WP 2025:03

Employee Stock Options - a literature review

Growth analysis
Swedish Agency for Growth Policy Analysis

Dnr: 2024/179
The Swedish Agency for Growth Policy Analysis
Studentplan 3, S-831 40 Östersund
Phone: +46 10 447 44 00
E-mail: info@tillvaxtanalys.se
www.tillvaxtanalys.se
Contact: Josefin Videnord
Phone: 010-447 44 06
E-mail: josefin.videnord@tillvaxtanalys.se
Photo: Johnér.

Employee Stock Options – a literature review

Alvin Chen

2025-11-10

Abstract

This paper reviews the theoretical and empirical literature on broad-based employee stock options (ESOs) and their impact on firm behavior and employee outcomes. ESOs—stock options granted to non-executive workers—are designed to ease financing constraints, strengthen retention, enhance motivation, and attract talent aligned with firm goals. Evidence from U.S. firms, and emerging data from Europe, shows that ESOs can relax financial constraints and stimulate investment in young, innovative firms, while improving retention and, in some settings, productivity and innovation. Their effectiveness, however, is highly context-dependent. For example, in large or cash-rich firms, ESOs may have negative consequences by distorting payout policies, encouraging earnings management, or reducing employee welfare through misvaluation and risk exposure. European policy initiatives such as the U.K.'s EMI and France's BSPCE illustrate how targeted tax design can improve adoption and outcomes. Overall, ESOs are contingent instruments—valuable when addressing genuine market frictions, but potentially counterproductive when misaligned with firm and institutional conditions.

1. Introduction

Broad-based employee stock options (ESOs) have become an important compensation tool in many firms. ESO plans grant stock options to non-executive employees, giving them the right to buy shares at a fixed "strike" price, typically over a long period. These plans gained popularity in the U.S., primarily in the tech industry, in the late 1990s and have since become more prevalent across various industries and geographic regions.

In Europe, ESOs have attracted renewed attention as part of broader policy discussions on competitiveness, innovation, and labor market dynamism. In particular, the 2024 EU Competitiveness Report places strong emphasis on productivity-enhancing reforms, highlighting talent retention, innovation capacity, and startup scale-up as strategic pillars for Europe's long-term growth.[1] Within this context, ESO plans are increasingly discussed not merely as a corporate governance tool, but also as a lever of industrial policy—supporting the alignment of incentives, the attraction of global talent, and the scaling of high-growth firms.

National initiatives complement this EU-level focus. The Swedish government, like several its European counterparts, has introduced or revised tax and regulatory frameworks to encourage wider employee ownership. For example, the Swedish *kvalificerade personaloptioner* (Qualified Employee Stock Option) scheme introduced in 2018 (and updated in 2022) aims to make it easier for startups and scaleups to attract and retain key personnel by granting tax advantages for equity incentives paid to non-executive workers in small firms.[2] Comparable reforms have been adopted in other European countries, reflecting a shared concern with strengthening the growth ecosystem and ensuring that employees share in the upside of firm success.

Alongside these top-down initiatives, bottom-up campaigns have played an important role. For instance, the "Not Optional" movement has made tangible progress in shifting both policy and practice toward broader adoption of employee ownership in Europe's startup ecosystem.[3] Proponents argue that broad ESOs can improve firm performance by aligning employees' interests with shareholders and by overcoming labor market frictions, while skeptics point to free-rider problems, dilution, and other potential unintended consequences.

This literature review synthesizes recent theoretical and empirical research on how ESOs affect firm outcomes. The review draws on high-quality, peer-reviewed studies as well as recent working papers from prominent working paper series. The goal is to offer an up-to-date understanding of how non-executive stock option plans influence firm performance, innovation, employee behavior, and labor market dynamics.

---

[1] https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en

[2] *Så beskattas personaloptioner*, April 7, 2025. Available at: https://www.aspia.se/inspiration/artikel/skatt/personaloptioner/

[3] See *5 years of Not Optional campaign sees European startups catch up on employee stock options*, Tech.eu, 28 October 2024.

2. Theoretical Overview: Why Grant Stock Options Broadly to Rank-and-File Employees?

The theoretical foundations for the benefits of ESOs rest on a set of interconnected market frictions that conventional cash compensation may not address. In the absence of such frictions, stock options would be an inefficient substitute for cash. The literature identifies four main mechanisms through which ESOs may affect firm performance: (1) alleviating financial constraints, (2) enhancing retention, (3) improving motivation and effort, and (4) screening for desirable employees. Each mechanism reflects a distinct friction, generates testable predictions, and informs policy debates about when and where ESO use is most effective.

2.1 Alleviating Financial Constraints and Lowering Capital Costs

Young and high-growth firms often face significant financial constraints as external capital becomes costly due to information asymmetries and agency issues. For such firms, paying competitive cash salaries would deplete critical resources needed for expansion and investments. By compensating employees with stock options, firms preserve cash by deferring pay, effectively transforming their workforce into a source of financing.

Core and Guay (2001) observe that when "information asymmetries between the firm and its employees are lower than those between the firm and outside investors, equity compensation can have cost advantages relative to external equity financing" (p. 259). This logic suggests that firms may find their own employees to be the least costly "capital providers," particularly when those employees already possess superior information about firm prospects. Building on this view, Babenko et al. (2011) highlight that ESOs also generate additional cash flows for the firm when its employees exercise their stock options. They further note that if "high stock prices signal good investment opportunities," then the cash inflows from stock option exercises correlate positively with the firm's investment opportunities (p. 984). In other words, ESOs may help relax the firm's financial constraints today and in the future. These arguments are especially relevant for startups and R&D-intensive firms where short-term cash flows may be negative but growth prospects (and thus equity upside) are high. For many countries in Europe, this mechanism is particularly salient in the policy debate surrounding the scaling up of startups, as shallow venture capital markets and bank-dominated finance often constrain high-growth firms.

Related Considerations

Stock option grants allow the firm's owners to transfer some risk to its employees, who now directly bear the consequences of low stock prices. Because employees are typically risk-averse, they might discount the value of risky stock options, requiring a premium or higher expected return to accept them. In effect, firms trade reduced cash outflows today for higher implicit financing costs tomorrow. As a result, tapping risk-averse employees as a source of finance involves a trade-off. For firms with excellent investment opportunities, ESOs can represent a rational solution to the financial constraint problem.

These arguments suggest that financially constrained firms are more likely to use stock options extensively and may achieve improved outcomes as a result.

2.2 Employee Retention

Employee turnover represents a significant cost, particularly for firms that rely on specialized human capital. When employees leave, firms incur substantial expenses related to recruiting and training replacements, while also suffering the loss of irreplaceable institutional knowledge. These factors hurt firm performance. Conventional contractual solutions for preserving employment relationships remain limited in most jurisdictions, with potential solutions such as non-compete agreements being incomplete and at times unenforceable. As a result, many firms face the serious risk of losing their employees when labor market conditions change. Because continuously renegotiating salaries to match outside offers is both costly and impractical, ESOs provide a contractual device that makes retention more efficient.

First, the vesting schedule of ESOs creates exit barriers. The stock options in compensation plans typically vest over multiple years, meaning employees who leave the firm forfeit all unvested stock options in their compensation plan. This structure substantially increases the cost of quitting and functions as a powerful retention tool—employees gain a compelling financial incentive to remain with the firm throughout the vesting period, especially when they anticipate continued stock price appreciation.

Second, as Oyer (2004) demonstrates, ESOs can serve as an elegant wage-indexation mechanism. When an employee´s outside opportunities improve due to positive industry-wide developments, the value of their stock options typically increases correspondingly, helping the firm retain talent without formal salary adjustments. For instance, during economic booms, rising company stock prices (and consequently, option values) effectively match higher external salary offers without requiring base compensation renegotiation. Conversely, during downturns, both the firm's stock and overall market wages decline in tandem, preventing the organization from becoming locked into unsustainably high fixed compensation. In this sense, ESOs substitute for formal wage-indexation contracts, which are rare in practice.

By partially correlating compensation with firm performance, broad-based ESO programs help companies retain employees during volatile labor market conditions, eliminating the need to recalibrate employee compensation continuously. This mechanism is especially valuable in industries where common economic forces can trigger significant fluctuations in the demand for talent.

ESOs effectively extend an employee's time horizon with the company. Unlike annual cash bonuses, the vesting schedule of ESOs encourages employees to adopt long-term perspectives and remain loyal. This approach is especially beneficial in organizations with flat hierarchies, where stock options serve as an alternative means of rewarding high-performing employees who might otherwise pursue opportunities elsewhere due to a lack of upward mobility. This aspect of ESOs connects to the concept of insurance against promotion risk (see Chen (2024)). Employees who may not advance to senior positions can still achieve substantial financial upside through equity growth, thereby mitigating the frustration caused by limited promotion opportunities. By granting stakeholder status in the firm's success, companies signal that loyalty will be financially

rewarded through stock price appreciation, even when opportunities for positional advancement are limited.

More recently, Sun and Xiaolan (2019) update this classical concept in the context of financing intangible capital—assets that become inextricably linked with the firm's employees. When employees embody critical intangible assets (e.g., technical know-how), their departure imposes costs not just through turnover but also through the partial loss of the firm's capital base. Because firms cannot compel employees to stay, and because exiting employees may take portions of the firm's intangible capital with them (e.g., technical know-how), firms are less motivated to invest in such assets. Sun and Xiaolan (2019) argue that firms address this challenge by deferring pay using ESOs.

Retention mechanisms may be especially salient in Europe, where firms compete for scarce technical talent and where employee mobility is high across firms and countries. By tying compensation to firm success, ESO schemes can help startups and scale-ups reduce brain drain, smooth wage competition with global tech firms, and create more stable growth trajectories.

2.3 Enhancing Motivation, Effort, and Collective Performance

Aligning employee incentives with firm objectives presents a fundamental principal-agent challenge. A core theoretical justification for offering employee stock options is their potential to enhance individual effort and foster collective performance. By linking compensation to firm value, ESOs give employees a direct financial interest in the firm's success, thus transforming passive wage earners into active participants in the firm's success. However, for non-executive workers, particularly those at larger firms, the direct incentive effect of stock-based pay is theoretically weak due to the free-rider problem (e.g., see Holmström 1982). Each individual employee's impact on the stock price may be negligible in a large firm. As a result, an individual employee can shirk without significantly lowering firm value. This logic has led some to argue that broad-based ESOs are ineffective as incentive devices for rank-and-file employees in large firms (e.g., see Oyer 2004, Bergman and Jenter 2007).

Several counter-arguments challenge this conclusion. First, in some instances, individual workers can meaningfully affect firm performance even in large firms. For instance, Winter (2004) studies production technologies with the "O-Ring" property, where the failure of a single task—such as one worker's negligence in airplane assembly—can produce catastrophic effects. Others highlight how in some settings, one worker's effort increases the productivity of their co-workers, creating a multiplier effect (e.g., see Blasi et al. (2016)). In such settings, compensating workers with stock options incentivizes them to help their coworkers rather than focus exclusively on their own output.

Second, free-riding concerns may diminish substantially in decentralized structures, smaller firms, or environments where social pressure exists and mutual monitoring is feasible (e.g., Hochberg and Lindsey 2010). In such contexts, effective coordination emerges among employees. While a single worker's effort may not dramatically improve organizational performance, the collective effort of the entire workforce certainly can. Because compensation scales with stock price, employees become motivated to coordinate and enhance firm performance, particularly relevant in settings where individual contributions demonstrate complementarity.

Third, stock-based compensation may activate psychological and identity-based motivators. When granted equity stakes, employees may experience enhanced status, improving job satisfaction and organizational commitment. They demonstrate greater diligence with "skin in the game," adopting an owner's identity rather than merely a worker's, however modest their stake. This transformation fundamentally reduces the psychological cost of exerting effort. Even when quantitative incentives remain modest, the qualitative effect—a shared sense of purpose—significantly enhances morale and discretionary contribution. Employees willingly invest additional time and energy, recognizing that organizational success translates directly to personal gain. This broad sense of ownership effectively supplants direct supervision as workers internalize organizational objectives. This phenomenon relates to the concept of gift exchange (e.g., see Akerlof 1982): employees view ESOs as gestures of goodwill and reciprocate with greater effort.

Related Considerations

ESOs feature convex payoff structures—offering unlimited upside potential if the stock value soars, while being insensitive to the performance if the firm's stock price falls below the strike price. This asymmetric incentive structure encourages risk-taking behaviors. Employees holding valuable options may support or initiate high-variance projects, recognizing that significant success could substantially increase their options' value.

For rank-and-file employees, this effect translates into enhanced innovation throughout the organization. Workers at all levels demonstrate greater willingness to suggest improvements, experiment with novel techniques, or accept challenging assignments because their option holdings are sensitive to upside. This mechanism effectively counters inherent conservatism stemming from risk aversion or fear of failure. In theory, broad-based option plans create workforces of "intrapreneurs" willing to undertake calculated risks benefiting the firm—particularly valuable in R&D contexts where researchers might pursue more ambitious projects when incentivized by potential stock price appreciation.

2.4 Employee Screening

Attracting the right talent—those employees with superior abilities, entrepreneurial mindsets, or a strong conviction in the firm's value proposition—is critical, especially for startups and innovation-driven enterprises. Traditional fixed cash compensation schemes, however, do little to differentiate among candidates with heterogeneous ability, risk tolerance, or beliefs about the firm. Both entrepreneurial risk-takers and conventional risk-averse employees find themselves equally attracted to positions offering fixed compensation, regardless of individual- or firm-level performance. High-potential candidates cannot credibly signal their willingness to bet on their own productivity, while lower-ability workers may benefit disproportionately from fixed pay that exceeds their actual output.

From a contract theory perspective, ESOs represent a type of risky, performance-based pay that can serve as a sophisticated sorting mechanism (e.g., see Stiglitz 1975). By embedding risk and upside potential into compensation, ESOs naturally attract candidates who are either more optimistic about the firm's prospects or more tolerant of

income risk (e.g., Bergman and Jenter 2007). Individuals with severe aversions to risk or those with unfavorable opinions about the firm's prospects will avoid compensation packages weighted heavily toward risky stock options in the firm. This self-selection helps firms recruit employees whose preferences and beliefs are more closely aligned with their objectives.

Related Considerations

This screening role of ESOs also complements its other roles. For instance, screening reinforces the motivational effects of equity compensation because employees with positive dispositions are easier to incentivize (e.g., Hales et al. 2015). However, this mechanism is not perfect. If only excessively optimistic or financially unsophisticated candidates opt into equity-based roles, the firm may inadvertently attract employees prone to overestimation or poor financial planning. While screening via option-heavy pay packages may help firms attract motivated talent, this approach raises concerns about fairness if it is based on systematically exploiting optimism or financial naivety. In practice, firms must balance the benefits of positive self-selection with the risks of attracting overly optimistic or naive employees.

3. Empirical Evidence

The theoretical foundation outlined in Section 2 generates several testable predictions about ESO adoption and effectiveness. If financial constraints drive ESO use, we should observe higher adoption rates among cash-poor, high-growth firms, with investment increasing following ESO grants. The retention hypothesis predicts lower turnover during vesting periods, particularly when option values are high. The screening mechanism suggests that ESO firms should attract more optimistic, risk-tolerant employees who subsequently outperform their peers. Finally, the motivation channel suggests that ESO adoption leads to improved firm performance, innovation, and productivity.

This section reviews the evidence concerning the key theoretical channels, prioritizing evidence from top academic journals and high-quality working paper series. Much of the available empirical evidence on ESOs is based on U.S.-listed firms, due to the early adoption of ESOs in the U.S. and the availability of detailed data. While these firms often operate globally, the institutional setting is nevertheless U.S.-centered. The mechanisms identified in this literature—financing, retention, motivation, and screening—form the foundation for understanding ESO use more broadly, and later sections consider whether similar patterns merge in Europe. Where appropriate, it will also note the sample context and methodological approach. Table 1, located at the end of this section, provides a summary of the findings.

3.1 Financial Constraints and Firm Investment

The financial constraints mechanism outlined in Section 2.1 suggests that ESO adoption should improve performance, particularly in cash-poor, high-growth firms. This mechanism has been explored in a growing empirical literature examining whether ESO grants are associated with improved investment capacity, especially in firms with limited access to external capital.

Early Evidence on ESOs as a Financing Tool

Core and Guay (2001) provide early empirical support for this idea. Analyzing 756 U.S.-listed firms from 1994 to 1997, they demonstrate that firms facing higher capital requirements and financing constraints are more likely to use ESOs. This strategic usage appears particularly pronounced in high-tech industries where human capital and growth prospects are high, but immediate cash flows are low.

Investing with ESO Proceeds

Babenko et al. (2011) offer complementary evidence showing that the proceeds from employee option exercises provide a significant source of internal capital (see also Fama and French 2005 for related evidence). Using a sample of 1,414 U.S.-listed firms from 2000 to 2005, they estimate that, on average, firms allocate 34% of the proceeds from employee stock option exercise toward increasing investments. Notably, this effect is concentrated among smaller firms and those with low cash flows and high investment demand. For instance, they estimate a striking contrast: cash-rich firms allocate 25% of the option proceeds to investment, while cash-poor firms allocate 56%—suggesting that ESOs serve as a particularly valuable financing mechanism for financially constrained firms.

Structural Evidence and Intangible Capital

More recent evidence from Sun and Xiaolan (2019) further strengthens this conclusion using a structural estimation approach. They build a model in which intangible capital—often embodied in employees—cannot serve as conventional collateral. In this setting, deferring compensation through ESOs relaxes the firm's financial constraints, allowing it to invest more in intangible capital. They structurally estimate this model using a large panel of U.S.-listed firms from 2006 to 2015. Their estimation shows that ESO adoption is associated with higher total borrowing capacity (including financing from employees) and greater R&D intensity.

Potential Investment Crowding-Out Effects

While the evidence supports a financing role for ESOs in constrained firms, it is not uniformly positive. Bens et al. (2002) highlight potential investment distortions arising from ESO exercises in larger, more cash-rich firms. In their sample consisting of 205 S&P 500 firms from 1996 to 1999, they document that ESO exercises are positively associated with share repurchases, and negatively associated with investments in R&D and physical capital. They interpret their findings as indicative of an agency problem: executives may prioritize managing earnings-per-share (EPS) dilution over optimal investment allocation due to concerns about their bonuses contingent on the firm's earnings-per-share (EPS). It is worth noting that these results need not be inconsistent. Bens et al. (2002) focus on large S&P 500 firms that typically face fewer financial constraints, while Babenko et al. (2011) study a more diverse sample where the ESO-related investment benefits concentrate among financially constrained firms that do not engage in share repurchases. Moreover, large listed firms may use ESOs for reasons other than financial constraints. For instance, Bergman and Jenter (2007) study a sample of U.S.-listed firms from 1993 to 2003 and find a positive correlation between cash holdings and ESO use. The accumulated evidence reveals ESOs as a double-edged financial instrument. For young, constrained, or innovation-intensive firms, ESOs effectively alleviate financing frictions and enable crucial investments in intangible assets and R&D. The mechanism works through two channels: immediate cash conservation when ESOs substitute for salary, and subsequent internal capital generation when employees exercise their options.

However, the benefits of ESOs are contingent on firm characteristics and broader incentive alignment. In larger, less constrained firms, agency considerations—such as short-term earnings management or misaligned executive incentives—can undermine the investment benefits. This nuanced picture suggests that ESOs function most effectively as a source of financing when deployed by firms that genuinely face financing constraints and maintain strong governance structures to ensure that improved liquidity supports long-term value creation rather than short-term financial cosmetics.

3.2 Employee Retention

Consistent with the theoretical prediction that ESOs delay attrition by creating vesting related exit costs (Section 2.2), several studies examine the relationship between ESO plans and employee turnover. Most ESO programs feature gradual vesting schedules—typically spanning three to four years—that impose significant costs on early departures. Employees who leave before full vesting forfeit their unvested options, creating what some researchers call "golden handcuffs" that bind them to their employers. Overall,

the evidence further suggests that effectiveness varies systematically with time, market conditions, and organizational context.

3.3 Enhancing Motivation

Beyond financing and retention, a central justification for broad-based ESOs lies in their potential to improve motivation and effort (Section 2.3). This subsection evaluates empirical studies on whether ESO pay improves firm performance, productivity, and innovation— particularly in settings where traditional incentive contracts may be limited.

The retention and motivation effects can operate jointly — retained workers are more likely to be incentivized, and motivated workers are more likely to stay. The empirical literature examining the incentivization benefit has evolved from early correlational studies to more sophisticated causal analyses, revealing nuanced patterns in how ESOs affect productivity, innovation, and overall firm performance. The central empirical pattern is that ESOs seem to improve performance and innovation under certain conditions, but the strength of the effect depends on firm size, scope of adoption, and market conditions.

Early Evidence

Initial research focused on new-economy firms where ESO adoption was most prevalent. Ittner et al. (2003) analyze survey data covering 217 U.S. new-economy firms from 1999 to 2000 and show that rewarding project milestones and firm goals ranked as the second most important ESO rationale given by firms after employee retention. Their exploratory analysis shows positive associations between ESO grants and subsequent firm ROA and stock returns, though they caution that this empirical pattern represents correlational rather than causal evidence.

In one of the earliest systematic studies of how ESOs affect firm performance, Sesil et al. (2007) examine data from the National Center for Employee Ownership covering a broad sample of 490 U.S.-listed firms with ESO plans in the 1990s. Comparing ESO firms to matched non-ESO counterparts, they document a striking productivity difference: ESO firms have 32-36% higher productivity (sales per employee) than non-ESO firms in cross-sectional analysis (in 1997). Moreover, ESO firms experienced a 22% productivity increase, on average, following ESO adoption (1985-87 vs. 1995-97), which is 17-18% higher than the increase experienced by non-ESO firms over the same period. It is worth noting that the researchers also document a positive but statistically insignificant difference in ROA between ESO and non-ESO firms.

Refined Analysis of Incentive Effects

Subsequent studies have refined these findings. Hochberg and Lindsey (2010) study U.S.-listed firms (S&P Super 1500) from 1997 to 2004 using detailed data compiled by the Investor Responsibility Research Center (IRRC) to construct sophisticated measures of implied incentives based on per-employee option deltas—capturing how option values change with stock price movements. Their analysis shows that ESO adoption is followed by an average 2.59 percentage point increase in industry-adjusted ROA.

To strengthen causal interpretation of their findings, they employ the instrumental variable approach of Kedia and Rajgopal (2009), which exploits variation in option usage across firms operating in the same labor market but different industries. The identifying

assumption is that firms partly adopt stock options not based on their own specific characteristics or performance needs, but rather to match compensation practices of other employers competing for the same local talent pool. This local labor market mimicry provides plausible exogenous variation in ESO adoption that helps isolate the causal impact of stock options on firm performance from unobserved firm characteristics that might simultaneously drive both option usage and performance outcomes.

Their findings also reveal a heterogeneity that offers some support for free-rider theories. For instance, the performance improvement is larger for smaller firms: firms in the 75th percentile of implied incentives for small firms have 0.38% higher industry-adjusted ROA than small firms in the 25th percentile. The incentive effects are also larger for high-growth firms. The authors suggest that mutual monitoring becomes more effective and coordination problems diminish in such firms, potentially offsetting free-rider concerns. This evidence indicates that incentive benefits are strongest where complementarities and coordination are feasible, and weaker in large, diffuse organizations.

Importance of Plan Scope and Firm Size

Kim and Ouimet (2014) provide additional insights into when broad-based employee share ownership plans, which include stock option plans as well as other ESOP-like programs, are more likely to succeed. Using a sample of 410 U.S.-listed firms from 1982 to 2001, they demonstrate that effectiveness depends critically on plan scope and firm size. Splitting their sample by ESOP size (5% threshold) employee count (75th percentile of listed firms), they document positive effects on wages—indicating productivity increases as in Jones and Kato (1995)—only in firms with not-so-numerous employees (below 75th percentile). The same pattern emerges for firm value measured by industry-adjusted Tobin's Q. They further augment their analysis using the two databases maintained by the U.S. Census Bureau: the Census of Manufacturers (CMF) and the Annual Survey of Manufacturers (ASM). These datasets allow them to directly estimate the total factor productivity of a subsample of firms, confirming that performance gains concentrate among firms with not-so-numerous employees. Notably, they demonstrate that the adoption of broad-based equity pay motivated by financial constraints does not improve productivity, suggesting that the performance gains stem from incentive alignment rather than improved financing.

Evidence from Option Repricing Events

This nuanced effect of ESO adoption on firm performance is further emphasized by Aboody et al. (2010), who exploit option repricing to test the incentive provision effects of ESOs more directly. Using a sample of U.S.-listed firms from 1992 to 2002 that announced option repricings, matched with similar (size and industry) non-repricing control firms, they use a difference-in-difference analysis to assess the impact. They find that repricing ESOs yields no statistically significant performance gains. Note that option repricing typically occurs after firms experience significant negative shocks that render existing options deeply underwater. This evidence indicates that the incentive provision effects of ESOs may break down precisely when firms need them most—during periods of poor performance when employee motivation becomes crucial for recovery. The results highlight a potential limitation of ESOs as incentive provisioning tools.

Innovation Effects: Risk-Taking versus Incremental Effort

In addition to general performance gains, a growing body of work isolates the link between ESOs and firm innovation. These studies test whether options enhance risk-taking and creativity among employees engaged in R&D and product development. Chang et al. (2015) examine 1,394 U.S. high-tech firms from 1998 to 2003 and document a positive effect of ESOs on corporate innovation output as measured by patent counts and citations, using the Kedia and Rajgopal (2009) instrumental variable approach for causal identification.

Importantly, their results are stronger for higher vega (option sensitivity to stock volatility) rather than delta (option sensitivity to stock price), indicating that ESOs encourage innovation primarily through risk-taking incentives rather than pay-for-performance mechanisms. They also find that the effects are concentrated in R&D-intensive and smaller firms, where free-riding concerns are less severe.

The weight of evidence suggests that employee stock options, when deployed under favorable conditions—appropriate firm size, sufficient but not excessive scope, and integration with complementary practices—can create performance improvements benefiting both employees and shareholders. While stock options do not represent a panacea for motivation challenges, they constitute a valuable component of broader high-performance human resource strategies.

3.4 Employee Screening

Beyond influencing behavior after hiring, ESOs can also play a role before employment begins. The screening hypothesis posits that stock options serve as a sorting device, attracting workers with traits such as optimism, risk tolerance, and entrepreneurial drive, while deterring those who are more risk-averse or skeptical of the firm's prospects. This screening function complements the motivational effects discussed above by shaping the pool of talent entering the firm in the first place.

Bergman and Jenter (2007) develop a framework based on "boundedly rational" optimistic employees who overvalue stock options. This overvaluation allows firms to extract economic rents by substituting overvalued equity compensation for cash wages, effectively paying a compensation premium to attract employees with favorable characteristics. Their empirical analysis of 2,171 U.S.-listed firms from 1992 to 2003 reveals patterns in option timing that support this hypothesis. Specifically, firms are more likely to grant ESOs following periods of strong stock returns, when employee optimism about future prospects is likely to be at its highest. Conversely, financially distressed firms grant fewer ESOs, consistent with the idea that employees in troubled firms maintain more realistic expectations about equity upside. The authors also document that cash-rich firms in their sample issue more ESOs, indicating that financially flexible companies use equity compensation strategically to attract risk-tolerant and optimistic workers rather than out of liquidity necessity.

Perhaps most tellingly, firms increase option grants when executives believe their stock is overvalued, as evidenced by increased insider selling activity. This pattern strongly supports the notion that sophisticated managers exploit employee overoptimism by substituting overvalued equity for cash compensation when market conditions favor such exchanges.

Experimental Evidence

While Bergman and Jenter (2007) infer sorting from firm behavior, Hales et al. (2015) provide direct experimental evidence on how dispositional optimism shapes compensation preferences and subsequent task performance. In their controlled setting, participants chose between compensation schemes with equal expected value: fixed wages versus stock-price contingent payouts analogous to ESOs. The experiment reveals that individuals with higher dispositional optimism (measured through survey questionnaires) significantly favored stockbased compensation over fixed wages, even after controlling for risk tolerance.

Critically, participants who self-select into stock-price-based payouts subsequently outperform those who choose fixed wages on challenging tasks. One channel for this performance differential is optimism—optimistic individual exert greater effort because they are more likely to believe that their individual contribution would generate positive outcomes. While conducted in an artificial laboratory setting, these findings lend credence to the idea that ESO compensation attracts high-drive individuals predisposed toward success in real-world contexts.

Complementary evidence comes from Kruse et al. (2010), who analyze data from the Generalized Social Survey (GSS) conducted by the National Opinion Research Center and the Share Capitalism Survey sponsored by the National Bureau of Economic Research (NBER).

They find that employees with ESO compensation tend to have a lower level of risk aversion compared to those with only cash wages. This evidence also supports the idea that ESOs attract workers with risk-tolerant profiles.

The screening evidence suggests that ESOs can function as sophisticated sorting mechanisms, helping firms identify and attract employees whose characteristics align with organizational needs. By offering ESOs, companies can simultaneously reduce cash wage costs (through employee overvaluation) while attracting workers who are optimistic, risk-tolerant, and high-performing—traits that often prove valuable in competitive, innovation-driven environments.

However, this screening function raises questions about the sustainability and fairness of compensation strategies that may exploit employee cognitive biases. While beneficial for firms in the short term, such approaches may create longer-term challenges if employees eventually recognize the systematic overvaluation of their equity compensation or if labor markets develop greater sophistication in pricing option-based pay packages.

Table 1 Table 1 Selected Empirical Studies on the Impact of Stock Option Pay.
Notes: ”+” indicates supportive empirical evidence for the mechanism; ”–” indicates evidence against; ”+/–” indicates mixed findings.

	Sample	Methodology	Financing	Retention	Motivation	Screening
Core & Guay 2001	U.S.-listed; 1994-1997	2SLS	+		+/-	
Babenko et al. 2011	U.S-listed; 2000-2005	Kinked design	+			
Sun & Xiaolan 2019	U.S.-listed; 2000-2005	Structural estimation	+			
Bens et al. 2012	U.S.-listed; 1996-1999	OLS	-			
Oyer & Schaefer 2005	U.S.-listed; 1999	Calibration, logistics reg.	-	+	-	+/-
Aldatmaz et al. 2018	U.S.-listed; 1994-2005	DiD		+		
Carter & Lynch 2004	U.S.-listed,repricing firms 1998	Matched sample		+		
Balsam et al. 2007	Fortune 100 firm; 1990s	Logistics reg.		+		
Gong et al. 2025	U.S.-listed,Chinese firms; 1999-2014	Bunching		+		
Blasi et al. 2015	Best Companies to Work for in America	Matched sample	+/-	+	+/-	+
Ittner et al. 2003	U.S. new-economy; 1999-2000	OLS	-	+		
Sesil et al. 2007	U.S.-listed; 1990s	Matched sample		+	+	
Hochberg & Lindsey 2010	U.S.-listed; 1997-2004	Instrumental variable			+	
Kim & Ouimet 2014	U.S.-listed; 1982-2001	DiD	+/-		+	
Aboody et al. 2010	U.S.-listed, repricing; 1992-2002	Matched sample			-	
Chang et al. 2015	U.S.-listed, high-tech; 1998-2003	Instrumental variable			+	
Bergman & Jenter 2007	U.S.-listed; 1993-2003	OLS Panel	-	+/-		+
Hales et al. 2015		Experimental			+	+
Kruse et al. 2010	Survey of U.S. house- holds/firms	OLS		+	+	

4. Potential Negative and Unintended Consequences

While ESOs are often implemented to relax financial constraints, provide incentives, and screen and retain employees, they may also generate unintended consequences. The same features that make ESOs a useful compensation tool may, under certain conditions, reduce employee welfare, encourage managerial misbehavior, and distort firm policies in ways that harm both workers and shareholders. The literature highlights four main categories of unintended consequences: (i) risks to employee welfare through misvaluation and concentrated exposure, (ii) risks to shareholders through dilution and payout distortions, (iii) ethical concerns and agency issues linked to earnings management and whistleblowing, and (iv) broader effects on corporate policies.

4.1 Employee Welfare: Misvaluation and Concentrated Exposure

Despite their ostensible benefits, employee stock options may paradoxically diminish worker welfare due to the inherent complexity of these financial instruments. Non-executive employees may lack the financial sophistication necessary to accurately value ESOs or properly assess their risk-return characteristics. This knowledge gap can lead workers to unwittingly accept compensation packages that disadvantage them—either through overestimating expected payoffs or failing to account for the concentrated, firm-specific risk they assume.

Extensive survey and experimental evidence indicate that non-executive employees tend to overvalue stock options relative to their Black-Scholes value (e.g., Oyer and Schaefer 2005, Hallock and Olson 2006, Hodge et al. 2009). For instance, in a revealing field survey of 77 current mid-level managers and 111 future entry-level managers at 46 U.S. firms, Hodge et al. (2009) document that lower-level managers consistently assign subjective values to their stock options exceeding Black-Scholes valuations.[4] This finding stands in contrast to studies of CEO valuations, which typically fall below Black-Scholes valuations (e.g., Hall and Murphy 2002, Bettis et al. 2005). Further illuminating this disconnect, Huddart and Lang (2003) examine stock option exercise decisions of 50,000 employees across seven major U.S. corporations from 1985 to 1994, revealing that many employees exercise options earlier than financially optimal—forgoing substantial option value—potentially due to pressing liquidity constraints or a misunderstanding of optimal exercise timing. These empirical patterns raise questions about whether employees truly benefit from equity compensation or merely subsidize firms' compensation costs through their financial inexperience. Sesil et al. (2007) find limited evidence of such substitution in their sample, documenting that ESO firms actually paid workers higher wages than matched non-ESO firms. This wage premium persists even after ESO adoption, suggesting that stock options may represent additional incentive compensation rather than a replacement for cash wages—though this pattern may not hold universally across all firms or time periods.

[4] The participants are MBA students at the University of Washington.

The welfare concerns extend beyond valuation errors. Most young ventures ultimately fail, meaning employees risk losing both their jobs and the value of unexercised options at the same time, thereby amplifying their exposure to correlated labor income and wealth risks. Additionally, recent research by Babenko et al. (2021) reveals a troubling pattern in corporate acquisitions: in 80% of 1,245 M&A deals involving publicly listed U.S. target firms, the ESOs of target firm employees are either canceled outright or significantly devalued. Their analysis presents evidence consistent with a systematic transfer of wealth from these employees to the shareholders of acquiring firms, undermining the purported welfare benefits of broad-based ESOs.

4.2 Dilution and Payout Distortions

Employee stock options can create substantial ownership dilution when exercised, resulting in cascading effects on corporate governance, capital allocation, and payout policies. Even before actual exercise, the anticipation of future dilution may influence managerial behavior in strategically significant ways.

Governance Implications

From a governance perspective, option-related dilution reconfigures ownership structures by redistributing equity toward employees. While this broadens internal ownership and theoretically enhances alignment, it simultaneously weakens external shareholders′ relative control, particularly in firms where equity issuance is already high. This shift affects voting dynamics and may undermine the disciplinary benefits of concentrated ownership, particularly when employees lack coordination mechanisms to serve as effective monitors. While broader internal ownership theoretically enhances alignment, it may paradoxically allow managerial slack to persist if employee-shareholders prove ineffective at corporate oversight.

Payout Policy Distortions

The impact of ESOs on payout policy is particularly pronounced. As stock options are exercised, the resulting increase in outstanding shares dilutes earnings per share (EPS)—a critical performance metric in financial markets and executive compensation frameworks. Anticipating this effect, management may initiate share repurchase programs specifically designed to counteract option-related dilution. Bens et al. (2002) provide empirical evidence supporting this dynamic in their analysis of S&P 500 firms from 1996 to 1999. Kahle (2002) corroborates this pattern, showing that firms with substantial outstanding ESOs exhibit higher propensities to repurchase shares in her sample of U.S.-listed firms from 1993 to 1996.

Babenko (2009) extends this analysis, documenting that U.S.-listed firms from 1996 to 2002 strategically use repurchases to concentrate ownership among employees holding unvested options, thereby enhancing incentives. Her research also reveals that workers exercise options earlier following such repurchases, consistent with a rational response following deliberate risk transfer from corporate owners to employees.

4.3 Earnings Management and Ethical Risks

While ESOs are often justified as mechanisms for improving alignment and performance, they can also introduce ethical hazards and additional agency frictions. These frictions are not limited to executive behavior; broad-based stock option plans can distort incentives across the firm, encouraging earnings management, weakening internal controls, and even deterring whistle-blowing.

One key concern is that ESOs amplify the incentive to inflate short-term financial performance, particularly around vesting or exercise windows. Stock prices are sensitive to accounting outcomes, and options derive value from volatility and upward price trends. As a result, both executives and non-executive employees with substantial option holdings may face subtle pressure to support near-term earnings targets, even if this involves the use of aggressive or questionable accounting choices.

Choudhary et al. (2009) provide empirical evidence of such manipulation by examining firms' responses to FAS-123-R reporting rule changes in 2004. Analyzing 354 U.S.-listed firms that accelerated option vesting between March 2004 and November 2005 to avoid recognizing fair value expenses, they show that managers strategically selected low stock return dates as new vesting points to minimize recognized expenses. This behavior reveals how ESOs can motivate accounting manipulations that serve option holders' interests while potentially misleading other stakeholders.

Further illuminating these concerns, Call et al. (2016) investigate the relationship between employee ownership and corporate misconduct. Using a matched sample of firms that experienced material earnings restatements and subsequently faced whistle-blower allegations or enforcement actions, they demonstrate that higher employee ownership is associated with a reduced likelihood of internal whistle-blowing. This effect is most pronounced when equity compensation is broadly distributed and constitutes a meaningful portion of total compensation.

The researchers argue that equity-based pay creates fundamental conflicts of interest: employees become reluctant to express concerns that might trigger regulatory scrutiny, stock price corrections, or legal liability, precisely when such vigilance is most needed. The same alignment mechanism that supposedly motivates employee performance may paradoxically compromise the internal controls and ethical oversight that protect organizational integrity.

4.4 Broader Corporate Finance Effects

Employee stock options also influence other corporate finance decisions in ways that extend beyond their primary compensation objectives. For instance, Graham et al. (2004) document that firms with large ESOs carry significantly lower debt levels, consistent with ESO-related tax shields substituting for interest tax shields. This substitution may alter optimal capital structure decisions and reduce firms' debt capacity utilization. Whether lower leverage should be viewed as beneficial remains ambiguous: on the one hand, ESO-related tax shields may efficiently substitute for interest deductions; on the other hand, firms may under-utilize debt capacity.

Employee ownership also affects corporate transparency and disclosure practices. Bova et al. (2015b) find that employee ownership leads to greater voluntary disclosure, particularly in firms where employees have significant bargaining power. They attribute this increased transparency to reduced proprietary cost concerns and improved corporate governance, as employee-shareholders may demand greater access to information and accountability from management.

Some research also suggests that employee ownership may moderate excessive corporate risk-taking (e.g., Bova et al. 2015a). When employees hold significant equity stakes, they may encourage more conservative decision-making, as their human capital and financial capital become concentrated within the same firm. This risk-reducing effect may partially offset executives' risk-taking incentives, though it may also discourage value-enhancing but risky investments.

Beyond these broader finance effects, it is also worth noting that preferential tax treatment itself can be a straightforward motive for issuing ESOs. In such cases, the option grant serves less as an incentive or financing device and more as a way for firms and employees to reduce tax liabilities relative to cash compensation. Relatedly, some observers note that broad-based option plans can play an internal political role by helping firms justify executive option grants or other equity-based perks, lending legitimacy by extending equity participation more widely. Because these drivers are largely institutional rather than economic, and the evidence is more anecdotal than systematic, they are not considered core mechanisms in this review.

5. European Evidence and Policy Experience

This section synthesizes the emerging evidence from Europe, complementing the largely U.S-based literature. It shows that while the same economic mechanisms apply, institutional and tax-policy differences may shape both firm outcomes and adoption rates. This section, therefore, discusses additional European evidence and policy experiences.

5.1 Firm-Level Studies

European studies at the firm-level provide generally consistent evidence, but with some heterogeneity across countries. Richter and Schrader (2017) analyze publicly listed firms in five large economies in Europe (France, Germany, Italy, Spain, U.K.) from 2006 to 2008, covering 97% of the public market capitalization in these countries. They find that employee share ownership programs, which include ESOs but also other programs such as restricted stock grants, are positively associated with Tobin's Q and industry-adjusted ROA. These results vary by country—strongest in the U.K. and statistically insignificant in Spain. They do not find consistent evidence for labor productivity (sales divided by the number of employees), which may be due to employment fluctuations.

Similarly, Adwan and Ahamed (2025) study a sample of 985 publicly listed firms in 11 countries in Europe from 2006 to 2017 and find that employee ownership improves investment efficiency, particularly in firms with lower analyst following and blockholder ownership, suggesting that employee ownership can serve as a substitute governance mechanism. Adwan et al. (2022) analyze the same sample of firms and report that employee ownership is positively associated with improved financial reporting quality, consistent with improved governance.

Finnish studies yield more cautious results. Jones et al. (2010) find no significant relationship between ESO pay and firm performance in their sample of 127 firms listed on the Helsinki Stock Exchange from 1992 to 2002. However, Jones et al. (2006) examine the same sample and confirm that ESO adoption is positively related to market volatility, consistent with the retention-based theories (e.g., Oyer (2004)).

Taken together, these firm-level studies suggest that ESOs are associated with improved firm outcomes in many European settings, though the magnitude and robustness of the effects vary across countries. While these econometric studies highlight cross-country variation, policy reforms provide an opportunity to examine more directly how institutional design shapes ESO adoption and impact. The next subsection turns to such policy experiences, beginning with the U.K.'s Enterprise Management Incentives (EMI) program.

5.2 U.K.'s EMI

European policy changes also provide some quasi-experimental evidence. One of the most studied programs is the Enterprise Management Incentives (EMI) scheme in the U.K., introduced in 2000 to help small and medium-sized enterprises (SMEs) recruit, retain, and incentivize employees through tax-advantaged share options. To illustrate its institutional design, Table 2 summarizes EMI's key features.

HM Revenue and Customs (the tax authority of the U.K.) commissioned a report from Ipsos MORI to evaluate the effectiveness of EMI.[5] Table 2 provides an overview of EMI's key features.[6] The report employs a mixed-methods approach. Its survey-based findings indicate that EMI adopters are most prevalent in industries featuring professional, scientific, and technical activities—sectors that rely heavily on skilled workers. These firms are often young (42% less than five years old), operating in high-risk markets (44%), and expecting high growth (39%). Participating firms also report many perceived positive benefits: a majority indicate that EMI helps them attract higher-quality employees, retain key personnel, and improve staff morale. Its quantitative econometric analyses show that early EMI-adopters experienced a larger decline in hard-to-fill vacancies than late adopters (26% vs. 16%). Early adopters also significantly increased R&D spending—from £19,729 to £88,000—compared to late adopters, who increased R&D from £5,693 to £39,643. Additionally, early adopters were more likely to have received outside equity financing (36% vs. 27%). However, the report found no statistically significant results for output or productivity growth, noting that the analysis period may have been too short to capture the program's full long-term economic impacts.

The European evidence, while showing some variation in magnitude and significance, broadly supports the core economic principles identified in US studies, suggesting that the identified mechanisms operate across different institutional environments. These findings offer insights not just for firm strategy but also for public policy, particularly where labor and capital market frictions inhibit efficient talent allocation and innovation financing.

[5] See HM Revenue and Customs Research Report 493.

[6] https://www.gov.uk/tax-employee-share-schemes/enterprise-management-incentives-emis

Table 2 Key Features of the UK Enterprise Management Incentives (EMI) Scheme

Feature	Description
Purpose	Help small and high-growth companies attract and retain key employees through tax-advantaged share options.
Eligibility (Employer)	Fewer than 250 full-time employees Gross assets of no more than £30 million A permanent establishment in the UK Not be controlled by another company
Eligibility (Employee)	Work at least 25 hours a week or 75% of working time for the company Hold less than 30% of the company's shares
Maximum Option Value	Up to £250,000 worth of options per employee over a three-year period
Tax Treatment (Grant)	No income tax or NICs at the time of grant.
Tax Treatment (Exercise)	No income tax or NICs on exercise if the exercise price is at least equal to the market value at grant.
Capital Gains Tax (CGT)	Gains on sale are subject to CGT.
Sector Restrictions	Certain sectors (e.g., banking, farming, property development, ship building, and legal services) are excluded.

5.2.1 Other European Tax Policy Reforms

Building on the U.K.'s experience with EMI, several other European countries have introduced their own tax-advantaged ESO schemes over the past decade. Despite institutional differences, these initiatives are united by a common motivation: to help young, innovation-driven firms attract and retain skilled labor under financial constraints while fostering high-growth sectors. Consistent with this logic, Henrekson and Sanandaji (2018) conduct a cross-country comparison of 38 OECD countries plus China, Hong Kong, Singapore, and Taiwan from 2010 to 2014, and document a negative correlation between the effective tax rate on stock option pay and venture capital activity.

Although rigorous evaluations of specific national schemes remain scarce, descriptive evidence from Estonia, France, Germany, and Norway already highlights how institutional design affects the adoption and effectiveness of these schemes.

Estonia: 2011 Tax Reform.

Estonia implemented one of Europe's most startup-friendly stock option regimes in 2011. If options are held for at least three years, employees pay no tax at grant or exercise, and gains are taxed only at sale, at a flat 20% rate. This structure offers maximum deferral and clarity while keeping rates low. Since 2011, Estonia has experienced significant growth in startup activity, with the total funding raised by Estonian startups increasing from €8.3

million in 2011 to approximately €879 million in 2021.[7] The country also now boasts one of the highest numbers of unicorns per capita globally.[8]

France: BSPCE Scheme.
France introduced its tax-favored Bons de Souscription de Parts de Créateur d´Entreprise (BSPCE) to support employee equity in young private companies.

The BSPCE scheme allows eligible firms to offer stock options that are taxed only upon share sale—at a flat 30% rate—if the employee has held the options for at least three years. There is no tax at grant or exercise. BSPCEs have become widespread among French startups, particularly in the tech sector, and are now considered a standard component of compensation packages. French authorities often refer to the BSPCE in pitches to international investors as evidence of France´s supportive climate for startups.[9] The BSPCE is limited to smaller firms and to genuinely risky equity compensation; a company that exceeds €150M in capital or 15 years of age exits the regime. The French tax authority enforces the fair-market-value (FMV) at-grant rule strictly to prevent any disguised remuneration. Overall, French policymakers appear satisfied that BSPCE strikes the right balance: it rewards entrepreneurial risk and employee shareholding while keeping the tax break targeted.

Germany: Future Financing Act.
Historically, Germany lagged behind other countries in promoting employee equity for startups. Prior to 2021, German tax rules on stock options were considered onerous: if an employee received shares or options at a discount, it triggered immediate taxable income—even if the shares could not be sold.[10] As a result, very few German companies offered ESO pay—only about 2% of firms in Germany had any employee equity participation as of 2019, essentially unchanged from 2001 (Hammermann et al. 2021).

The German Income Tax Act of 2021 introduced a program that allows employees in some firms to defer taxation until the sale of their equity. The Zukunftsfinanzierungsgesetz (Future Financing Act) in 2024 further reformed the tax treatment of ESOs, especially for start-ups. Key reforms include extending the tax deferral period to 15 years and allowing full deferral until share sale if the employer assumes full wage tax liability. Additionally, the definition of eligible start-ups has been broadened by increasing the company size threshold (up to 1,000 employees and €100 million in revenue) and the age threshold (from 12 to 20 years). The business community viewed the reforms favorably and there has since been a surge in ESO interest.

Norway: Expanded Share Option Scheme.
Norway introduced an ESO scheme targeted at start-ups in 2022, and significantly expanded it in March 2025 with European Surveillance Authority (ESA) approval. The

[7] Available at: https://e-estonia.com/opinion-a-hard-turn-and-100x-growth-in-10-years-how-estonia-became-a-startup-country/
[8] See Hannah Brown, *The Big Question: Estonia has the most tech unicorns per capita in Europe - What´s their secret*, Euro News, September 23, 2024.
[9] For example, see Business France, *Make a French Start: 10 Insights to Grow Your Business in France*. Available at: https://en.media.businessfrance.fr/download-pdf/672e1ec7be5895b55a0da031?
[10] See Alvarez & Marsal, *Germany improves tax benefits for employee share plans*, February 28, 2024. Available at: https://www.alvarezandmarsal.com/insights/germany-improves-tax-benefits-employeeshare-plans

expanded scheme now applies to firms with up to 150 employees and NOK 200 million in assets. Like in many other jurisdictions, taxation is deferred until shares are sold, and gains are taxed at a capital gains rate (37.84%), which is lower than salary tax (47.4%) and exempt from employer social contributions (14.1%). Given the very recent nature of the reform, quantitative evaluations are still pending. The Norwegian government's stated purpose was to allow more growth-stage companies to offer competitive equity incentives and to strengthen recruitment and retention in knowledge-intensive sectors.

5.3 Policy Design and Market Frictions

The proliferation of employee stock option (ESO) tax reforms across Europe reflects a growing recognition of market frictions that constrain startup growth and innovation. These policies address three interconnected economic problems that traditional market mechanisms fail to resolve.

Financial Constraints and the Dry Income Problem

Young firms often face financial constraints that limit their ability to compete for talent through cash wages. ESO pay offers a solution by allowing firms to defer compensation until value is realized. However, these benefits are only viable if the tax system also defers liability. Taxation at grant or exercise (when shares are illiquid) creates the so-called "dry income" problem, in which employees face tax liabilities before they can realize any gains. This mismatch between tax timing and cash availability can render stock options economically unattractive, undermining their effectiveness as a recruitment and retention tool.

Missing Insurance Markets for Idiosyncratic Risk

Employees who accept equity compensation bear concentrated, firm-specific risk that cannot be diversified or insured through private markets. Tax deferral and concessional rates effectively shift some of this risk to the state, improving the risk-adjusted returns for employees while enabling broader participation in high-growth but high-risk ventures.

Positive Externalities

Entrepreneurial firms generate widely acknowledged positive externalities, including knowledge spillovers and the formation of entrepreneurial human capital. Because individual startups cannot capture these broader social returns, they may underinvest in growth and talent acquisition relative to the social optimum. Targeted tax relief for equity compensation helps correct this misalignment by subsidizing socially valuable activity.

From a fiscal perspective, such schemes may be viewed as tax expenditures. For example, France's BSPCE regime effectively converts what might otherwise be taxed as salary income (at marginal rates approaching 60%, including social charges) into capital gains taxed at around 30%. However, this apparent cost may only be notional: without favorable tax treatment, many startups could not afford to hire and retain key employees at all. When programs are well-targeted, the tax expenditure facilitates economic activity that might otherwise not occur, with the state ultimately capturing revenue when firms succeed and employees realize gains.

The European experience highlights a set of emerging best practices in ESO tax policy for startups and SMEs, corresponding to the frictions identified above:

- Tax Deferral Until Liquidity Events: The most essential feature is aligning tax liability with cash availability. Taxation should occur only when employees can actually sell shares, eliminating dry income risk and making equity compensation viable for financially constrained workers.
- Targeted Eligibility: Restricting favorable tax treatment to young, private, or growthstage firms ensures that support is focused where financial frictions are most acute and public funds can generate the greatest impact.
- Concessional and Transparent Tax Rates: Capping tax rates or applying capital-gains treatment increases ESO pay’s attractiveness, compensating them for bearing risk.
- Administrative Simplicity: Schemes that are easy to understand and implement—without requiring complex valuations, approvals, or ongoing reporting—are more likely to be adopted by startups with limited legal and financial capacity.

These features are increasingly recognized in international comparisons of startup ecosystems. France, Estonia, Germany, and the U.K. are frequently cited by entrepreneurs, investors, and comparative policy research as offering models that strike a strong balance between fiscal prudence and economic impact. These insights underscore the importance of aligning tax treatment with both entrepreneurial risk profiles and broader social returns.

Ultimately, the design of ESO tax regimes must strike a balance between the benefits of alleviating financing frictions and improving talent allocation, and the potential costs, including lower tax revenues and increased employee exposure to risk.

6. Conclusions

Broad-based employee stock options (ESOs) pay can play a multifaceted role. Theoretical arguments emphasize how ESO pay can alleviate financing constraints, improve talent retention, attract aligned employees, and enhance innovation. The empirical evidence broadly supports these mechanisms, with particularly robust results in settings where firms face cash constraints, rely heavily on skilled human capital, or operate in volatile labor markets.

At the same time, ESOs are not without limitations. Their effectiveness depends critically on firm size, organizational culture, and market conditions. While they may improve employee alignment and innovation in some contexts, they can also lead to unintended consequences, such as option misvaluation by employees, dilution of ownership, earnings management, and weakened internal controls. Moreover, the retention effects may be transitory, and the motivational benefits may break down in periods of poor performance or in firms with weak governance.

Overall, ESOs are best understood as contingent tools—powerful when used under the right conditions, but ineffective or counterproductive when misaligned with firm characteristics or worker expectations. Policy interventions through tax-advantaged ESO schemes may be justifiable as a correction of certain market failures but require careful targeting.

Some best-practice policy design features include: (1) firm-size thresholds to ensure benefits reach genuinely constrained firms; (2) sectoral focus on innovation-intensive industries with high spillovers; (3) employee protection measures addressing systematic misvaluation; and (4) sunset provisions preventing mature firms from exploiting startup-focused incentives.

Despite substantial progress in understanding ESOs, many open questions remain. How broad-based stock options generate meaningful incentive effects in large firms—where individual employees have negligible impact on performance—is not well-understood, despite many proposed mechanisms involving social pressure and identity-based motivation. Additional gaps include how employees learn to value their options over time, whether equity compensation interacts synergistically with other organizational practices like trust-building and empowerment, and how evolving labor market norms shape both the effectiveness and perceived fairness of stock-based pay. As European policymakers continue to expand tax advantaged ESO regimes, addressing these questions will be crucial for aligning equity-based compensation with firm performance and employee welfare.

References

Aboody, David, Nicole Bastian Johnson, and Ron Kasznik, *Employee stock options and future firm performance: Evidence from option repricings*, Journal of Accounting and Economics, 2010, 50 (1), 74–92.

Adwan, Sami, Alaa Alhaj-Ismail, and Ranko Jelic, *Non-executive employee ownership and financial reporting quality: evidence from Europe,* Review of Quantitative Finance and Accounting, 2022, 59 (2), 793–823.

, and M Mostak Ahamed, E*mployee ownership and corporate investment efficiency in Europe*, Review of Quantitative Finance and Accounting, 2025, 64 (1), 191–236.

Akerlof, George A, *Labor contracts as partial gift exchange,* *Quarterly Journal of Eco- nomics*, 1982, *97* (4), 543–569.

Aldatmaz, Serdar, Paige Ouimet, and Edward D. Van Wesep, *The option to quit: The effect of employee stock options on turnover,* Journal of Financial Economics, 2018, 127 (1), 136–151.

Babenko, Ilona, *Share repurchases and pay-performance sensitivity of employee compensation contracts*, Journal of Finance, 2009, 64 (1), 117–150.

Fangfang Du, and Yuri Tserlukevich, *Will I get paid? Employee stock options and mergers and acquisitions*, Journal of Financial and Quantitative Analysis, 2021, 56 (1), 29–64.

, Michael Lemmon, and Yuri Tserlukevich, *Employee stock options and investment*, Journal of Finance, 2011, 66 (3), 981–1009.

Balsam, Steven, Richard Gifford, and Sungsoo Kim, *The effect of stock option grants on voluntary employee turnover,* Review of Accounting and Finance, 2007, 6 (1), 5–14.

Bens, Daniel A, Venky Nagar, and MH Franco Wong, *Real investment implications of employee stock option exercises,* Journal of Accounting Research, 2002, 40 (2), 359–393.

Bergman, Nittai K. and Dirk Jenter, *Employee sentiment and stock option compensation*, Journal of Financial Economics, 2007, 84 (3), 667–712.

Bettis, J Carr, John M Bizjak, and Michael L Lemmon, *Exercise behavior, valuation, and the incentive effects of employee stock options*, Journal of Financial Economics, 2005, 76 (2), 445–470.

Blasi, Joseph, Richard Freeman, and Douglas Kruse, *Do broad-based employee ownership, profit sharing and stock options help the best firms do even better?*, British Journal of Industrial Relations, 2016, 54 (1), 55–82.

Bova, Francesco, Kalin Kolev, Jacob K. Thomas, and X. Frank Zhang, *Non-executive employee ownership and corporate risk,* Accounting Review, 2015, 90 (1), 115–145.

, Yiwei Dou, and Ole-Kristian Hope, *Employee ownership and firm disclosure* Contemporary Accounting Research, 2015, 32 (2), 639–673.

Call, Andrew C., Simi Kedia, and Shivaram Rajgopal, *Rank and file employees and the discovery of misreporting: The role of stock options*, Journal of Accounting and Economics, 2016, *62* (2-3), 277–300.

Carter, Mary Ellen and Luann J Lynch, *The effect of stock option repricing on employee turnover*, Journal of Accounting and Economics, 2004, 37 (1), 91–112.

Chang, Xin, Kangkang Fu, Angie Low, and Wenrui Zhang, *Non-executive employee stock options and corporate innovation*, Journal of Financial Economics, 2015, 115 (1), 168–188.

Chen, Alvin, *Firm performance pay as insurance against promotion risk*, Journal of Finance, 2024, 79 (5), 3497–3542.

Choudhary, Preeti, Shivaram Rajgopal, and Mohan Venkatachalam, *Accelerated vesting of employee stock options in anticipation of FAS 123-R*, Journal of Accounting Research, 2009, 47 (1), 105–146.

Core, John E and Wayne R. Guay, *Stock option plans for non-executive employees*, Journal of Financial Economics, 2001, 61 (2), 253–287.

Fama, Eugene F and Kenneth R French, *Financing decisions: who issues stock*, Journal of Financial Economics, 2005, 76 (3), 549–582.

Gong, Qing, Hong Zhang, and Li-An Zhou, *Retention Effects of Employee Stock Options: Evidence from Bunching at Vesting Dates,* Technical Report, UNC Working Paper 2025.

Graham, John R., Mark H. Lang, and Douglas A. Shackelford, *Employee stock options, corporate taxes, and debt policy*, Journal of Finance, 2004, 59 (4), 1585–1618.

Hales, Jeffrey, Laura W Wang, and Michael G Williamson, *Selection benefits of stock-based compensation for the rank-and-file*, Accounting Review, 2015, 90 (4), 1497–1516.

Hall, Brian J. and Kevin J. Murphy, *Stock options for undiversified executives*, *Journal of Accounting and Economics*, 2002, 33 (1), 3–42.

Hallock, Kevin F and Craig Olson, *The value of stock options to non-executive employees*, 2006. Working Paper, NBER.

Hammermann, Andrea, Klaus-Heiner Röhl, and Christian Rusche, *Start-ups: Zusammen erreicht man mehr,* July 2021. IW-Kurzbericht

Henrekson, Magnus and Tino Sanandaji, *Stock option taxation and venture capital activity: A cross-country study*," Venture Capital, 2018, 20 (1), 51–71.

Hochberg, Yael V. and Laura Lindsey, *Incentives, targeting, and firm performance: An analysis of non-executive stock options*, Review of Financial Studies, 2010, 23 (11), 4148–4186.

Hodge, Frank D, Shiva Rajgopal, and Terry Shevlin, *Do managers value stock options and restricted stock consistent with economic theory?*, Contemporary Accounting Research, 2009, pp. 74–91.

Holmström, Bengt, *Moral hazard in teams*, The Bell journal of economics, 1982, pp. 324–340.

Huddart, Steven and Mark Lang, *Information distribution within firms: evidence from stock option exercises*, Journal of Accounting and Economics, 2003, 34 (1-3), 3–31.

Ittner, Christopher D, Richard A Lambert, and David F Larcker, *The structure and performance consequences of equity grants to employees of new economy firms*, Journal of Accounting and Economics, 2003, 34 (1-3), 89–127.

Jones, Derek C. and Takao Kato, *The productivity effects of employee stock-ownership plans and bonuses: evidence from Japanese panel data*, American Economic Review, 1995, 85 (3), 391–414.

Jones, Derek C, Panu Kalmi, and Mikko Mäkinen *The determinants of stock option compensation: Evidence from Finland*, Industrial Relations: A Journal of Economy and Society, 2006, 45 (3), 437–468.

, , and ,*The productivity effects of stock option schemes: evidence from Finnish panel data*, Journal of Productivity Analysis, 2010, 33, 67–80.

Kahle, Kathleen M, *When a buyback isn't a buyback: Open market repurchases and employee options*, Journal of Financial Economics, 2002, 63 (2), 235–261.

Kedia, Simi and Shiva Rajgopal, *Neighborhood matters: The impact of location on broad based stock option plans*, Journal of Financial Economics, 2009, 92 (1), 109–127.

Kim, E. Han and Paige Ouimet, *Broad-Based Employee Stock Ownership: Motives and Outcomes*, Journal of Finance, 2014, 69 (3), 1273–1319.

Kruse, Douglas L., Joseph R. Blasi, and Rhokeun Park, *Shared Capitalism in the U.S. Economy: Prevalence, Characteristics, and Employee Views of Financial Participation in Enterprises*, in Douglas L. Kruse, Richard B. Freeman, and Joseph R. Blasi, eds., *Shared Capitalism at Work: Employee Ownership, Profit and Gain Sharing, and Broad-based Stock Options*, University of Chicago Press, 2010, chapter 1, pp. 41–75.

Oyer, Paul, *Why do firms use incentives that have no incentive effects*, Journal of Finance, 2004, 59 (4), 1619–1650.

, and Scott Schaefer, *Why do some firms give stock options to all employees?: An empirical examination of alternative theories*, Journal of Financial Economics, 2005, 76 (1), 99–133.

Richter, Ansgar and Susanne Schrader, *Levels of employee share ownership and the performance of listed companies in Europe*, British Journal of Industrial Relations, 2017, 55 (2), 396–420.

Sesil, James C, Maya K. Kroumova, Douglas L. Kruse, and Joseph R. Blasi, *Broad-based employee stock options in the US-company performance and characteristics*, Management Revue, 2007, pp. 5–22.

Stiglitz, Joseph E, *Incentives, risk, and information: notes towards a theory of hierarchy*, *Bell Journal of Economics*, 1975, pp. 552–579.

Sun, Qi and Mindy Z Xiaolan, *Financing intangible capital*, Journal of Financial Economics, 2019, 133 (3), 564–588.

Winter, Eyal, *Incentives and discrimination*, American Economic Review, 2004, 94 (3), 764–773.

The Swedish Agency for Growth Policy Analysis
Studentplan 3, S-831 40 Östersund
Phone: +46 10-447 44 00
E-mail: info@tillvaxtanalys.se