this strength reduces concerns about omitted variable bias in the second stage.

First, I assume that a firm's regulatory burden is the sum-product of the industry-level regulatory burden and the share of that industry within the firm. I construct a Bartik instrument using the firm's initial industry shares from Compustat's Business Segment database (i.e. the industry share from the first year of data per firm) and the industry regulatory burden over time, measured at the Fama-French Industry 48 level. The share is calculated as the segment sales scaled by total sales. The Bartik Instrument is then constructed as follows:

$$z_{it}^{BI} = \sum_{j} w_{ij} \cdot e_{tj}$$

where w_{ij} is the pre-determined industry share and e_{tj} is the industry regulatory burden. The first stage regession is subsequently:

$$x_{it} = \gamma z_{it}^{BI} + \beta \boldsymbol{X} + \alpha_i + \alpha_f + \alpha_{jt}$$

where x_{it} is time-varying firm regulatory burden, α_i are inventor fixed effects, α_f are firm fixed effects, and α_{jt} are industry-by-year fixed effects (as in the uninstrumented analyses). The second stage regression is:

$$log(\mathbb{E}[y_{i,t}]) = \beta_1 \text{Time Burden}_{i,t-1} + \beta_2 \hat{\nu}_{i,t-1} + \beta \boldsymbol{X} + \alpha_i + \alpha_f + \alpha_{jt}$$

where y_{it} represents innovation output at the inventor-year level. To continue using the Poisson model in the second stage, I follow the control function approach developed by Lin and Wooldridge (2019), where the first stage residual is included in the second stage and standard errors are bootstrapped.

The Bartik instrument relies on the differential impacts of industry-wide regulatory trends on a firm's regulatory burden, arising from the deviations in a firm's initial industry segmentation. This means z_{it}^{BI} does not vary across firms over time due to endogenous changes of the shares (e.g. growth of specific industries over time) or endogenous unit-specific trends (e.g. chasing better opportunities in less regulated industries).

Goldsmith-Pinkham, Sorkin, and Swift (2020) (GPSS) demonstrate that the initial industry shares must be conditionally exogenous to changes in outcome variables. From the GPSS perspective, the instrument is conditionally exogenous so long as the initial deviations in firm segmentation from its primary industry (i.e. conditional on industry-by-year FE), are unrelated to the changes in inventor patenting outcomes over time. Put differently, the predictors of the initial *levels* of the deviations cannot predict the *changes* in inventor-level patenting; they can predict the *levels* of patenting without affecting instrument validity.

In Table 6, I report the instrumented mobility results. 1st stage F-stats are reported in the footer, and satisfy the Stock-Yogo test. Because I use linear probability models to predict switching jobs (industries), I adopt a standard two-stage least squares (TSLS) approach to instrument Time Burden. I find a 15-20% (0.4-0.6pp) larger effect than the uninstrumented results, on average and in the sample split by Star status. Confidence intervals are wider as well, given the imprecision introduced by IV, however all results continue to be statistically significant at conventional levels. Given the uncertain lag relationship between innovation and regulation, we may expect coefficients in uninstrumented analyses to be attenuated, though this requires the assumption that innovation is uncorrelated with the error term in regulation regressed on innovation. Without this assumption, the sign of the bias is ex ante unpredictable.

For inventor-level innovation output, I adopt the Lin and Wooldridge (2019) control function approach. Bootstrapping is required to report correct standard errors. Due to the large sample size and the non-linear 2nd stage, estimation is quite computationally intense, and so I use the shared computing resources in the University Research Computing Facility at Drexel University (Picotte cluster computing / supercomputer). Results here are pending.

5.2 Alternative Measures

In Appendix Tables A1 and A2, I use a different measure of regulatory burden, "Paperwork Burden", which is an index measuring the number of responses a firm's regulatory burden requires. I find similar results using this measure, wherein inventors facing higher lagged Paperwork Burden increase subsequent job mobility and have decreased productivity in the next period. The effects are concentrated in Star Inventors, and the differential impact of burden on Star productivity vs Non-Star productivity are present as well. I find no relation when using the Number of Regulations to which an inventor's firm is subject.

5.3 Nonlinearities

In this section, I explore the functional form of Time Burden, namely the natural log, inverse hypersine, square root, negative reciprocal (to preserve ordering), and a squared term. I repeat analyses for firm-level patenting, inventor job mobility, and inventor-level patenting quantity with each of these alternative functional forms, and find evidence of a slight curvilinear relationship. Using the natural log, inverse hypersine, square root, or negative reciprocal of Time Burden yields similar magnitudes and statistical significance as the level term in all analyses. Time burden is associated with a reduction in future firm-level patents per inventor, an increase in inventor-level job mobility, and a decrease in inventor-level patenting. When I include the square of Time Burden, neither coefficient is individually significant,though their joint significance achieves conventional levels of significance (reported in footer) in the firm-level productivity and inventor mobility analyses. The vertices of these parabolae are each outside the range of my sample. This indicates that Time Burden's relationship has a slight curvature to it, but any "u-turn" occurs beyond the bounds of my data. This generally mitigates concerns about using the untransformed level of Time Burden.

5.4 Alternative Specifications

I also report the OLS coefficients for firm-level patenting, firm-level R&D spending, and inventor-level patenting quantity. While OLS is less appropriate than Poisson given the skew of the underlying data, results and interpretations are broadly unchanged from Poisson. The only difference is the inventor-level productivity when split by Stars vs Non-Stars (Table A5 Columns (2) and (7)). In this specification, Non-Stars are significantly negatively affected (as opposed to insignificantly negatively affected), and Stars have inconsistently significant, but positive, coefficients. I attribute this to Stars' greater skew of patent production measures, particularly that of citation-weighted patents. However, the turnover results and the differential impact of turnover on Stars vs Non-Stars are present in OLS as well.

Conclusion

Economists are frequently tasked with providing commentary on new government policies, laws, and rules, typically estimating the costs and benefits as experienced by various parties. Much of this outside analysis informs how the government creates its own estimates of policy cost and benefit. My paper uses a subset of regulatory burden estimates, namely the federal government's administrative agency burden (not state or municipality), and asks how this burden impacts the innovative activities of corporations. I find that regulatory burden decreases the quantity of innovation produced without significantly changing the cost of producing this quantity. This evidence is neutral in terms of policy recommendations; the projects forgone may be riskier and less focused because they have unknown long-term impacts on consumer welfare (or safety). Disincentivizing these projects would thus be utility maximizing for the regulator. However, I also find evidence that inventors find paperwork burden unattractive, and are willing to reallocate from high burden firms (industries) to lower burden firms (industries). This evidence suggests regulation affects the wedge between inventors and employers, increasing turnover to the detriment of corporate innovation. Further, this turnover is highly disruptive, decreasing an inventor's output in the following years at a new firm. Collectively, these findings show how the administrative state imposes costs on innovative activities, both in the aggregate and at an individual contributor-level, and provides firms with strategies to mitigate these costs.

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Table 1: This table reports summary statistics for key variables used in the analyses. Panel A summarizes the sample used in the firm-level analyses. Panel B summarizes the sample used in the inventor-level analyses. All variables are winsorized at the first and ninty-ninth percentiles.

Panel A: Firm-Year Panel

	Mean	St. Dev.	P5	P10	P25	Median	P75	P90	P95
RD/AT	0.076	0.111	0.000	0.000	0.000	0.030	0.107	0.204	0.296
Patents / Emp.	7.344	19.079	0.000	0.000	0.000	0.313	4.933	19.789	38.478
Patents / Inv.	0.234	0.329	0.000	0.000	0.000	0.143	0.333	0.583	1.000
Time Burden	100.302	16.384	73.862	80.464	90.464	98.590	111.420	121.291	126.762
Bartik Time	101.719	16.776	73.235	80.680	91.949	101.056	112.384	121.679	127.957
Ln(AT)	5.973	2.116	2.670	3.240	4.386	5.889	7.465	8.863	9.685
MB	2.181	1.758	0.812	0.926	1.165	1.608	2.465	4.040	5.658
Leverage	0.198	0.199	0.000	0.000	0.012	0.161	0.312	0.459	0.571
Cash/AT	0.213	0.221	0.006	0.012	0.039	0.131	0.325	0.561	0.692
PPE/AT	0.215	0.184	0.024	0.037	0.077	0.160	0.297	0.478	0.620
ROA	0.060	0.213	-0.374	-0.155	0.037	0.110	0.166	0.225	0.270
CAPX/AT	0.048	0.049	0.005	0.009	0.017	0.033	0.061	0.103	0.144
Ln(Firm Age)	2.850	0.757	1.609	1.792	2.303	2.890	3.466	3.871	3.989
HHI	703.816	552.320	269.032	292.634	354.820	479.640	789.017	1602.216	1983.859
Op. Cost/AT	0.993	0.597	0.270	0.367	0.572	0.873	1.267	1.741	2.137
Employees (000s)	9.033	21.843	0.057	0.105	0.319	1.413	6.187	23.000	47.000
Inventors	89.381	275.664	1.000	1.000	3.000	10.000	43.000	169.000	425.000
Observations	43004								

Panel B: Inventor-Year Panel

	Mean	St. Dev.	P5	P10	P25	Median	P75	P90	P95
Inv. Changes Jobs	0.035	0.183	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inv. Changes Industry	0.018	0.132	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inv. Patent Count	0.787	1.383	0.000	0.000	0.000	0.000	1.000	2.000	3.000
Inv. Citation-weighted Patents	52.218	205.601	0.000	0.000	0.000	0.000	13.000	79.000	230.000
Paperwork Burden	104.507	18.278	74.514	81.892	91.166	102.067	119.782	128.395	132.553
Time Burden	104.430	13.983	81.045	87.030	94.878	103.048	115.885	121.751	125.578
Bartik Time	105.685	14.607	79.490	88.167	96.247	105.859	116.588	122.944	127.064
Experience	7.073	4.736	2.000	2.000	3.000	6.000	10.000	14.000	17.000
Ln(AT)	9.695	1.865	6.049	7.049	8.573	10.021	11.290	11.699	11.933
MB	2.372	1.330	1.054	1.185	1.521	2.040	2.773	3.909	4.884
Leverage	0.211	0.143	0.000	0.009	0.109	0.210	0.297	0.380	0.472
Cash/AT	0.198	0.171	0.015	0.030	0.072	0.135	0.284	0.490	0.548
PPE/AT	0.187	0.127	0.044	0.062	0.091	0.144	0.261	0.368	0.424
ROA	0.152	0.088	0.027	0.069	0.109	0.152	0.203	0.253	0.291
CAPX/AT	0.046	0.035	0.010	0.013	0.021	0.035	0.060	0.091	0.121
Ln(Firm Age)	3.464	0.700	2.079	2.398	3.045	3.761	4.025	4.143	4.190
HHI	641.643	478.037	262.805	293.723	354.662	478.265	674.937	1468.952	1823.398
Op. Cost/AT	0.664	0.348	0.258	0.306	0.412	0.590	0.819	1.102	1.329
Observations	2684558								

Table 2: The dependent variables are Patents per Inventor and Patents per 1000 Employees. The variable of interest is Time Burden and its interactions. Control variables are total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Both firm and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

Patenting Quantity (Poisson)

	(1) Pat/Inv	(2) Pat/Inv	(3) Pat/Emp	(4) Pat/Inv	(5) Pat/Inv	(6) Pat/Inv
Time Burden	-0.050***	-0.052**	-0.046*			
	(-4.64)	(-2.39)	(-1.75)			
T.Burden x Below Med. AT				-0.053**		
				(-2.32)		
T.Burden x Above Med. AT				-0.049*		
				(-1.95)		
T.Burden x Mature Firms					-0.055**	
					(-2.45)	
T.Burden x Young Firms					-0.041	
					(-1.47)	
T.Burden x Undistressed						-0.052**
						(-2.36)
T.Burden x Distressed						-0.054*
						(-1.83)
Ln(Assets)		0.423***	-0.204***	0.408***	0.422***	0.402***
		(11.10)	(-3.02)	(10.18)	(11.08)	(10.31)
MB		0.047***	0.018	0.046***	0.047***	0.042***
		(5.06)	(1.41)	(5.00)	(5.05)	(4.50)
Leverage		-0.059***	-0.029	-0.059***	-0.059***	-0.044***
		(-4.65)	(-1.47)	(-4.67)	(-4.63)	(-3.19)
Cash/AT		0.059***	0.104***	0.059***	0.059***	0.056***
		(3.71)	(4.42)	(3.75)	(3.71)	(3.51)
PPE/AT		0.012	-0.072	0.012	0.012	0.016
		(0.49)	(-1.56)	(0.48)	(0.47)	(0.66)
ROA		-0.025*	-0.066***	-0.024*	-0.025*	-0.034**
		(-1.71)	(-3.24)	(-1.66)	(-1.71)	(-2.34)
CAPX/AT		0.037***	0.016	0.037***	0.037***	0.035***
		(3.40)	(0.99)	(3.43)	(3.41)	(3.18)
Ln(Firm Age)		-0.154***	-0.118**	-0.156***	-0.146***	-0.147***
		(-5.18)	(-2.31)	(-5.06)	(-3.66)	(-4.92)
HHI		-0.102	-0.349	-0.104	-0.102	-0.088
		(-0.93)	(-1.13)	(-0.94)	(-0.93)	(-0.78)
Op. Cost./AT		0.036*	-0.140***	0.035*	0.036*	0.036*
		(1.69)	(-3.89)	(1.67)	(1.68)	(1.71)
1(Above Median Size)				0.017		
				(0.14)		
1(Young Firms)					-0.061	
					(-0.45)	
1(Distressed)						-0.119
						(-0.77)
Firm FE	No	Yes	Yes	Yes	Yes	Yes
IndxYear FE	No	Yes	Yes	Yes	Yes	Yes
Number of Observations	43004	43004	43004	43004	43004	43004
High=Low(p-value)				0.87	0.55	0.94

Table 3: The dependent variable is R&D Expenditure scaled by total assets. The variable of interest is Time Burden and its interactions. Control variables are total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Both firm and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

R&D Spending (Poisson)

	(1) RD/AT	(2) RD/AT	(3) RD/AT	(4) RD/AT	(5) RD/AT
Time Burden	-0.070***	-0.006			
	(-5.38)	(-0.57)			
T.Burden x Below Med. AT			-0.005		
			(-0.47)		
T.Burden x Above Med. AT			-0.011		
			(-0.80)		
T.Burden x Mature Firms				-0.005	
				(-0.47)	
T.Burden x Young Firms				-0.009	
				(-0.65)	
T.Burden x Undistressed					-0.012
					(-1.01)
T.Burden x Distressed					0.006
					(0.42)
Ln(Assets)		-0.414***	-0.398***	-0.414***	-0.417***
		(-17.02)	(-15.86)	(-17.02)	(-16.75)
MB		0.070***	0.070***	0.070***	0.068***
		(13.55)	(13.80)	(13.59)	(13.39)
Leverage		-0.040***	-0.040***	-0.040***	-0.037***
		(-5.93)	(-5.93)	(-5.95)	(-5.29)
Cash/AT		0.035***	0.035***	0.036***	0.035***
		(3.89)	(3.82)	(3.91)	(3.79)
PPE/AT		0.055***	0.055***	0.055***	0.058***
		(3.20)	(3.18)	(3.22)	(3.42)
ROA		-0.081***	-0.082***	-0.081***	-0.084***
		(-13.12)	(-13.23)	(-13.13)	(-13.26)
CAPX/AT		0.016***	0.016***	0.016***	0.015**
		(2.62)	(2.58)	(2.64)	(2.46)
Ln(Firm Age)		0.042**	0.043**	0.024	0.043**
		(2.26)	(2.30)	(0.99)	(2.29)
HHI		-0.097***	-0.096***	-0.098***	-0.096***
		(-3.11)	(-3.05)	(-3.19)	(-3.03)
Op. Cost./AT		0.095***	0.095***	0.095***	0.095***
		(7.71)	(7.74)	(7.72)	(7.77)
1(Missing R&D)		0.588***	0.587***	0.588***	0.588***
		(9.30)	(9.29)	(9.30)	(9.29)
1(Above Median Size)			-0.002		
			(-0.03)		
1(Young Firms)				-0.003	
				(-0.05)	
1(Distressed)					-0.131*
					(-1.96)
Firm FE	No	Yes	Yes	Yes	Yes
IndxYear FE	No	Yes	Yes	Yes	Yes
Number of Observations	43004	43004	43004	43004	43004
High=Low(p-value)			0.632	0.740	0.125

Table 4: The dependent variables are indicators for whether an inventor changes job or changes industry. The variable of interest is Time Burden, as well as its interaction with a "star inventor" indicator. Control variables are inventor experience (logged), total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Inventor, firm, and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

Inventor Mobility: Time Burden

	(1) Change Job	(2) Switch Ind	(3) Change Job	(4) Switch Ind
Time Burden	0.028**	0.026**		
	(2.44)	(2.42)		
T.Burden x Star			0.035***	0.029***
			(3.12)	(2.87)
T.Burden x Non-Star			0.027**	0.025**
			(2.36)	(2.36)
Ln(Experience)	0.004*	0.003**	0.005**	0.003**
	(1.89)	(2.15)	(2.16)	(2.42)
Ln(Assets)	-0.074*	-0.032	-0.074*	-0.032
	(-1.95)	(-1.19)	(-1.95)	(-1.19)
MB	-0.013***	-0.006**	-0.013***	-0.006**
	(-3.31)	(-2.02)	(-3.31)	(-2.01)
Leverage	0.007	0.003	0.007	0.003
	(1.01)	(0.73)	(1.01)	(0.73)
Cash/AT	-0.009	-0.009	-0.009	-0.009
	(-0.76)	(-1.18)	(-0.76)	(-1.18)
PPE/AT	0.002	0.002	0.002	0.002
	(0.14)	(0.21)	(0.14)	(0.21)
ROA	-0.011	-0.007	-0.011	-0.007
	(-1.45)	(-1.35)	(-1.45)	(-1.35)
CAPX/AT	-0.006	-0.004	-0.006	-0.004
	(-0.96)	(-1.04)	(-0.96)	(-1.04)
Ln(Firm Age)	0.098***	0.058***	0.098***	0.058***
	(2.82)	(3.10)	(2.82)	(3.10)
HHI	-0.015	-0.010	-0.015	-0.010
	(-0.49)	(-0.33)	(-0.49)	(-0.33)
Op.Cost/AT	0.004	-0.004	0.004	-0.004
	(0.22)	(-0.34)	(0.22)	(-0.34)
Inventor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes
Number of Observations	2686142	2686142	2686142	2686142
Adj. R-sq	0.09	0.07	0.09	0.07
Star=Non-Star (p-value)			0.0000	0.0005

Table 5: The dependent variables are inventor-level count of patents produced and citation-weighted patents. The variables of interest are Time Burden, as well as its interaction with a "star inventor" indicator, and indicators for switching to a lower burden job or switching to a higher burden job. Control variables are inventor experience (logged), total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Inventor, firm, and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized. Columns (1)-(3) and (6)-(8) include all inventor-years. Columns (4) and (9) include only Star Inventors. Columns (5) and (10) include only Non-Star Inventors.

Inventor Productivity: Time Burden

	(1) Patents	(2) Patents	(3) Patents	(4) Stars	(5) Non-Stars	(6) C.W.Patents	(7) C.W.Patents	(8) C.W.Patents	(9) Stars	(10) Non-Stars
Time Burden	0.955*					0.922*				
	(-1.82)					(-1.80)				
T.Burden x Star		0.865***					0.884***			
		(-5.56)					(-2.80)			
T.Burden x Non-Star		1.012					0.976			
		(0.46)					(-0.50)			
New Lower Burden Job			0.883***	0.803***	0.917***			0.838***	0.764***	0.905***
			(-9.73)	(-10.93)	(-6.41)			(-7.54)	(-9.33)	(-3.90)
New Higher Burden Job			0.888***	0.734***	0.960***			0.828***	0.666***	0.972
			(-7.69)	(-10.93)	(-2.86)			(-4.52)	(-6.97)	(-0.75)
Ln(Experience)	1.200***	1.174***	1.196***	1.167***	1.089***	1.186***	1.170***	1.181***	1.244***	1.012
	(15.22)	(14.57)	(14.71)	(10.22)	(5.74)	(8.57)	(8.31)	(8.28)	(8.82)	(0.65)
Ln(Assets)	1.115***	1.116***	1.113***	1.095**	1.108***	1.156***	1.157***	1.149***	1.187***	1.099***
	(4.21)	(4.32)	(4.14)	(2.55)	(3.85)	(4.04)	(4.07)	(3.83)	(2.96)	(2.82)
MB	1.017	1.016	1.019	1.005	1.015	1.019	1.019	1.022	1.007	1.032
	(1.39)	(1.37)	(1.51)	(0.34)	(1.32)	(0.97)	(0.95)	(1.14)	(0.32)	(1.56)
Leverage	0.971**	0.971**	0.971**	0.963**	0.978**	0.943**	0.943***	0.942**	0.932**	0.958**
	(-2.39)	(-2.37)	(-2.35)	(-2.14)	(-2.01)	(-2.57)	(-2.59)	(-2.55)	(-2.29)	(-2.45)
Cash/AT	1.015	1.015	1.014	1.009	1.015	1.037*	1.037*	1.036*	1.043*	1.022
	(0.86)	(0.85)	(0.79)	(0.58)	(0.81)	(1.70)	(1.71)	(1.67)	(1.94)	(0.90)
PPE/AT	0.996	0.997	0.997	1.020	0.982	1.061	1.060	1.062	1.115*	0.992
	(-0.13)	(-0.12)	(-0.10)	(0.48)	(-0.88)	(1.23)	(1.21)	(1.24)	(1.73)	(-0.24)
ROA	1.025**	1.026**	1.025**	1.046***	1.019*	1.045***	1.045***	1.045***	1.067***	1.030**
	(2.17)	(2.25)	(2.25)	(3.14)	(1.87)	(2.89)	(2.94)	(2.90)	(3.29)	(2.11)
CAPX/AT	1.025	1.025*	1.024	1.007	1.032***	0.993	0.993	0.992	0.972	1.016
	(1.63)	(1.65)	(1.61)	(0.39)	(2.83)	(-0.29)	(-0.29)	(-0.33)	(-1.06)	(0.89)
Ln(Firm Age)	0.889***	0.890***	0.886***	0.857***	0.903***	0.884***	0.883***	0.883***	0.837***	0.923**
	(-4.01)	(-4.00)	(-4.02)	(-3.55)	(-3.79)	(-2.79)	(-2.84)	(-2.67)	(-2.94)	(-2.19)
HHI	1.023	1.022	1.023	1.033	1.024	1.021	1.022	1.022	1.033	1.021
	(0.87)	(0.85)	(0.89)	(0.69)	(1.06)	(0.57)	(0.59)	(0.59)	(0.51)	(0.79)
Op.Cost/AA	0.981	0.983	0.979	0.941*	0.999	0.912***	0.914***	0.910***	0.878**	0.944**
	(-1.00)	(-0.91)	(-1.06)	(-1.75)	(-0.06)	(-2.83)	(-2.78)	(-2.81)	(-2.47)	(-2.50)
Inventor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	2686142	2686142	2686142	298627	2387515	2686142	2686142	2686142	298627	2387515
Difference (p-value)		0.0000	0.6781	0.0027	0.0050		0.0000	0.7259	0.0153	0.0574

Table 6: The dependent variables are indicators for whether an inventor changes job or changes industry. The variable of interest is instrumented Time Burden, as well as its interaction with a "star inventor" indicator. Control variables are inventor experience (logged), total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Inventor, firm, and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

2nd Stage: Inventor Mobility: Time Burden

	(1) Change Job	(2) Switch Ind	(3) Change Job	(4) Switch Ind
Time Burden	0.038**	0.034**		
	(2.25)	(2.15)		
T.Burden x Star			0.045***	0.038**
			(2.78)	(2.48)
T.Burden x Non-Star			0.037**	0.034**
			(2.19)	(2.11)
Ln(Experience)	0.004*	0.002**	0.005**	0.003**
	(1.86)	(2.10)	(2.18)	(2.40)
Ln(Assets)	-0.074*	-0.032	-0.074*	-0.032
	(-1.96)	(-1.19)	(-1.96)	(-1.19)
MB	-0.013***	-0.006*	-0.013***	-0.006*
	(-3.28)	(-1.95)	(-3.28)	(-1.95)
Leverage	0.007	0.003	0.007	0.003
	(1.00)	(0.72)	(1.00)	(0.72)
Cash/AT	-0.009	-0.009	-0.009	-0.009
	(-0.78)	(-1.20)	(-0.78)	(-1.20)
PPE/AT	0.003	0.002	0.003	0.002
	(0.15)	(0.23)	(0.15)	(0.23)
ROA	-0.011	-0.007	-0.011	-0.007
	(-1.44)	(-1.34)	(-1.44)	(-1.34)
CAPX/AT	-0.006	-0.004	-0.006	-0.004
	(-0.98)	(-1.08)	(-0.98)	(-1.08)
Ln(Firm Age)	0.098***	0.058***	0.098***	0.058***
	(2.82)	(3.09)	(2.82)	(3.09)
HHI	-0.015	-0.010	-0.015	-0.010
	(-0.49)	(-0.33)	(-0.49)	(-0.33)
Op.Cost/AT	0.003	-0.004	0.003	-0.004
	(0.21)	(-0.35)	(0.21)	(-0.35)
Inventor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes
Number of Observations	2686142	2686142	2686142	2686142
1st Stage F-stat	95.92	95.92	47.41	47.41
Star=Non-Star (p-value)			0.0000	0.0000

Table A1: The dependent variables are indicators for whether an inventor changes job or changes industry. The variable of interest is Paperwork Burden, as well as its interaction with a "star inventor" indicator. Control variables are inventor experience (logged), total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Inventor, firm, and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

Inventor Mobility: Paperwork Burden

	(1) Change Job	(2) Switch Ind	(3) Change Job	(4) Switch Ind
Paperwork Burden	0.019*	0.014		
	(1.72)	(1.40)		
PW.Burden x Star			0.026**	0.018*
			(2.38)	(1.88)
PW.Burden x Non-Star			0.018	0.013
			(1.63)	(1.33)
Ln(Experience)	0.004*	0.003**	0.005**	0.003**
	(1.92)	(2.23)	(2.20)	(2.56)
Ln(Assets)	-0.073*	-0.032	-0.073*	-0.032
	(-1.95)	(-1.18)	(-1.95)	(-1.18)
MB	-0.013***	-0.006**	-0.013***	-0.006**
	(-3.37)	(-2.10)	(-3.37)	(-2.10)
Leverage	0.007	0.003	0.007	0.003
	(1.02)	(0.75)	(1.02)	(0.74)
Cash/AT	-0.008	-0.009	-0.008	-0.009
	(-0.73)	(-1.12)	(-0.73)	(-1.12)
PPE/AT	0.002	0.002	0.002	0.002
	(0.12)	(0.18)	(0.12)	(0.18)
ROA	-0.011	-0.007	-0.011	-0.007
	(-1.46)	(-1.36)	(-1.46)	(-1.36)
CAPX/AT	-0.006	-0.003	-0.006	-0.003
	(-0.93)	(-0.98)	(-0.93)	(-0.98)
Ln(Firm Age)	0.099***	0.059***	0.099***	0.059***
	(2.85)	(3.12)	(2.85)	(3.12)
HHI	-0.015	-0.010	-0.015	-0.010
	(-0.49)	(-0.33)	(-0.49)	(-0.33)
Op.Cost/AT	0.004	-0.004	0.004	-0.004
	(0.25)	(-0.30)	(0.24)	(-0.31)
Inventor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes
Number of Observations	2686142	2686142	2686142	2686142
Adj. R-sq	0.09	0.07	0.09	0.07
Star=Non-Star (p-value)			0.0000	0.0000

Table A2: The dependent variables are inventor-level count of patents produced and citation-weighted patents. The variables of interest are Paperwork Burden, as well as its interaction with a "star inventor" indicator, and indicators for switching to a lower burden job or switching to a higher burden job. Control variables are inventor experience (logged), total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Inventor, firm, and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized. Columns (1)-(3) and (6)-(8) include all inventor-years. Columns (4) and (9) include only Star Inventors. Columns (5) and (10) include only Non-Star Inventors.

Inventor Productivity: Paperwork Burden

	(1) Patents	(2) Patents	(3) Patents	(4) Stars	(5) Non-Stars	(6) C.W.Patents	(7) C.W.Patents	(8) C.W.Patents	(9) Stars	(10) Non-Stars
Paperwork Burden	0.968					0.947				
	(-1.25)					(-1.28)				
PW.Burden x Star		0.883***					0.911**			
		(-4.62)					(-2.19)			
PW.Burden x Non-Star		1.027					1.001			
		(0.99)					(0.02)			
New Lower Burden Job			0.883***	0.803***	0.916***			0.842***	0.763***	0.912***
			(-9.26)	(-11.58)	(-6.31)			(-6.54)	(-9.20)	(-3.28)
New Higher Burden Job			0.888***	0.734***	0.961***			0.821***	0.670***	0.959
			(-8.00)	(-10.57)	(-2.81)			(-5.80)	(-7.17)	(-1.39)
Ln(Experience)	1.200***	1.173***	1.196***	1.167***	1.089***	1.185***	1.169***	1.181***	1.244***	1.013
	(15.18)	(14.63)	(14.62)	(10.23)	(5.71)	(8.48)	(8.27)	(8.28)	(8.82)	(0.67)
Ln(Assets)	1.114***	1.113***	1.113***	1.095**	1.108***	1.154***	1.153***	1.149***	1.187***	1.099***
	(4.24)	(4.28)	(4.14)	(2.56)	(3.85)	(4.02)	(4.01)	(3.83)	(2.97)	(2.80)
MB	1.018	1.018	1.019	1.005	1.015	1.021	1.021	1.022	1.007	1.032
	(1.46)	(1.49)	(1.51)	(0.34)	(1.32)	(1.09)	(1.08)	(1.14)	(0.32)	(1.56)
Leverage	0.971**	0.971**	0.971**	0.963**	0.978**	0.943**	0.943***	0.942**	0.932**	0.957**
	(-2.39)	(-2.36)	(-2.35)	(-2.14)	(-2.00)	(-2.56)	(-2.58)	(-2.55)	(-2.29)	(-2.45)
Cash/AT	1.014	1.013	1.014	1.009	1.015	1.036*	1.036*	1.036*	1.043*	1.022
	(0.83)	(0.80)	(0.79)	(0.57)	(0.81)	(1.68)	(1.69)	(1.67)	(1.94)	(0.91)
PPE/AT	0.997	0.996	0.997	1.020	0.982	1.062	1.060	1.062	1.115*	0.992
	(-0.10)	(-0.13)	(-0.10)	(0.48)	(-0.88)	(1.25)	(1.22)	(1.24)	(1.73)	(-0.25)
ROA	1.025**	1.026**	1.025**	1.046***	1.019*	1.044***	1.045***	1.045***	1.067***	1.030**
	(2.18)	(2.28)	(2.25)	(3.13)	(1.87)	(2.87)	(2.93)	(2.90)	(3.29)	(2.11)
CAPX/AT	1.025	1.024	1.024	1.007	1.032***	0.992	0.992	0.992	0.972	1.016
	(1.59)	(1.57)	(1.61)	(0.39)	(2.83)	(-0.33)	(-0.33)	(-0.33)	(-1.06)	(0.89)
Ln(Firm Age)	0.889***	0.890***	0.886***	0.856***	0.903***	0.884***	0.885***	0.883***	0.837***	0.923**
	(-4.02)	(-3.99)	(-4.01)	(-3.55)	(-3.78)	(-2.79)	(-2.81)	(-2.68)	(-2.95)	(-2.16)
HHI	1.022	1.021	1.023	1.033	1.024	1.021	1.021	1.022	1.033	1.020
	(0.86)	(0.82)	(0.89)	(0.69)	(1.05)	(0.57)	(0.58)	(0.59)	(0.51)	(0.78)
Op.Cost/AA	0.979	0.981	0.979	0.941*	0.999	0.910***	0.912***	0.910***	0.878**	0.944**
	(-1.04)	(-0.95)	(-1.06)	(-1.75)	(-0.06)	(-2.82)	(-2.76)	(-2.81)	(-2.47)	(-2.50)
Inventor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	2686142	2686142	2686142	298627	2387515	2686142	2686142	2686142	298627	2387515
Difference (p-value)		0.0000	0.7104	0.0019	0.0046		0.0000	0.3713	0.0173	0.0928

Table A3: The dependent variable is an indicator for whether an inventor changes job. The variables of interest are transformations of Time Burden. Control variables are inventor experience (logged), total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Inventor, firm, and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

Inventor Mobility: Nonlinearities

	(1) Change Job	(2) Change Job	(3) Change Job	(4) Change Job	(5) Change Job
Ln(Time Burden)	0.026**				
	(2.35)				
IHS(Time Burden)		0.026**			
		(2.35)			
Sqrt(Time Burden)			0.027**		
			(2.40)		
Neg. Recip. Time Burden				0.022**	
				(2.19)	
Time Burden					-0.051
					(-0.59)
$(\text{Time Burden})^2$					0.006
					(0.90)
Ln(Experience)	0.004*	0.004*	0.004*	0.004*	0.004*
	(1.90)	(1.90)	(1.90)	(1.91)	(1.88)
Ln(Assets)	-0.074*	-0.074*	-0.074*	-0.074*	-0.073*
	(-1.95)	(-1.95)	(-1.95)	(-1.96)	(-1.95)
MB	-0.013***	-0.013***	-0.013***	-0.013***	-0.013***
	(-3.31)	(-3.31)	(-3.31)	(-3.31)	(-3.35)
Leverage	0.007	0.007	0.007	0.007	0.007
	(1.02)	(1.02)	(1.01)	(1.02)	(1.00)
Cash/AT	-0.009	-0.009	-0.009	-0.009	-0.009
	(-0.75)	(-0.75)	(-0.76)	(-0.74)	(-0.78)
PPE/AT	0.002	0.002	0.002	0.002	0.003
	(0.13)	(0.13)	(0.13)	(0.13)	(0.14)
ROA	-0.011	-0.011	-0.011	-0.011	-0.011
	(-1.46)	(-1.46)	(-1.45)	(-1.46)	(-1.44)
CAPX/AT	-0.006	-0.006	-0.006	-0.006	-0.006
	(-0.95)	(-0.95)	(-0.96)	(-0.94)	(-0.97)
Ln(Firm Age)	0.099***	0.099***	0.098***	0.099***	0.098***
	(2.83)	(2.83)	(2.83)	(2.83)	(2.82)
HHI	-0.015	-0.015	-0.015	-0.016	-0.015
	(-0.50)	(-0.50)	(-0.49)	(-0.50)	(-0.48)
Op.Cost/AT	0.004	0.004	0.004	0.004	0.004
	(0.22)	(0.22)	(0.22)	(0.23)	(0.22)
Inventor FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes	Yes
Number of Observations	2686142	2686142	2686142	2686142	2686142
Adj. R-sq	0.09	0.09	0.09	0.09	0.09
Joint Significance (p-value)					0.0485

Table A4: The dependent variable is the inventor-level count of patents produced. The variables of interest are transformations of Time Burden. Control variables are inventor experience (logged), total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Inventor, firm, and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

Inventor Productivity: Nonlinearities

	(1) Patents	(2) Patents	(3) Patents	(4) Patents	(5) Patents
Ln(Time Burden)	0.957*				
	(-1.86)				
IHS(Time Burden)		0.957*			
		(-1.86)			
Sqrt(Time Burden)			0.956*		
			(-1.84)		
Neg. Recip. Time Burden				0.962*	
				(-1.88)	
Time Burden					1.054
					(0.38)
$(\text{Time Burden})^2$					0.993
					(-0.65)
Ln(Experience)	1.200***	1.200***	1.200***	1.200***	1.200***
	(15.21)	(15.21)	(15.22)	(15.19)	(15.24)
Ln(Assets)	1.115***	1.115***	1.115***	1.115***	1.115***
	(4.22)	(4.22)	(4.21)	(4.23)	(4.19)
MB	1.017	1.017	1.017	1.017	1.017
	(1.39)	(1.39)	(1.39)	(1.39)	(1.40)
Leverage	0.971**	0.971**	0.971**	0.971**	0.971**
	(-2.40)	(-2.40)	(-2.39)	(-2.40)	(-2.38)
Cash/AT	1.015	1.015	1.015	1.015	1.015
	(0.84)	(0.84)	(0.85)	(0.83)	(0.87)
PPE/AT	0.996	0.996	0.996	0.997	0.996
	(-0.13)	(-0.13)	(-0.13)	(-0.12)	(-0.14)
ROA	1.025**	1.025**	1.025**	1.025**	1.024**
	(2.19)	(2.19)	(2.18)	(2.21)	(2.12)
CAPX/AT	1.025	1.025	1.025	1.025	1.025
	(1.63)	(1.63)	(1.63)	(1.62)	(1.63)
Ln(Firm Age)	0.889***	0.889***	0.889***	0.889***	0.889***
	(-4.01)	(-4.01)	(-4.01)	(-4.01)	(-4.00)
HHI	1.023	1.023	1.023	1.023	1.022
	(0.87)	(0.87)	(0.87)	(0.87)	(0.86)
Op.Cost/AT	0.980	0.980	0.980	0.980	0.981
	(-1.01)	(-1.01)	(-1.01)	(-1.02)	(-1.00)
Inventor FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes	Yes
Number of Observations	2686142	2686142	2686142	2686142	2686142
Joint Significance (p-value)					0.1586

Table A5: The dependent variable is Patents per Inventor. The variables of interest are transformations of Time Burden. Control variables are total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Firm and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

Firm Patenting Quantity: Nonlinearities

	(1) Pat/Inv	(2) Pat/Inv	(3) Pat/Inv	(4) Pat/Inv	(5) Pat/Inv
Ln(Time Burden)	-0.047**				
	(-2.33)				
IHS(Time Burden)		-0.047**			
		(-2.33)			
Sqrt(Time Burden)			-0.050**		
			(-2.37)		
Neg. Recip. Time Burden				-0.041**	
				(-2.17)	
Time Burden					-0.049
					(-0.36)
$(\text{Time Burden})^2$					-0.000
					(-0.02)
Ln(Assets)	0.423***	0.423***	0.423***	0.423***	0.423***
	(11.10)	(11.10)	(11.10)	(11.11)	(11.10)
MB	0.047***	0.047***	0.047***	0.047***	0.047***
	(5.06)	(5.06)	(5.06)	(5.06)	(5.06)
Leverage	-0.059***	-0.059***	-0.059***	-0.059***	-0.059***
	(-4.64)	(-4.64)	(-4.65)	(-4.65)	(-4.64)
Cash/AT	0.059***	0.059***	0.059***	0.059***	0.059***
	(3.71)	(3.71)	(3.71)	(3.71)	(3.71)
PPE/AT	0.012	0.012	0.012	0.012	0.012
	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)
ROA	-0.025*	-0.025*	-0.025*	-0.025*	-0.025*
	(-1.70)	(-1.70)	(-1.71)	(-1.70)	(-1.71)
CAPX/AT	0.037***	0.037***	0.037***	0.037***	0.037***
	(3.41)	(3.41)	(3.41)	(3.41)	(3.40)
Ln(Firm Age)	-0.154***	-0.154***	-0.154***	-0.154***	-0.154***
	(-5.17)	(-5.17)	(-5.17)	(-5.17)	(-5.17)
HHI	-0.102	-0.102	-0.102	-0.103	-0.102
	(-0.93)	(-0.93)	(-0.93)	(-0.93)	(-0.93)
Op. Cost./AT	0.036*	0.036*	0.036*	0.036*	0.036*
	(1.70)	(1.70)	(1.69)	(1.70)	(1.69)
Firm FE	Yes	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes	Yes
Number of Observations	43004	43004	43004	43004	43004
Joint Significance (p-value)					0.057

Table A6: The dependent variables are Patents per Inventor Patents per 1000 Employees. The variable of interest is the Time Burden measure and its interactions. Control variables are total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Both firm and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

Patenting Quantity (OLS)

	(1)	(2)	(3)	(4)	(5)	(6)
	Pat/Inv	Pat/Inv	Pat/Emp	Pat/Inv	Pat/Inv	Pat/Inv
Time Burden	-0.012***	-0.014**	-0.592			
	(-4.63)	(-2.49)	(-1.39)			
T.Burden x Below Med. AT				-0.013**		
				(-2.17)		
T.Burden x Above Med. AT				-0.017**		
				(-2.51)		
T.Burden x Mature Firms					-0.014**	
					(-2.39)	
T.Burden x Young Firms					-0.015*	
					(-1.92)	
T.Burden x Undistressed						-0.015**
						(-2.48)
T.Burden x Distressed						-0.012*
						(-1.74)
Ln(Assets)		0.097***	-1.598**	0.095***	0.097***	0.093***
		(10.37)	(-2.18)	(9.66)	(10.34)	(9.76)
MB		0.012***	0.299	0.012***	0.012***	0.011***
		(4.68)	(1.27)	(4.66)	(4.68)	(4.20)
Leverage		-0.016***	-0.532**	-0.016***	-0.016***	-0.013***
		(-5.41)	(-2.37)	(-5.40)	(-5.39)	(-4.05)
Cash/AT		0.014***	1.641***	0.014***	0.014***	0.014***
		(3.55)	(5.06)	(3.57)	(3.54)	(3.42)
PPE/AT		0.005	-0.796*	0.005	0.005	0.006
		(0.86)	(-1.84)	(0.85)	(0.86)	(1.09)
ROA		-0.005	-1.135***	-0.005	-0.005	-0.007**
		(-1.35)	(-3.21)	(-1.34)	(-1.33)	(-1.99)
CAPX/AT		0.012***	0.109	0.012***	0.012***	0.012***
		(4.30)	(0.73)	(4.28)	(4.29)	(4.09)
Ln(Firm Age)		-0.034***	-2.152***	-0.035***	-0.029***	-0.032***
		(-4.15)	(-4.49)	(-4.22)	(-2.69)	(-3.98)
HHI		-0.020	-0.289	-0.020	-0.020	-0.018
		(-1.04)	(-0.41)	(-1.02)	(-1.03)	(-0.96)
Op. Cost./AT		0.008	-1.240***	0.007	0.008	0.008
		(1.48)	(-4.10)	(1.46)	(1.47)	(1.50)
1(Above Median Size)				0.030		
				(0.98)		
1(Young Firms)					0.013	
					(0.34)	
1(Distressed)						-0.040
						(-1.11)
Firm FE	No	Yes	Yes	Yes	Yes	Yes
IndxYear FE	No	Yes	Yes	Yes	Yes	Yes
Number of Observations	43004	43004	43004	43004	43004	43004
Adj. R-sq	0.00	0.32	0.58	0.32	0.32	0.32
High=Low(p-value)				0.425	0.859	0.674

Table A7: The dependent variable is R&D Expenditure scaled by total assets. The variable of interest is the Time Burden measure and its interactions. Control variables are total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Both firm and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

R&D Spending (OLS)

	(1) RD/AT	(2) RD/AT	(3) RD/AT	(4) RD/AT	(5) RD/AT
Time Burden	-0.006***	-0.003			
	(-5.41)	(-1.56)			
T.Burden x Below Med. AT			-0.005**		
			(-2.44)		
T.Burden x Above Med. AT			-0.003*		
			(-1.82)		
T.Burden x Mature Firms				-0.002	
				(-1.43)	
T.Burden x Young Firms				-0.003	
				(-1.50)	
T.Burden x Undistressed					-0.003*
					(-1.82)
T.Burden x Distressed					-0.001
					(-0.41)
Ln(Assets)		-0.042***	-0.041***	-0.042***	-0.042***
		(-14.14)	(-14.14)	(-14.11)	(-14.19)
MB		0.018***	0.018***	0.018***	0.017***
		(17.61)	(17.92)	(17.62)	(17.71)
Leverage		-0.003***	-0.003***	-0.003***	-0.002***
		(-3.02)	(-3.44)	(-3.03)	(-2.62)
Cash/AT		0.002*	0.002*	0.002*	0.002
		(1.65)	(1.92)	(1.68)	(1.60)
PPE/AT		0.005***	0.004**	0.005***	0.005***
		(2.73)	(2.48)	(2.74)	(2.89)
ROA		-0.026***	-0.027***	-0.026***	-0.026***
		(-19.13)	(-19.11)	(-19.15)	(-19.16)
CAPX/AT		0.001**	0.001**	0.001**	0.001**
		(2.18)	(2.10)	(2.21)	(2.03)
Ln(Firm Age)		0.005**	0.005**	0.003	0.005**
		(2.53)	(2.56)	(1.16)	(2.57)
HHI		0.002	0.005	0.002	0.002
		(0.15)	(0.62)	(0.15)	(0.16)
Op. Cost./AT		0.013***	0.014***	0.013***	0.013***
		(9.09)	(9.36)	(9.10)	(9.09)
1(Missing R&D)		0.029***	-0.022***	0.029***	0.029***
		(8.08)	(-7.50)	(8.08)	(8.05)
1(Above Median Size)			-0.011		
			(-1.53)		
1(Young Firms)				0.002	
				(0.19)	
1(Distressed)					-0.015
					(-1.37)
Firm FE	No	Yes	Yes	Yes	Yes
IndxYear FE	No	Yes	Yes	Yes	Yes
Number of Observations	43004	43004	43004	43004	43004
Adj. R-sq	0.00	0.78	0.79	0.78	0.78
High=Low(p-value)			0.213	0.587	0.266

Table A8: The dependent variables are inventor-level count of patents produced and citation-weighted patents. The variables of interest are Time Burden, as well as its interaction with a "star inventor" indicator, and indicators for switching to a lower burden job or switching to a higher burden job. Control variables are inventor experience (logged), total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Inventor, firm, and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized. Columns (1)-(3) and (6)-(8) include all inventor-years. Columns (4) and (9) include only Star Inventors. Columns (5) and (10) include only Non-Star Inventors.

Inventor Productivity: Time Burden (OLS)

	(1) Patents	(2) Patents	(3) Patents	(4) Stars	(5) Non-Stars	(6) C.W.Patents	(7) C.W.Patents	(8) C.W.Patents	(9) Stars	(10) Non-Stars
Time Burden	-0.035**					-3.631				
	(-2.06)					(-1.48)				
T.Burden x Star		0.065					21.449***			
		(1.34)					(2.89)			
T.Burden x Non-Star		-0.047**					-6.661***			
		(-2.38)					(-2.61)			
New Lower Burden Job			-0.062***	-0.458***	-0.025***			-5.974***	-54.769***	-1.481**
			(-6.60)	(-11.21)	(-3.52)			(-5.75)	(-9.41)	(-2.23)
New Higher Burden Job			-0.072***	-0.542***	-0.019**			-7.831***	-66.845***	-0.879
			(-6.69)	(-10.54)	(-2.52)			(-5.66)	(-7.59)	(-1.01)
Ln(Experience)	0.105***	0.115***	0.104***	0.390***	0.066***	5.139***	7.419***	4.995***	51.572***	0.814
	(9.84)	(13.75)	(9.57)	(9.28)	(9.62)	(2.73)	(4.90)	(2.64)	(5.95)	(1.38)
Ln(Assets)	0.065***	0.065***	0.064***	0.187**	0.049***	6.773***	6.941***	6.723***	36.449***	2.898***
	(3.56)	(3.62)	(3.47)	(2.47)	(3.58)	(3.60)	(3.82)	(3.55)	(3.06)	(3.40)
MB	0.008	0.008	0.009	0.004	0.004	1.083	1.156	1.175	-0.012	0.666
	(0.83)	(0.84)	(0.91)	(0.10)	(0.65)	(0.83)	(0.87)	(0.90)	(-0.00)	(0.96)
Leverage	-0.022**	-0.022**	-0.022**	-0.091**	-0.012**	-3.489***	-3.522***	-3.496***	-18.450**	-1.191**
	(-2.15)	(-2.17)	(-2.13)	(-2.23)	(-1.98)	(-2.61)	(-2.62)	(-2.59)	(-2.58)	(-2.42)
Cash/AT	0.006	0.006	0.005	0.005	0.007	1.650	1.716	1.582	8.537	0.857
	(0.40)	(0.42)	(0.35)	(0.12)	(0.71)	(1.09)	(1.12)	(1.04)	(1.36)	(1.03)
PPE/AT	0.004	0.004	0.005	0.046	-0.004	3.929	3.879	3.985	23.760	0.536
	(0.21)	(0.20)	(0.24)	(0.49)	(-0.37)	(1.42)	(1.41)	(1.43)	(1.60)	(0.57)
ROA	0.019**	0.019**	0.020**	0.101***	0.009*	1.827*	1.758*	1.889*	13.882**	0.428
	(2.10)	(2.09)	(2.16)	(2.78)	(1.69)	(1.80)	(1.75)	(1.86)	(2.48)	(1.02)
CAPX/AT	0.014	0.014	0.014	0.018	0.012**	-0.780	-0.754	-0.822	-7.200	0.067
	(1.45)	(1.46)	(1.41)	(0.42)	(2.42)	(-0.59)	(-0.57)	(-0.62)	(-1.03)	(0.12)
Ln(Firm Age)	-0.072***	-0.072***	-0.075***	-0.308***	-0.050***	-3.779**	-3.937**	-4.099**	-31.473***	-1.116
	(-3.74)	(-3.78)	(-3.77)	(-3.58)	(-3.53)	(-2.04)	(-2.09)	(-2.16)	(-2.68)	(-1.04)
HHI	0.007	0.007	0.007	0.051	0.006	-0.581	-0.527	-0.551	1.247	-0.133
	(0.45)	(0.46)	(0.45)	(0.56)	(0.66)	(-0.36)	(-0.33)	(-0.33)	(0.10)	(-0.20)
Op.Cost/AT	-0.007	-0.008	-0.008	-0.109	0.003	-3.799**	-3.954**	-3.871**	-24.507**	-1.607**
	(-0.51)	(-0.56)	(-0.55)	(-1.43)	(0.36)	(-2.23)	(-2.31)	(-2.24)	(-2.33)	(-2.03)
Inventor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	2686142	2686142	2686142	298627	2387515	2686142	2686142	2686142	298627	2387515
Adj. R-sq	0.35	0.35	0.35	0.28	0.20	0.32	0.32	0.32	0.33	0.20
Difference (p-value)		0.0466	0.3095	0.0978	0.4497		0.0002	0.1633	0.1578	0.5427

Table A9: The dependent variables are indicators for whether an inventor changes to a lower burden job (industry). The variable of interest is Time Burden, as well as its interaction with a "star inventor" indicator. Control variables are inventor experience (logged), total assets (logged), market-to-book ratio, leverage, cash, tangibility, ROA, capital expenditure, operational costs (scaled by assets), firm age (logged), and industry concentration. Inventor, firm, and industry-by-year fixed effects are included in all specifications. Standard errors are clustered at the firm-level. All independent variables are lagged. All continuous independent variables are standardized.

Inventor Mobility: Time Burden

	(1) Change LB Job	(2) Switch LB Ind	(3) Change LB Job	(4) Switch LB Ind
Time Burden	0.134***	0.107***		
	(14.54)	(11.54)		
T.Burden x Star			0.135***	0.108***
			(14.29)	(11.41)
T.Burden x Non-Star			0.134***	0.107***
			(14.54)	(11.54)
Ln(Experience)	0.001	0.001	0.002	0.001
	(1.23)	(1.31)	(1.31)	(1.39)
Ln(Assets)	-0.037**	-0.018	-0.037**	-0.018
	(-2.05)	(-1.28)	(-2.05)	(-1.28)
MB	-0.006***	-0.003**	-0.006***	-0.003**
	(-3.46)	(-2.36)	(-3.46)	(-2.37)
Leverage	0.003	0.002	0.003	0.002
	(0.82)	(0.71)	(0.82)	(0.71)
Cash/AT	-0.005	-0.005	-0.005	-0.005
	(-0.81)	(-1.09)	(-0.81)	(-1.09)
PPE/AT	0.002	0.002	0.002	0.002
	(0.31)	(0.38)	(0.31)	(0.38)
ROA	-0.005	-0.004*	-0.005	-0.004*
	(-1.58)	(-1.78)	(-1.58)	(-1.78)
CAPX/AT	-0.003	-0.002	-0.003	-0.002
	(-0.88)	(-0.83)	(-0.88)	(-0.83)
Ln(Firm Age)	0.041***	0.024**	0.041***	0.024**
	(2.59)	(2.44)	(2.59)	(2.44)
HHI	-0.010	-0.008	-0.010	-0.008
	(-0.64)	(-0.53)	(-0.64)	(-0.53)
Op.Cost/AT	0.001	-0.000	0.001	-0.000
	(0.16)	(-0.10)	(0.16)	(-0.10)
Inventor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
IndxYear FE	Yes	Yes	Yes	Yes
Number of Observations	2686142	2686142	2686142	2686142
Adj. R-sq	0.11	0.11	0.11	0.11
Star=Non-Star (p-value)			0.4339	0.7542