Managers, Entrepreneurs, and the Allocation of Talent: Evidence from Hungary's Transition*

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Abstract

Management quality drives firm performance and aggregate productivity, yet the supply of managerial talent remains poorly understood. A key friction is that hired managers cannot fully appropriate the surplus they generate, unlike entrepreneurs who own their firms, creating a wedge between private and social returns to management. Here we develop a general equilibrium model to quantify how this corporate governance friction distorts talent allocation between entrepreneurship, management, and employment. Using the universe of Hungarian firms and CEOs (1986–2022), we exploit the transition to capitalism—when the count of enterprises increased from 21,000 to 115,000 in three years—to identify the parameters of the model. We find that managers capture only 60% of the surplus they create, resulting in too few professional managers and too many less-productive entrepreneurs. Eliminating this friction would raise GDP per worker by 4% through improved occupational composition. Uniform subsidies fail to correct the misallocation, raising GDP by only 0.1%. Our results show that management interventions' aggregate effects depend critically on targeting the specific friction between hired managers and entrepreneurs rather than expanding the overall pool of business leaders.

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1 Introduction

A large literature documents the importance of management for firm performance and aggregate productivity (Bloom et al., 2014). While firm-level management interventions can be effective (Bloom et al., 2013; Bruhn et al., 2010, 2018; Bloom et al., 2020; Giorcelli, 2019, 2021), less is known about the supply of management skills and its macroeconomic consequences. Who becomes a manager? How easily can policies influence this supply? Do policies that raise returns to management increase aggregate output, or merely reshuffle talent across occupations?

We build a general equilibrium model that integrates occupational choice between entrepreneurship, management, and paid employment. Individuals differ in managerial skill and in an occupation-specific endowment ("entrepreneurial spirit"). The key friction is a corporate governance wedge: professional managers cannot capture the full operating surplus they generate, whereas entrepreneurs, who own their firms, can. Consistent with Jensen and Meckling (1976), we interpret this wedge as the shadow value of monitoring and incentive provision. This friction leads to underprovision of management skills: too few people become managers. The friction also creates misallocation: because there are too few managers, worker wages are depressed, making entrepreneurship more attractive. The equilibrium features too few managers and too many entrepreneurs relative to the first-best allocation.

We use data on the universe of Hungarian firms and their CEOs between 1986 and 2022 (Koren et al., 2025) to calibrate the model and evaluate its mechanisms. We exploit Hungary's transition from communism to capitalism as a natural experiment to identify key parameters. The transition created a sudden shock increasing demand for managers and entrepreneurs. As markets became liberalized, business enterprises exploded from 21,000 in 1989 to 115,000 in 1992. This increase put more than 160,000 people, many without prior management experience, in top managerial positions. This demand shock helps us trace out the supply curve.[1] For a sample of CEOs, we observe their earnings from linked employer-employee data based on social security records.

Three empirical patterns emerge from the data. First, we find a novel empirical fact: a strong inverse relationship between the size of the cohort of newly entering individuals managing firms and average firm size. This relationship is consistent with heterogeneous manager quality and a downward sloping supply curve of managerial talent. The relationship is robust to controlling for demographic factors, age, and experience.[2] Second, entrepreneurs—CEOs who own their firms—are three times as numerous as hired man-

[1] Our work is motivated by case studies and interviews with business leaders during this period (Laki and Szalai, 2004, 2013).

[2] This fact is different from the fact in Sedláček and Sterk (2017) and Moreira (2016) who find that the size of firms that enter during downturns stay permanently low compared to firms that enter during different times.

agers and run firms half as large. This is consistent with earlier work on the private benefits and low productivity of entrepreneurship (Evans and Leighton, 1989; Hamilton, 2000; Hurst and Pugsley, 2011). Third, annual gross compensation of full-time CEOs amounts to 10–20 percent of their firms' operational performance (EBITDA), consistent with managers not capturing the full surplus they generate, though some of this gap may reflect unobserved firm-level factors.

There are three key mechanisms in our model, each of which we can discipline using micro moments from the data. First, the extent of selection of managers by skill depends on how heterogeneous managers are in terms of quality. To aid tractability, we model manager skill with a Pareto distribution, with its tail parameter θ directly calibrated to the degree of selection measured in the data. Our estimates reveal moderate selection: increasing the number of managers by 10 percent (holding their supply constant) reduces their average firm size by 0.4–1.4 percent, implying a tail parameter between 7 and 25. This moderate selection ($1/\theta$) is combined with a high supply elasticity (θ), meaning many managers are near the occupational margin. Second, the relative productivity of entrepreneurs versus managers, together with the corporate governance friction, determines the strength of talent misallocation across occupations. We calibrate this relative productivity by exploiting within-person variation in firm size of CEOs who become entrepreneurs at some point in their careers. The within-person nature of this measurement is important because it allows us to control for management quality. Using this variation we find that entrepreneurial firms are about 44 percent smaller than managerial firms (that is, about 56 percent of the size). Third, the earnings data allow us to discipline the corporate governance wedge, which determines how much of the firm's surplus a manager captures. With different estimates ranging from 0.2 to 0.6 to calibrate the corporate governance friction, we pick a conservative value of 0.6, that is, managers capture 60 percent of the surplus they generate for the firm.

We conduct a number of policy counterfactuals in our calibrated model. First, we compute what the first-best allocation would be without the corporate governance friction. In a simpler version of the model, with only managers and workers (the "M-economy"), GDP per worker would be about 1.5 percent higher. We then study the full model with both entrepreneurs and managers (the "E–M economy"). Here, the first-best would raise GDP per worker by about 4 percent. The effect is larger than in the M-economy, because the subsidy that induces choices as if the corporate governance friction did not exist would also correct the misallocation of talent across occupations by simultaneously increasing the number of (more productive) managers and reducing the number of (less productive) entrepreneurs.

These effects require large interventions. Managers need subsidies to reach their socially optimal role because the corporate governance friction reduces private returns relative to social returns.[3] The first-best requires a 67 percent subsidy to manager earnings, offsetting the corporate governance friction. This would increase the share of managers from 10 to 15 percent of the workforce in the M-economy and from 3 to 15 percent in the E–M economy. (In the baseline E–M economy, three quarters of "managers" are entrepreneurs, as in the data.)

We consider more modest policies. A 10 percent subsidy to manager earnings raises GDP per worker by 0.5 percent in the M-economy and 1.6 percent in the E–M economy. This subsidy *reduces* the total number of managers in the E–M economy, as more entrepreneurs exit than managers enter.

The GDP elasticity with respect to the subsidy differs markedly: 0.05 in the M-economy versus 0.16 in the E–M economy. The E–M economy responds more elastically because the subsidy removes unproductive entrepreneurs from the market, reducing product market competition and increasing profit per worker for the remaining firms. This reallocation from low-productivity entrepreneurial firms to high-productivity professional management amplifies the subsidy's effects.

In practice, setting different subsidies for managers and entrepreneurs is difficult because "entrepreneurial spirit" is unobservable and ownership patterns are easily manipulated. We therefore consider a uniform subsidy to all business leaders. The second-best uniform subsidy that maximizes GDP is 17 percent. Even this large subsidy raises GDP by only 0.1 percent in the E–M economy because it incentivizes both occupations to enter, failing to correct the composition distortion.

Finally, we consider an education-like intervention that raises managerial skill by 10 percent. This increases output by 1.6 percent in both economies without requiring reallocation across occupations. While our model is silent about specific trainings and costs, this exercise suggests such interventions can raise aggregate productivity without disrupting labor and manager markets.

Our results highlight that macroeconomic elasticities of management interventions depend crucially on the economic environment and can be very different from the microeconomic elasticities.

Our maintained assumption is that managers differ in innate manager skills. Recent evidence confirms that CEOs differ systematically in their effects on firm performance. This has been established using CEO fixed effects as they move across firms (Bertrand and Schoar, 2003; Custódio et al., 2013; Quigley and Hambrick, 2015; Schoar and Zuo, 2016),

[3] In our framework, managers earn "too little," not "too much," as often suggested in the executive compensation debate (Frydman and Saks, 2010). The settings differ: we study small and medium-sized private businesses in an emerging economy, whereas the executive compensation literature focuses on large publicly listed firms in industrial economies.

CEO characteristics (Graham et al., 2012), and quasi-experimental variation from CEO deaths (Fee et al., 2013; Becker and Hvide, 2022; Sauvagnat and Schivardi, forthcoming) and sickness (Bennedsen et al., 2020). General management skills have become increasingly important relative to firm-specific knowledge in recent decades (Frydman and Saks, 2010; Custódio et al., 2013).

Our contribution is to build an equilibrium framework that integrates occupational choice between entrepreneurship, management, and paid employment. Prior work has studied either professional CEOs of large corporations or entrepreneurs running small businesses, but not their interaction. For example, Bloom et al. (2014); Akcigit et al. (2021) study management quality and organization in large corporations, while Lucas (1978); Banerjee and Newman (1993) focus on entrepreneurial talent and selection into small business ownership. In our model, these two groups face different incentives: managers cannot capture all the surplus they generate for the firm, while entrepreneurs can. This leads to an underprovision of manager skills in the aggregate economy, but also a misallocation as too many people become entrepreneurs, drawn in by depressed wages. Following Engbom et al. (2024), we show that this distinction between managers and entrepreneurs is crucial for understanding the rise of managerial capitalism. Most existing models with managerial skills or organizational capital are set up at the aggregate level (Burstein and Monge-Naranjo, 2009; Gennaioli et al., 2012; Akcigit et al., 2021; Hjort et al., n.d.), with no role for such heterogeneity and selection. Our approach with micro data is similar to Akcigit et al. (2020), who emphasize selection and equilibrium response of innovators to policy changes.

The model has implications for large economic transitions. Fuchs-Schündeln and Masella (2016); Fuchs-Schündeln and Schündeln (2020) explore occupation choice after German reunification. We study a very large shock with business activity increasing 20-fold. Recent evidence from repeated large-scale management development programs in the US during WWII (Giorcelli, 2023) and management training in Italy (Bianchi and Giorcelli, 2022) shows that such interventions can have lasting effects on manager careers and firm outcomes. Our results can be informative about the general equilibrium implications of such programs.

2 An equilibrium model of managers

We build a general equilibrium model to study managers and entrepreneurs. The key friction is that managers, unlike entrepreneurs, cannot capture all rents from their skills. This results in underprovision of management skills and opens the door for policy interventions. We study the steady-state equilibrium and show how policy can achieve the first-best allocation.

Individuals choose whether to become a manager, an entrepreneur, or a worker. Workers are identical, but managers and entrepreneurs differ in "management skill," an input to production. Higher returns to management skills induce more people to choose managerial careers. Policy influences this occupational choice through taxes and subsidies.

2.1 The M Economy

We first study an economy with only managers and workers (the M-economy) as a benchmark. We then extend the model to include entrepreneurs (the E-M economy).

There is a mass L of individuals, who choose to be either a worker or a manager. Each individual is characterized by an innate manager skill $z \in \mathbb{R}^+$. The distribution of skills in the population is Pareto with lower bound $\Lambda(1-1/\theta)$ and shape parameter $\theta > 1$, so that $\Pr(z > x) = \Lambda^\theta(1-1/\theta)^\theta x^{-\theta}$. Note that $\mathrm{E}(z) = \Lambda$.

A manager with skill z can hire h workers to produce output with the production function

$$q = (Az)^\nu h^{1-\nu}. \tag{1}$$

Here A is a productivity shifter reflecting technologies, institutions, or market conditions affecting all firms. Manager skill z enters multiplicatively with A: better managers raise productivity, and this effect is amplified in high-A environments. Better managers organize production, motivate workers, implement technologies, and have larger spans of control (Lucas, 1978). The parameter $\nu \in (0,1)$ captures returns to management. The ν fraction of revenue represents the joint contribution of A and skill z; since A is exogenous, managers compete to capture rents from their skill.

Workers are hired in competitive labor markets. Their value marginal product is equal to their wage,

$$(1-\nu)(Az/h)^\nu = w,$$

and, without loss of generality, we have normalized the price of output to one. This pins down the employment of a firm with manager z as

$$h(z) = Azw^{-1/\nu}(1-\nu)^{1/\nu},$$

so that firm revenue is

$$r(z) = q(z) = Azw^{1-1/\nu}(1-\nu)^{1/\nu-1}.$$

Employment, wage bill, and revenue are all linear in A and z.

Workers receive a $1-\nu$ fraction of revenue. The remaining fraction goes to owners who bid for managers competitively. Manager wages cannot exceed a $\phi < 1$ fraction of operating surplus. Leftover rents go to firm owners. Firms are owned by a mutual fund that redistributes profits to all workers.[4] This ensures GDP equals production and ϕ represents an allocation constraint rather than wealth destruction. If $\phi = 1$, managers capture full operating surplus without friction.

The corporate governance friction $\phi < 1$ captures agency problems, monitoring costs, and limited commitment in the manager-owner relationship. In equilibrium, shareholders cannot write enforceable contracts that commit all surplus to hired managers, reflecting hold-up problems and asymmetric information about managerial effort.

Formally, the wage of a manager with skill level z is $\omega(z)$. Profit maximization of firms involves

$$\max_z r(z) - wh(z) - \omega(z)$$

subject to

$$\omega(z) \leq \phi[r(z) - wh(z)].$$

Bertrand competition among owners for managers drives the wage to the contractual upper bound, so the constraint binds:

$$\omega(z) = \phi\nu r(z) = \phi\nu Azw^{1-1/\nu}(1-\nu)^{1/\nu-1}.$$

Definition 1. The *equilibrium of the M-economy* is (i) a worker wage rate w, (ii) a manager wage rate $\omega(z)$, (iii) employment function $h(z)$, and (iv) a measure of management skills $\mu(z)$ for those active in the economy such that

1. firms maximize profit subject to the corporate governance constraint
2. labor market clears
$$\int_z [1 + h(z)]\mu(z)dz = L$$
3. market for managers clears at each skill level z,
$$\mu(z) \leq \theta\Lambda^\theta z^{-\theta-1}L$$
4. individuals choose occupations to maximize their income. At each skill level z, all individuals become managers if the manager wage exceeds the worker wage ($\omega(z) > w$); some or all individuals become workers if work pays weakly better ($\omega(z) \leq w$).

Firms maximize profits given governance constraints (1); labor market clears (2); the measure of active managers cannot exceed the potential supply from the skill distribution (3); and individuals choose the higher-paying occupation (4). Together, these conditions ensure that the equilibrium respects both resource constraints and individual incentives.

[4] This technical assumption abstracts from capital market frictions.

As the proposition shows, optimal occupational choice combined with the governance friction generates a threshold property: there exists a cutoff $z_{\min}$ such that higher-skilled individuals become managers while lower-skilled individuals become workers.

Define

$$n := \int_{\Lambda(1-1/\theta)}^{\infty} \mu(z)dz/L$$

as the fraction of managers in the workforce and

$$\tilde{z} := \int_{\Lambda(1-1/\theta)}^{\infty} z\mu(z)dz / \int_{\Lambda(1-1/\theta)}^{\infty} \mu(z)dz$$

their average skill.

Proposition 1. An *equilibrium of the M-economy* exists, is unique, and exhibits a threshold property: there is a threshold $z_{\min}$ such that all individuals with $z > z_{\min}$ become managers, while all individuals with $z < z_{\min}$ become workers. The equilibrium variables are characterized by the following equations:

$$n = \frac{\phi}{\phi + \kappa} \tag{2}$$

$$z_{\min} = \Lambda(1 - 1/\theta)n^{-1/\theta} \tag{3}$$

$$\tilde{z} = \Lambda n^{-1/\theta} \tag{4}$$

$$h(z) = z\frac{1}{\phi\Lambda}\frac{1-\nu}{\nu_\theta}n^{1/\theta} \tag{5}$$

$$w = \Lambda^\nu \phi^\nu A^\nu \nu_\theta^\nu (1-\nu)^{1-\nu} n^{-\nu/\theta} \tag{6}$$

$$\omega(z) = \frac{\theta}{\theta - 1} z\Lambda^{\nu-1}\phi^\nu A^\nu \nu_\theta^\nu (1-\nu)^{1-\nu} n^{(1-\nu)/\theta} \tag{7}$$

with $\nu_\theta := \nu(1 - 1/\theta) \in (0, 1)$ the "selection adjusted" returns to management and $\kappa = (1 - \nu)/\nu_\theta > 0$ the relative importance of labor in production.

The proof of this and all subsequent propositions can be found in the Appendix.

The threshold property follows from single crossing: since z is valuable only for managers, the relative wage $\omega(z)/w$ is strictly increasing in z. The threshold $z_{\min}$ is determined by free entry and labor market clearing. The equilibrium share of managers n depends only on ϕ, ν and θ—not on A or Λ—due to free entry. Once we know n, all other variables follow. The threshold $z_{\min}$ decreases in n and increases in Λ. Average skill $\tilde{z}$ is a constant multiple of the entry threshold by Pareto properties.

Employment $h(z)$ increases in both z and n. While more managers ($n \uparrow$) leading to larger firms ($h(z) \uparrow$) seems counterintuitive, this reflects general equilibrium: as n rises, the entry threshold falls and marginal managers have lower skill. To maintain indifference, worker wages fall, making labor cheaper for all managers. Hence $h(z)$ rises for any $z > z_{\min}$.

Aggregate employment $(1-n)L$ still falls because the composition effect (fewer workers) dominates the scale effect (larger firms).

Proposition 2. *GDP per worker* in the M-economy is

$$y := \frac{Y}{L} = A^\nu \Lambda^\nu n^{\nu_\theta} (1-n)^{1-\nu} = A^\nu \Lambda^\nu \phi^{\nu_\theta} \kappa^{1-\nu} (\phi+\kappa)^{-(1-\nu/\theta)}. \tag{8}$$

Productivity A and skill Λ directly affect GDP per worker, though the skill effect is mitigated by $\nu < 1$. The manager share n enters GDP with exponent $\nu_\theta = \nu(1-1/\theta)$ rather than ν due to selection: as n increases, marginal managers have lower skill. The Pareto parameter θ governs how quickly average quality declines with quantity. With stronger selection (smaller θ), expanding managers yields smaller GDP gains. The rent share ϕ reduces managers and total skill, reducing GDP. This effect is larger when management is more important (larger ν) and managers are more similar (smaller θ). While more people work in production when ϕ is low, this is dominated by reduced managerial talent.

Definition 2. The *first best allocation* of the M-economy is (i) an employment function $h(z)$, and (ii) a measure of management skills $\mu(z)$ for those active in the economy such that

1. GDP is maximal
2. labor market clears
$$\int_z [1+h(z)]\mu(z)dz = L$$
3. market for managers clears at each skill level z,
$$\mu(z) \le \theta \Lambda^\theta z^{-\theta-1} L.$$

Proposition 3. A *first best allocation of the M-economy* exists, is unique, and exhibits a threshold property: there is a threshold $z_{\min *}$ such that all individuals with $z > z_{\min *}$ become managers, while all individuals with $z < z_{\min *}$ become workers. The solution is characterized by the following equations:

$$n_* = \frac{1}{1+\kappa} \tag{9}$$

$$z_{\min *} = \Lambda(1-1/\theta) n_*^{-1/\theta} \tag{10}$$

$$\tilde{z}_* = \Lambda n_*^{-1/\theta} \tag{11}$$

$$h_*(z) = z \frac{1}{\Lambda} \frac{1-\nu}{\nu_\theta} n_*^{1/\theta} \tag{12}$$

$$w_* = \Lambda^\nu A^\nu \nu_\theta^\nu (1-\nu)^{1-\nu} n_*^{-\nu/\theta} \tag{13}$$

$$\omega_*(z) = \frac{\theta}{\theta-1} z \Lambda^{\nu-1} A^\nu \nu_\theta^\nu (1-\nu)^{1-\nu} n_*^{(1-\nu)/\theta} \tag{14}$$

The first-best allocation maximizes GDP subject to resource constraints, ignoring the corporate governance friction. The optimal manager share n_* is independent of ϕ, with $n_* > n$ since the planner internalizes the full social value of management. The entry threshold and average skill are lower than in equilibrium. Aggregate employment $(1-n_*)L$ is lower in the first best as more people become managers. For any skill z, firm employment $h_*(z)$ is lower because managers are more abundant and workers scarcer, raising wages. Manager wages per unit of skill are higher. The first best features a larger manager/worker wage premium.

Proposition 4. Equilibrium GDP per worker is lower than the first best:

$$y < y_* = A^\nu \Lambda^\nu n_*^{\nu_\theta}(1-n_*)^{1-\nu}. \tag{15}$$

The proportional shortfall relative to the first best is

$$\frac{y}{y_*} = \phi^{\nu_\theta}\left(\frac{1+\kappa}{\phi+\kappa}\right)^{1-\nu/\theta} \tag{16}$$

with $\kappa = \frac{1-\nu}{\nu_\theta}$ as before.

Consider a policy that pays a proportional subsidy $s \geq 0$ on manager wages. Managers receive $(1+s)\omega(z)$ while firms pay $\omega(z)$ and still face the governance constraint $\omega(z) \leq \phi[r(z) - wh(z)]$. The subsidy is financed by lump-sum transfers via the mutual fund, so total GDP equals production.

The equilibrium under this subsidy is characterized by

$$n_s = \frac{\phi(1+s)}{\phi(1+s)+\kappa}, \tag{17}$$

$$z_{\min,s} = \Lambda(1-1/\theta)n_s^{-1/\theta}, \qquad \tilde{z}_s = \Lambda n_s^{-1/\theta}, \tag{18}$$

$$w_s = \Lambda^\nu[\phi(1+s)]^\nu A^\nu \nu_\theta^\nu (1-\nu)^{1-\nu} n_s^{-\nu/\theta}, \tag{19}$$

$$\omega_s^F(z) = z\Lambda^{\nu-1}\phi^\nu(1+s)^{\nu-1}A^\nu\nu_\theta^\nu(1-\nu)^{1-\nu}n_s^{(1-\nu)/\theta}, \tag{20}$$

$$\omega_s(z) = \frac{\theta}{\theta-1}z\Lambda^{\nu-1}[\phi(1+s)]^\nu A^\nu \nu_\theta^\nu(1-\nu)^{1-\nu}n_s^{(1-\nu)/\theta}. \tag{21}$$

GDP per worker equals

$$y_s = A^\nu\Lambda^\nu n_s^{\nu(1-1/\theta)}(1-n_s)^{1-\nu}. \tag{22}$$

Corollary 1 (First-best implementation)**.** Setting $s^* = \phi^{-1} - 1$ implies $\phi(1+s^*) = 1$, hence $n_s = n_*$ and $y_s = y_*$.

Corollary 2 (Elasticity near zero subsidy)**.** Let $x := \phi(1+s)$. Since $n_s = \frac{x}{x+\kappa}$ and $y_s = A^\nu\Lambda^\nu n_s^{\nu_\theta}(1-n_s)^{1-\nu}$, a short calculation gives

$$\left.\frac{d\ln y}{d\ln(1+s)}\right|_{s=0} = \frac{\nu_\theta(1-\phi)}{1+\phi\nu_\theta/(1-\nu)} \in (0,1) \tag{23}$$

Thus, with $\phi < 1$, a one percent proportional subsidy to manager pay raises GDP per worker by approximately this percentage. The gain vanishes at the first best ($\phi = 1$) and is larger when governance frictions are stronger (smaller ϕ) and when selection is weaker (greater ν_θ). There is a crowding out effect dampening the effect through labor market clearing. Because the subsidy increases the relative attractiveness of the manager occupation, more people become managers (greater n_s), and fewer people work in production, which partially offsets the positive productivity effect.

This concludes our analysis of the M-economy. We now turn to the E-M-economy with both entrepreneurs and managers.

2.2 The E-M Economy

In the E-M-economy, individuals can choose to be a worker, a manager, or an entrepreneur. Entrepreneurs differ from managers in that they own the firm they manage and can capture the full operating surplus. We model this by assuming that individuals differ in two dimensions: their innate manager skill z and their "entrepreneurial spirit" e. The latter is a binary variable that indicates whether an individual can be an entrepreneur or not.[5] Unlike the M-economy where the governance friction ϕ applies uniformly, the E-M economy features heterogeneity in who faces this friction. Individuals with entrepreneurial spirit can self-manage and avoid the wedge entirely.

Each individual is then characterized by a vector of skills (z, e), where $z \in \mathbb{R}^+$ is the innate manager skill and $e \in \{M, E\}$ is entrepreneurial spirit. The joint distribution of skills in the population is characterized by the density function $g_e(z)$ with $\int_z g_M(z)dz + \int_z g_E(z) = 1$.

The production function is the same as before, except that the productivity shifter may differ between entrepreneurs and managers:

$$q = (A_e z)^\nu h^{1-\nu}. \tag{24}$$

We allow different productivity parameters for entrepreneurs and managers because these represent distinct groups with potentially different operational focus and time allocation. Another key distinction from the M-economy is that if the manager and the owner are the same person ("entrepreneur"), she can retain the full operating surplus. An outside manager, however, can only get a $\phi < 1$ fraction of this surplus.

Definition 3. The *equilibrium of the E-M economy* is (i) a wage rate w, (ii) returns to manager and entrepreneur skills $\omega_e(z)$, (iii) employment function $h_e(z)$, and (iv) joint

[5] We call e "entrepreneurial spirit" to emphasize that it is an innate characteristic of an individual, not a choice variable and not an input into the production process. Empirical evidence on entrepreneurs supports the notion that they have different attitudes and preferences than managers (e.g., Evans and Leighton, 1989; Hamilton, 2000; Hurst and Pugsley, 2011).

measure of management and entrepreneur skills $\mu_e(z)$ for those active in the economy such that

1. firms maximize profit subject to the corporate governance constraint
2. labor market clears

$$\int_z [1 + h_M(z)]\mu_M(z)dz + \int_z [1 + h_E(z)]\mu_E(z)dz = L$$

3. market for managers clears at each skill level z and e,

$$\mu_e(z) \leq g_e(z)L$$

4. occupation choice is optimal for all z and e,

$$[\omega_e(z) - w][\mu_e(z) - g_e(z)L] \leq 0$$

For brevity, recall the notation $\kappa := 1 - \nu/\nu_\theta$ and $\nu_\theta := \nu(1 - 1/\theta)$.

In the two separate groups of individuals with and without entrepreneurial spirit, we can write the ratios of managers as

$$n_E = \Lambda^\theta(1 - 1/\theta)^\theta z_{\min,E}^{-\theta} = A_E^\theta \Lambda^\theta \nu_\theta^\theta (1 - \nu)^{\theta(1/\nu - 1)} w^{-\theta/\nu},$$
$$n_M = \Lambda^\theta(1 - 1/\theta)^\theta z_{\min,M}^{-\theta} = A_M^\theta \phi^\theta \Lambda^\theta \nu_\theta^\theta (1 - \nu)^{\theta(1/\nu - 1)} w^{-\theta/\nu}.$$

Proposition 5. The *equilibrium of the E-M economy* exists, is unique, and satisfies the threshold property.

$$n_E = \frac{1}{\alpha(1 + \kappa) + (1 - \alpha)(1 + \kappa/\phi)\left(\frac{\phi A_M}{A_E}\right)^\theta}, \tag{25}$$

$$n_M = \frac{\left(\frac{\phi A_M}{A_E}\right)^\theta}{\alpha(1 + \kappa) + (1 - \alpha)(1 + \kappa/\phi)\left(\frac{\phi A_M}{A_E}\right)^\theta}, \tag{26}$$

$$w = \Lambda^\nu A_E^\nu \nu_\theta^\nu (1 - \nu)^{1-\nu} n_E^{-\nu/\theta}, \tag{27}$$

$$\omega_M(z) = \frac{\theta}{\theta - 1} z \Lambda^{\nu-1} \phi^\nu A_M^\nu \nu_\theta^\nu (1 - \nu)^{1-\nu} n_M^{(1-\nu)/\theta}, \tag{28}$$

$$\omega_E(z) = \frac{\theta}{\theta - 1} z \Lambda^{\nu-1} A_E^\nu \nu_\theta^\nu (1 - \nu)^{1-\nu} n_E^{(1-\nu)/\theta}. \tag{29}$$

The equilibrium is characterized by closed-form solutions for within-group manager shares n_E and n_M. The key difference from the M-economy is that the governance friction ϕ now affects only the manager share n_M, while entrepreneurs face no wedge. This creates a compositional distortion: the ratio n_M/n_E is tilted toward entrepreneurs by the factor $\phi^\theta < 1$.

Proposition 6 (GDP per worker in the E-M economy)**.** Let $n = \alpha n_E + (1-\alpha)n_M$. Then

$$y = \Lambda^\nu \left[\alpha A_E n_E^{1-1/\theta} + (1-\alpha) A_M n_M^{1-1/\theta}\right]^\nu (1-n)^{1-\nu}. \tag{30}$$

GDP aggregates entrepreneurial and managerial productivity via a CES-like composite with elasticity θ, weighted by population shares α and $1-\alpha$.

First best of the E–M economy. We can define the first best allocation analogously to the M-economy. The planner chooses (n_E^*, n_M^*) to maximize GDP per worker subject to the talent bounds and labor market clearing. The first best exists, is unique, and admits closed-form solutions.

Proposition 7 (First best in the E–M economy)**.** The total first-best share of managers equals the M-economy planner's solution,

$$n_* = \frac{1}{1+\kappa}. \tag{31}$$

The optimal across-group allocation equalizes the social marginal product of managerial talent, $A_E n_E^{-1/\theta} = A_M n_M^{-1/\theta}$ and implies

$$n_E^* = \frac{A_E^\theta}{\alpha A_E^\theta + (1-\alpha) A_M^\theta} n_*, \tag{32}$$

$$n_M^* = \frac{A_M^\theta}{\alpha A_E^\theta + (1-\alpha) A_M^\theta} n_*. \tag{33}$$

Relative to equilibrium, the planner's ratio n_M^*/n_E^* depends only on the productivity gap A_M/A_E, whereas equilibrium tilts this ratio downward by the governance wedge $\phi < 1$.

Corollary 3 (Equilibrium vs. first best shares)**.** For any $\phi \in (0,1)$, the equilibrium ratio satisfies

$$\frac{n_M}{n_E} = \left(\frac{\phi A_M}{A_E}\right)^\theta < \left(\frac{A_M}{A_E}\right)^\theta = \frac{n_M^*}{n_E^*},$$

implying $n < n_*$, $n_M < n_M^*$, and $n_E > n_E^*$.

Intuitively, $\phi < 1$ makes hired manager careers less attractive, reducing n_M below the efficient level. Since total managers are too few ($n < n_*$) and managers are compositionally tilted toward entrepreneurs, we must have both $n_M < n_M^*$ and $n_E > n_E^*$.

Define the equilibrium composition shares $\chi_E := n_E/n$ and $\chi_M := n_M/n$ and the first-best composition shares $\chi_E^* := n_E^*/n_*$ and $\chi_M^* := n_M^*/n_*$. Then GDP per worker relative to the first best decomposes as

Proposition 8 (Decomposition of the output gap)**.**

$$\frac{y}{y_*} = \underbrace{\left(\frac{n}{n_*}\right)^{\nu_\theta}\left(\frac{1-n}{1-n_*}\right)^{1-\nu}}_{\text{fewer managers}} \times \underbrace{\left(\frac{\alpha A_E \chi_E^{1-1/\theta} + (1-\alpha)A_M \chi_M^{1-1/\theta}}{\alpha A_E \chi_E^{*1-1/\theta} + (1-\alpha)A_M \chi_M^{*1-1/\theta}}\right)^{\nu}}_{\text{between-group misallocation}}. \tag{34}$$

Both terms are at most one and attain one if and only if $\phi = 1$ (equivalently, $n_M/n_E = (A_M/A_E)^\theta$).

The first term captures the aggregate shortage of managers ($n < n_*$). The second term captures misallocation *among* managers: too many entrepreneurs and too few hired managers relative to their productivities. When $\phi < 1$, both terms are strictly less than one, so the governance friction generates both aggregate and compositional inefficiencies.

2.2.1 First best policy

As before, the first-best allocation can be implemented by a proportional subsidy $s_M^* = \phi^{-1} - 1$ on manager wages. Consider proportional subsidies $s_E \geq 0$ to entrepreneurs' pay and $s_M \geq 0$ to managers' pay, applied to the income received by workers and financed by lump-sum transfers. Define the effective wedges and summary terms

$$x_E := 1 + s_E, \qquad x_M := \phi(1 + s_M), \qquad R := \left(\frac{A_M}{A_E}\right)^{\theta}\left(\frac{x_M}{x_E}\right)^{\theta-1}.$$

Within-group active shares and the total share are

$$n_{E,s} = \frac{x_E}{\alpha(x_E + \kappa) + (1-\alpha)(x_M + \kappa)R}, \tag{35}$$

$$n_{M,s} = \frac{x_M R}{\alpha(x_E + \kappa) + (1-\alpha)(x_M + \kappa)R}, \tag{36}$$

$$n_s = \frac{\alpha x_e + (1-\alpha)x_M R}{\alpha(x_E + \kappa) + (1-\alpha)(x_M + \kappa)R}. \tag{37}$$

GDP per worker equals

$$y = \Lambda^\nu \kappa^{1-\nu} A_E^\nu x_E^{\nu_\theta} \frac{\alpha + (1-\alpha)R}{[\alpha(x_E + \kappa) + (1-\alpha)(x_M + \kappa)R]^{1-\nu/\theta}}.$$

The elasticity of GDP to manager-only subsidies near zero is [formula from appendix]. Unlike the M-economy case, this depends on both the governance friction ϕ and the composition of businesses between E and M types.

Corollaries. *Composition ratio:*

$$\frac{n_{M,s}}{n_{E,s}} = \left(\frac{A_M x_M}{A_E x_E}\right)^{\theta} = \left(\frac{A_M}{A_E}\right)^{\theta}\left(\frac{\phi(1 + s_M)}{1 + s_E}\right)^{\theta}.$$

Special cases and first best: (i) With $s_E = s_M = 0$, these expressions reduce to the baseline E–M equilibrium. (ii) A manager-only subsidy with $s_E = 0$ is equivalent to replacing ϕ by $\phi(1 + s_M)$ in the baseline formulas. (iii) The first-best composition and total share obtain when $x_E = x_M = 1$; one implementation is $s_E = 0$ and $s_M = \phi^{-1} - 1$, which yields $n = 1/(1 + \kappa)$ and $n_M/n_E = (A_M/A_E)^\theta$.

2.2.2 Second-best uniform subsidy

Consider a *uniform* rate s applied to both occupations, $s_E = s_M = s$. Then $x_E = 1 + s$ and $x_M = \phi(1 + s)$, so the relative wedge $x_M/x_E = \phi$ is unchanged. By the composition corollary, the ratio n_M/n_E remains fixed, hence uniform subsidies cannot change the *composition* between entrepreneurs and hired managers; they operate only through the *total* manager share n by relaxing the labor-market terms $1 + \kappa/x_e$ and $1 + \kappa/x_m$.

Define n_s as the total manager share under a uniform subsidy. Holding x_M/x_E constant, the GDP elasticity satisfies

$$\left.\frac{\partial \ln y}{\partial \ln x_E}\right|_{x_M/x_E \text{ const}} = \nu_\theta - (1 - \nu/\theta)n_s.$$

Hence uniform subsidies raise GDP if and only if $n_s < n_*$, with $n_* = (1+\kappa)^{-1}$ the optimal total manager share. The *second-best* uniform rate s_2 equates n_s to n_* and pins down

$$s_2 = \frac{1}{\phi}\frac{\alpha\phi + (1-\alpha)(\phi A_M/A_E)^\theta}{\alpha + (1-\alpha)(\phi A_M/A_E)^\theta} - 1. \tag{38}$$

This subsidy is strictly positive whenever $\phi < 1$ and is strictly less than the first-best manager-only subsidy $s_M^* = \phi^{-1} - 1$ whenever $\alpha > 0$.

To understand why the second-best uniform subsidy is lower than the first-best manager-only subsidy, rewrite (38) as

$$s_2 = \frac{(1-\alpha)n_M}{n} s_M^*.$$

The optimal uniform rate is fraction of the first-best manager-only rate $s_M^* = \phi^{-1} - 1$. While the subsidy expands both E and M margins, only a fraction $(1 - \alpha)n_M/n$ of it is effective, reaching the businesses operated by hired managers who are directly distorted by the governance wedge. The rest of the subsidy is wasted. When entrepreneurs account for a large share of businesses (as in our calibration), a uniform subsidy spends most resources on undistorted firms, so the GDP-maximizing rate is much smaller than s_M^*.

3 Calibration

3.1 Data

Manager data comes from the *Hungarian Manager Database* (HUN-REN KRTK, 2024*a*), compiled from the *Cégjegyzék* (corporate registry). This records, for all corporations, officers as specified in corporate law, including name, mother's name, address, position, and exact dates (Koren et al., 2025). We use name-based matching to identify managers moving across firms and infer nationality.

We create an annual panel of CEOs by taking a snapshot of main directors on June 21 each year. We keep only chief executive officers with Hungarian names (Koren and Telegdy, 2023) to study the domestic labor market. For CEOs at multiple firms, we keep only the largest. We merge balance sheets and financial statements (HUN-REN KRTK, 2024*b*) with nearly universal coverage.

Table 1: Manager Entry by Cohort

Cohort	Non-Entrepreneur	Entrepreneur	Total
1990	58,725	155,988	214,713
1995	59,058	156,117	215,175
2000	64,990	148,526	213,516
2005	66,804	118,981	185,785
2010	74,485	106,447	180,932
2015	56,202	54,840	111,042
2020	36,573	44,647	81,220
Total	427,234	785,546	1,212,780

Notes: This table reports the number of managers entering each cohort by entrepreneurship status. Cohorts are defined by the first year a manager appears in the data, grouped in 5-year bins. Entrepreneurs are defined as CEOs who are also founders of the firm they manage. The sample is restricted to Hungarian managers with non-missing revenue data and at most 4 simultaneous positions.

Table **??** shows the breakdown of manager entries by cohort and entrepreneur status. We track 147,000 CEOs and 206,000 entrepreneurs over time. Across all cohorts, but especially in earlier cohorts, entrepreneurs are overrepresented at about 60–70% of all CEOs.

3.2 Overview of Calibration Strategy

Our calibration proceeds in three steps. First, we identify the rent-sharing parameter ϕ using firm size differences, profit rates, and CEO wage shares. Second, we estimate selection intensity θ from cohort variation during Hungary's transition. Third, we pin down relative productivity A_M/A_E using within-person variation.

These three parameters—θ, ϕ, and A_M/A_E—determine allocation between entrepreneurs and managers and aggregate productivity. The selection parameter θ governs entry response to policy, ϕ measures the governance friction, and A_M/A_E captures the efficiency gap between organizational forms. We also calibrate ν (output elasticity with respect to management) and α (entrepreneurial spirit) directly from data moments.

3.3 Identifying the Rent-sharing Parameter ϕ

We employ three complementary approaches to estimate ϕ, the fraction of rents that managers can capture. Each method provides an independent moment to discipline this key parameter.

Method 1: Firm Size Differences The model delivers a sharp prediction for the relative firm sizes of entrepreneurs and managers. In equilibrium, the ratio of average firm sizes is:

$$\frac{\tilde{h}_E}{\tilde{h}_M} = \phi. \tag{39}$$

Managers can only capture fraction ϕ of rents, requiring them to run proportionally larger firms to achieve the same return as entrepreneurs. Since both occupations face the same outside wage w, the marginal manager must run a firm $1/\phi$ times larger than the marginal entrepreneur's to be indifferent.

Method 2: Profit Rate Comparison An alternative calibration strategy measures the profit rate of entrepreneur-run firms relative to manager-run firms. Under the assumption that entrepreneurs pay themselves only the minimum wage required for tax compliance, the profit rate of entrepreneur-run firms reveals the full rent ν. In contrast, manager-run firms report a share $\phi\nu$ of revenue as manager wages in the wagebill and only a share $(1-\phi)\nu$ as profit. We find that the median profit rate of entrepreneur-run firms is 17.2% (once corrected for the minimum tax burden of the CEO), while that of manager-run firms is only 13.8%, implying $1-\phi = 0.138/0.172 = 0.8$, so $\phi = 0.2$.

Method 3: CEO Wage Shares A third estimate of ϕ comes from direct measurement of CEO compensation. In our model, ν share of revenue is retained as operating surplus (EBITDA), with managers capturing $\phi\nu$ as wage while the remainder goes to firm owners. We use linked employer-employee data based on social security records, which cover a 50% random sample of all Hungarian employees.[6] We identify CEOs using occupation codes

[6] The linked administrative data are the property of the National Health Insurance Fund, Hungarian State Treasury, National Tax and Customs Administration, Ministry of Innovation and Technology, and the Educational Authority (and their legal successors). The data were processed and harmonized by the HUN-REN KRTK Databank. Tax return data originate from the National Tax and Customs Administration and were harmonized by the HUN-REN KRTK Databank (HUN-REN KRTK Databank, 2024; Sebők, 2019).

and match them to our CEO panel from the corporate registry, restricting to full-time CEOs with no other jobs and at least twice the minimum wage. The detailed results appear in Appendix Table 8. The median CEO wage share is approximately 10% each year, while the mean is around 22%, implying that ϕ lies in the 10–22% range.

Reconciling the Estimates The three methods yield a range of estimates: size differences suggest $\phi \approx 0.60$, profit rates imply $\phi \approx 0.20$, and CEO wage shares indicate $\phi \in [0.10, 0.22]$. We adopt $\phi = 0.60$ as our baseline, representing a conservative choice that avoids overstating governance frictions. This higher value is consistent with the firm size evidence and may reflect additional compensation channels not captured in wage data alone.

3.4 Identifying the Selection Parameter θ

The selection parameter θ governs how strongly average quality responds to entry. To identify it, we exploit the relationship between cohort entry rates and average firm size. The model predicts that average firm size for entrepreneurs follows:

$$\tilde{h}_e = \Lambda (N_e/\alpha_e)^{-1/\theta} L^{1/\theta} A_e w^{-1/\nu} (1-\nu)^{1/\nu},$$

Taking logs yields our estimating equation:

$$\ln \tilde{h}_e = \ln \Lambda - \frac{1}{\theta} \ln N_e + \frac{1}{\theta} \ln \alpha_e + \frac{1}{\theta} \ln L + \ln A_e - \frac{1}{\nu} \ln w + \frac{1}{\nu} \ln(1-\nu). \tag{40}$$

The coefficient on $\ln N_e$ identifies $-1/\theta$ if we can induce variation in manager entry that is orthogonal to other determinants like supply α_e or productivity A_e. Following Sedláček and Sterk (2017) and Moreira (2016), we exploit variation in cohort sizes when managers first became CEO. The Hungarian context provides particularly compelling variation: the transition to capitalism in 1990 led to a sudden, demand-driven increase in the number of firms and managers. By comparing cohorts entering in different years while controlling for competition and productivity measures, we can identify the selection effect.

We implement this strategy by regressing log firm revenue on the log number of entrants in each cohort, controlling for manager and firm characteristics. The coefficient on log entry rate equals $-1/\theta$, providing our identification of the selection parameter.

Table 2 presents our main results across five specifications. The dependent variable is log firm revenue, and we control for CEO age, entrepreneur status, and firm age, with industry-year fixed effects throughout. The industry-year fixed effects absorb variation in worker wages w and competitive conditions in product markets, which are common to all cohorts within an industry-year. Because individual cohorts are small relative to the total labor force, their entry has negligible impact on aggregate wages, ensuring that the identifying variation in $\ln N_e$ is orthogonal to $\ln w$.

The baseline specification (Column 1) includes industry-year and demographic group fixed effects, the latter being an interaction of birth cohorts and gender. The coefficient on log entry rate is -0.139, implying $\theta = 7.19$. This suggests moderate selection: when cohort entry doubles, average firm size falls by 13 percent.

Columns 2-4 test robustness across different samples. Excluding entrepreneurs (Column 2) yields a weaker selection effect ($\theta = 9.26$). Restricting to post-transition entrants (Column 3) or post-EU accession data (Column 4) shows weaker selection effects ($\theta = 11 - 18$), suggesting selection was strongest during the rapid expansion of the 1990s.

Column 5 adds firm fixed effects, identifying the selection parameter from manager turnover within the same firms. The estimated $\theta = 24.39$ indicates weaker selection when comparing managers across time within firms, but still confirms the negative relationship between entry and average quality. For our baseline calibration, we use $\theta = 11.0$ from Column 3, which focuses on the post-transition period most relevant for our policy analysis.

3.5 Identifying Relative Productivity A_M/A_E

The entrepreneur productivity penalty observed across all specifications provides initial evidence that entrepreneurs run smaller firms than managers. However, this size difference conflates two distinct mechanisms: selection (entrepreneurs may have different skills) and productivity (entrepreneurs may be less productive per unit of skill). To separate these effects, we need within-person variation.

Table 3 exploits variation in the entrepreneur status of CEOs to identify key model parameters. The identification strategy relies on comparing the same individuals when they run their own firms (entrepreneurs) versus when they manage others' firms (professional managers).

Column 1 includes no firm or person controls, measuring the average size difference between entrepreneur-managed and non-entrepreneur-managed firms. We interpret the former as entrepreneurial (E) firms and the latter as managerial (M) firms. The entrepreneur coefficient of -0.46 log points in this specification identifies $\ln \phi$, as it captures the equilibrium size ratio predicted by the model.

Column 3 adds person fixed effects, fundamentally changing what we identify. By controlling for individual skill z, selection no longer affects the estimates. The entrepreneur dummy now measures the size difference between E and M firms for the same manager skill level, effectively identifying $\ln(A_E/A_M)$. The coefficient of -0.58 log points implies $A_E/A_M = \exp(-0.58) = 0.56$, or equivalently $A_M/A_E = 1.78$.

Table 2: Manager Selection and Cohort Entry Effects

	Dependent Variable: Log Revenue				
	(1) Baseline	(2) No Founders	(3) Post-1992	(4) Post-2004	(5) Firm FE
($\ln n$)					
Number of CEO Entrants, log	-0.137***	-0.104***	-0.091***	-0.055***	-0.039***
	(0.019)	(0.019)	(0.015)	(0.017)	(0.003)
CEO Age	0.126***	0.162***	0.112***	0.124***	0.087***
	(0.012)	(0.011)	(0.010)	(0.010)	(0.003)
CEO Age Squared	-0.001***	-0.002***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Entrepreneur CEO	-0.415***	0.000	-0.412***	-0.362***	-0.131***
	(0.037)	(.)	(0.036)	(0.034)	(0.008)
Firm Age	0.081***	0.024***	0.076***	0.055***	0.076***
	(0.005)	(0.005)	(0.003)	(0.006)	(0.004)
Firm Age Squared	-0.003***	-0.000**	-0.003***	-0.002***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	7.686***	6.994***	7.679***	7.320***	7.661***
	(0.455)	(0.425)	(0.481)	(0.441)	(0.101)
Fixed Effects: Industry × Year	Yes	Yes	Yes	Yes	Yes
Birth Cohort × Gender	Yes	Yes	Yes	Yes	Yes
Firm	No	No	No	No	Yes
Selection Parameter: θ	7.30***	9.62***	10.98***	18.22***	25.32***
	(1.01)	(1.72)	(1.76)	(5.60)	(2.16)
Observations	7,087,435	1,649,978	6,756,480	5,065,112	7,003,390
Adjusted R-squared	0.173	0.152	0.175	0.150	0.753

Notes: This table reports results from regressions of log firm revenue on cohort entry characteristics for Hungarian CEOs, 1992-2022. The key variable of interest is Log Entry Rate ($\ln n$), which measures the log number of managers entering in each cohort. Demographic groups are defined by birth cohort (5-year bins) interacted with gender, capturing systematic differences in baseline skills and demographics across manager cohorts. Column (1) shows the baseline specification with industry-year and demographic group fixed effects. Column (2) excludes entrepreneurs from CEOs. Column (3) restricts to post-transition entrants (first year $\geq$ 1992). Column (4) uses only post-EU accession data (2004 onwards). Column (5) adds firm fixed effects. The selection parameter θ is computed as $\theta = -1/\beta_{\ln n}$ using the delta method for standard errors. Sample restricted to Hungarian managers aged 18-75 with non-missing revenue data and at most 4 simultaneous positions. Standard errors clustered by first entry year in parentheses.
Significance levels: * p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01.
Data source: Hungarian Manager Database (CEU MicroData) merged with firm financial statements, 1992-2022.

Table 3: Entrepreneur Discount

	Dependent Variable: Log Revenue		
	(1) No Controls	(2) With Controls	(3) CEO FE
Entrepreneur CEO	-0.460***	-0.430***	-0.577***
	(0.005)	(0.005)	(0.008)
CEO Age		0.112***	0.176***
		(0.002)	(0.003)
CEO Age Squared		-0.001***	-0.002***
		(0.000)	(0.000)
Firm Age		0.082***	0.047***
		(0.001)	(0.001)
Firm Age Squared		-0.003***	-0.002***
		(0.000)	(0.000)
Constant	9.749***	6.861***	5.066***
	(0.005)	(0.072)	(0.110)
Fixed Effects: Industry × Year	Yes	Yes	Yes
Birth Cohort × Gender	No	Yes	No
CEO	No	No	Yes
Observations	7,087,436	7,087,435	6,967,913
Adjusted R-squared	0.146	0.170	0.713

Notes: This table reports results from regressions of log firm revenue on an entrepreneur CEO indicator for Hungarian CEOs, 1992-2022. Column (1) shows the baseline specification with industry-year fixed effects. Column (2) adds controls for CEO age and firm age as well as skill group fixed effects defined by birth cohort (5-year bins) interacted with gender, capturing systematic differences in baseline skills and demographics across manager cohorts. Column (3) adds CEO fixed effects, so the entrepreneur coefficient is identified off CEOs who switch between entrepreneur and non-entrepreneur roles. The sample is restricted to Hungarian managers aged 18-75 with non-missing revenue data and at most 4 simultaneous positions. Standard errors clustered by manager in parentheses.
Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Data source: Hungarian Manager Database (CEU MicroData) merged with firm financial statements, 1992-2022.

The similarity between estimates (-0.46 vs -0.58 log points) has economic significance. It suggests individuals are roughly indifferent between careers when $\phi A_M \approx A_E$: managers receive $\phi A_M z$ while entrepreneurs receive $A_E z$. This near-indifference validates our occupational choice framework. Within-person comparison is crucial—without it, we cannot distinguish whether entrepreneurs run smaller firms due to lower skill (selection) or lower productivity per unit of skill.

3.6 Direct Calibration of ν and α

The remaining parameters can be directly calibrated from data moments. We calibrate α, the fraction of the population with entrepreneurial spirit, to target the share of entrepreneurs among CEOs. From Table 1, we observe that 60-70% of CEOs are entrepreneurs. Given our estimates of ϕ, θ, and A_M/A_E, we choose $\alpha = 0.86$ to match a baseline entrepreneur share of 75% in the model.[7]

The elasticity of output with respect to management, ν, is calibrated to match the share of CEOs in the workforce. The average firm size in the economy is:

$$\tilde{h} = \frac{N_E}{N_E + N_M}\tilde{h}_E + \frac{N_M}{N_E + N_M}\tilde{h}_M = \frac{\theta}{\theta - 1}\frac{1-\nu}{\nu}\frac{\alpha A_E^\theta + (1-\alpha)A_M^\theta \phi^{\theta-1}}{\alpha A_E^\theta + (1-\alpha)A_M^\theta \phi^\theta},$$

which pins down $\nu = 0.16$ given our estimates of the other parameters.

3.7 Summary of Calibrated Parameters

4 Counterfactual Policies

This section uses the calibrated model to quantify how alternative policies affect the allocation between entrepreneurs and hired managers, skill composition, and aggregate output.

4.1 Understanding the Policy Response Magnitudes

The policy responses in our calibrated economy reflect two key features of our parameter estimates: moderate selection ($1/\theta = 1/11 \approx 0.09$) and substantial governance frictions ($\phi = 0.6$). The moderate selection means that quality declines only gradually as more people become managers—when entry increases by 10 percent, average firm size falls by only 0.9 percent. At the same time, the high supply elasticity ($\theta = 11$) means that many high-ability individuals are close to the occupational margin and will switch occupations

[7]The model-predicted 75% entrepreneur share is slightly above the 60-70% range observed in the data, reflecting the conservative choice of $\phi = 0.6$. Alternative calibrations with lower ϕ values (0.2-0.4) would match the observed range more closely but would imply stronger governance frictions and larger policy responses. Our baseline choice represents a conservative approach that avoids overstating the potential gains from policy intervention.

Table 4: Model Parameter Calibration

Parameter	Description	Target Moment	Preferred Value
ϕ	Manager rent share	Entrepreneur firm size Table 3, Col (1) Alternative: Profit rates (0.20) Alternative: CEO wages (0.10–0.22)	0.60
θ	Selection parameter	Cohort selection elasticity Table 2, Col (3)	11.0
A_M/A_E	Relative productivity	Within-person entrepreneur discount Table 3, Col (3)	1.78
ν	Management elasticity	CEO share in workforce Average firm size equation	0.16
α	Entrepreneurial spirit	Share of entrepreneurs among CEOs Table 1	0.86

Notes: This table summarizes the calibrated parameter values. Each parameter is identified from specific empirical moments. For ϕ, we present three independent estimation methods (firm size differences, profit rates, CEO wage shares) with our preferred estimate based on firm size evidence to avoid overstating governance frictions. The selection parameter θ is identified from cohort variation during Hungary's transition. The relative productivity A_M/A_E uses within-person variation to separate selection from productivity effects. The parameters ν and α are directly calibrated to match data moments.

in response to moderate policy changes. The governance friction ($\phi < 1$) creates a wedge between social and private returns to management, leaving room for welfare-improving interventions.

The interaction between entrepreneurs and managers amplifies policy effects through a competition mechanism. When we subsidize managers, not only do more people become managers (direct effect), but the increased competition in the goods market also reduces entrepreneur profitability, causing additional reallocation from less productive entrepreneurs to more productive managers (indirect effect). This explains why the E-M economy shows larger policy responses than the M economy.

We report steady-state outcomes normalized to the baseline calibration (GDP per capita = 1) and track the number of managers n, average skill $\tilde{z}$, and wage outcomes for workers and managers. We first build intuition in the manager-only (M) economy, then analyze the economy with both entrepreneurs and hired managers (E–M). Policy levers include a manager subsidy s that shifts the occupational margin, a skill intervention that raises the scale parameter Λ by 10% ("training"), and—in the E–M economy—uniform subsidies to both occupations alongside the second-best uniform rate that maximizes GDP. We also report a first-best allocation as a benchmark and later decompose GDP gains into expansion of the overall manager pool versus reallocation between E and M.

Table 5: Counterfactual Policies in the M-Economy

	Baseline	**First best**	**10% subsidy**	**Training**
Manager subsidy s	—	0.667	0.100	—
GDP per capita (baseline = 1)	1.000	1.015	1.005	1.016
Managers n	0.097	0.151	0.105	0.097
Avg. skill $\tilde{z}$	1.000	0.960	0.992	1.100
Worker wage w, (baseline = 1)	1.000	1.080	1.014	1.016
Manager wage $\omega(\tilde{z})/z$, (baseline = 1)	1.000	1.125	1.022	1.016

Notes: This table presents counterfactual policy analysis using the calibrated model. **Baseline:** baseline calibration values. **First best:** first-best allocation. **10% subsidy:** 10% subsidy to manager earnings. **Training:** business training that increases the skill parameter Λ by 10%.
GDP per capita: Normalized to 1 in the baseline calibration.
Skill measures: Average manager skill, normalized to 1 in baseline.
Wage premiums: Ratio of occupation-specific average compensation to worker wages.

4.2 Manager-Only Economy

Table 5 presents counterfactuals for the manager-only economy. An important caveat: because all parameters are calibrated in the E-M economy, and we adopt conservative values for both rent-sharing ($\phi \approx 0.6$, keeping us near first best) and relative productivity (A_M/A_E chosen so entrepreneur-run firms are not much worse than manager-run firms), the M-economy baseline does not exactly match the data on the number of managers. In particular, there are fewer managers in the M economy ($n = 0.097$) than in the data ($n = 0.13$), because in reality, many CEOs are entrepreneurs.

Implementing the first-best allocation (here, an $s \approx 0.667$ manager subsidy) expands the manager share from 0.097 to 0.151 while average manager skill falls by about 4 percent to 0.960 due to selection. General-equilibrium forces keep the entry elasticity below one: as n rises, $1 - n$ shrinks, worker wages increase (to 1.080), and the return to managerial skill compresses, dampening additional entry. The aggregate payoff is modest—GDP rises by 1.5 percent—even as both worker and manager wages increase, implying higher wage inequality at the first best.

Policy magnitudes matter. A realistic 10 percent subsidy barely moves aggregates: n increases to 0.105, average skill slips to 0.992, and GDP rises by only 0.5 percent; worker and manager wages rise roughly in tandem (1.014 and 1.022).

By contrast, a 10 percent rightward shift in the managerial skill distribution (training that raises Λ) delivers a larger 1.6 percent GDP gain without distorting occupational choice: headcounts are unchanged, and both wages move one-for-one (1.016 and 1.016), leaving the manager premium unchanged. While we do not model specific training programs, our result that a skill increase can raise productivity without large reallocations or changes in inequality is consistent with empirical evidence from Italy and the United States that management-oriented training can work at a large scale (Giorcelli, 2019; Bianchi and Giorcelli, 2022).

4.3 Economy with Entrepreneurs and Managers

Table 6 shows that introducing entrepreneurs dramatically changes how the economy responds to policy. The baseline calibration is set to match the observed composition: $n_E \approx 0.097$, $n_M \approx 0.032$.

The first-best manager subsidy ($s_M \approx 0.667$) triggers a large reallocation: hired managers expand to 0.150 while entrepreneurs nearly disappear (0.002). This dramatic shift occurs because entrepreneurs and managers compete in the goods market. The almost fivefold increase in the number of managers reduces the profitability of entrepreneurs by 27 percent. Combined with worker wages rising by 6 percent, this competition effect drives most entrepreneurs to exit. Due to selection, the average skill of the remaining entrepreneurs

Table 6: Counterfactual Policies in the E-M Economy

	Baseline	**First best**	**10% subsidy**	**Second best**
Manager subsidy s_M	—	0.667	0.100	0.168
Entrepreneur subsidy s_E	—	—	—	0.168
GDP per capita (baseline = 1)	1.000	1.040	1.016	1.001
Entrepreneurs $n_E \alpha$	0.097	0.002	0.064	0.114
Managers $n_M(1-\alpha)$	0.032	0.150	0.061	0.038
Avg. E skill $\tilde{z}_E$	1.000	1.454	1.041	0.988
Avg. M skill $\tilde{z}_M$	1.000	0.872	0.946	0.988
Worker wage w	1.000	1.063	1.007	1.024
E wage $\omega_E(z)/z$	1.000	0.731	0.967	1.037
M wage $\omega_M(z)/z$	1.000	1.219	1.064	1.037

Notes: This table presents counterfactual policy analysis using the calibrated model. **Baseline:** baseline calibration values. **First best:** first-best allocation. **10% subsidy:** 10% subsidy to managers. **Second best:** second-best optimal uniform subsidy rate.
GDP per capita: Normalized to 1 in the baseline calibration.
Skill measures: Average skills of entrepreneurs and managers, normalized to 1 for entrepreneurs in baseline.
Wage premiums: Ratio of occupation-specific average compensation to worker wages.

rises by 45 percent. The net effect is a 4 percent GDP gain, much larger than in the M economy, demonstrating the importance of the reallocation channel.

At smaller scale, the same forces operate. A 10 percent manager subsidy nearly doubles n_M to 0.061, induces moderate entrepreneur exit ($n_E \approx 0.064$), and raises GDP by 1.6 percent—more than three times the M-economy effect.

By contrast, the second-best uniform policy ($s_E = s_M \approx 0.16$) leaves composition exactly intact, expands both occupations symmetrically (including marginal, low-productivity entrepreneurs), and yields only a 0.1 percent GDP gain.[8] The effect is much smaller than the manager-only subsidy for two reasons. First, the elasticities are smaller: with two occupations competing in the goods market, the entry of one occupation reduces the profitability of the other, dampening overall expansion. This reduces the magnitude of the effects from any uniform subsidy, but does not change its direction. Second, and more importantly, the uniform subsidy does not address the core misallocation—that entrepreneurs are less productive than managers. By subsidizing both occupations equally, the policy preserves the existing distorted allocation.

4.4 Decomposing the GDP Effects

To understand the mechanisms driving our results, Table 7 decomposes the GDP effects into two channels: (i) expansion of the overall manager pool (both entrepreneurs and hired managers), and (ii) reallocation between entrepreneurs and hired managers, holding the overall manager pool fixed. This decomposition, based on Proposition 8, reveals which policies work through increasing total management versus improving its allocation.

Table 7: GDP Decomposition Across Counterfactuals

	First best	**10% subsidy**	**Second best**
GDP per capita	1.040	1.016	1.001
Overall manager pool	1.001	0.998	1.001
Reallocation E vs M	1.039	1.017	1.000

Notes: GDP per capita from Table 6. The decomposition follows Proposition 8, equation (34). Overall manager pool measures the GDP effect from changing total management ($n_E + n_M$). Reallocation measures the GDP effect from shifting the composition between E and M, holding total management fixed. The product of the two components equals the total GDP effect.

The reallocation channel is the dominant driver of GDP changes. The first-best allocation and the 10% manager subsidy both generate large reallocations between entrepreneurs

[8]The composition ratio n_M/n_E is exactly unchanged and the total manager share equals the theoretical value n_* in the underlying simulation. Small discrepancies visible in Table 6 (approximately 1% for the ratio and 3% for the total) are purely rounding artifacts from independently rounding each component to three decimals.

and hired managers, which account for nearly all of the GDP gains. The overall manager pool barely changes (ranging from 0.998 to 1.001), indicating that these policies primarily work by shifting managers from less productive entrepreneurial firms to more productive professionally managed firms.

Only the second-best uniform subsidy fails to generate reallocation (1.000), and correspondingly produces negligible GDP gains despite slightly expanding the overall manager pool. This stark contrast highlights that in our calibrated economy, the misallocation between organizational forms is more important than the overall level of management.

5 Conclusion

We built a dynamic equilibrium model of managers to study the demand and supply of good management and the competition between managers of heterogeneous skills. We used data on the universe of corporations and their top managers in Hungary between 1986 and 2022 to study the rapid liberalization of the 1990s through the lens of our model. Our results suggested that the inelastic supply of good managers is an important constraint to the success of management interventions.

We expect this model to be useful for studying other macroeconomic interventions in the manager market. With small modifications, one can explore the effects of policies relating to the education system, the tax system, and the international labor market.

The model also has implications for manager earnings: How much more does a manager make relative workers and how unequal are manager earnings? With data on manager earnings, the model can also be used to better understand the distribution of manager skills.

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Appendix

A Additional Tables

B Proofs

B.1 General E–M equilibrium with occupation-specific subsidies

Consider proportional subsidies $s_E \geq 0$ to entrepreneurs' pay and $s_M \geq 0$ to managers' pay. Managers hired by outside owners face the corporate governance constraint ϕ at the firm level; subsidies apply to the income received by the worker and are financed by lump-sum transfers via the mutual fund, so GDP equals production.

Define the effective wedges

$$x_E := 1 + s_E, \qquad x_M := \phi\,(1 + s_M).$$

Table 8: CEO Wage Share of Adjusted EBITDA, 2013–2017

Year	Number of CEOs	Median wage share (%)	Mean wage share (%)
2013	7,974	10.2%	23.2%
2014	7,751	10.4%	22.5%
2015	8,507	10.7%	22.3%
2016	9,558	11.1%	23.0%
2017	18,237	9.3%	20.3%
Total	52,027	10.2%	22.1%

Notes: Wage share equals CEO wage (inclusive of 27% payroll tax) divided by adjusted EBITDA. CEOs are selected from a 50% sample of all Hungarian employees (ADMIN3) and must: (i) be classified as CEO by occupation code; (ii) have a full-time employment contract with the firm for all 12 months of the year; (iii) have no other contractual relations reported in ADMIN3; and (iv) receive at least 2× the minimum wage. Adjusted EBITDA = Sales − Personnel − Materials + CEO wage. The series begins in 2013 because wages are top-coded in earlier years of the data.

Optimal hiring and returns. Firms solve $(1-\nu)(A_e z/h_e)^\nu = w$, yielding $h_e(z) = A_e z\, w^{-1/\nu}(1-\nu)^{1/\nu}$ and $r_e(z) = A_e z\, w^{1-1/\nu}(1-\nu)^{1/\nu-1}$. The payment schedules before subsidies are $\omega_M^F(z) = \phi\nu r_M(z)$ and $\omega_E(z) = \nu r_E(z)$. After subsidies, workers receive $\omega_M(z) = (1+s_M)\omega_M^F(z)$ and $\omega_E(z)$ unchanged when $s_E = 0$.

Threshold and indifference. Single crossing implies thresholds $z_{\min}(e)$ satisfy $\omega_e(z_{\min}(e)) = w$ for the received income. This gives

$$z_{\min}(M) = (x_M)^{-1}\nu^{-1}A_M^{-1}(1-\nu)^{1-1/\nu}w^{1/\nu}, \qquad z_{\min}(E) = (x_E)^{-1}\nu^{-1}A_E^{-1}(1-\nu)^{1-1/\nu}w^{1/\nu}.$$

Active shares and composition. With Pareto tails and threshold selection, $n_e = \Lambda^\theta(1-1/\theta)^\theta z_{\min}(e)^{-\theta}$ and $\tilde{z}_e = \frac{\theta}{\theta-1}z_{\min}(e)$. Taking the ratio eliminates w:

$$\frac{n_M}{n_E} = \left(\frac{A_M x_M}{A_E x_E}\right)^\theta =: \mathcal{R}.$$

Note that $\mathcal{R} = (x_M/x_E)\, R$, where R is defined in the main text as $R := (A_M/A_E)^\theta(x_M/x_E)^{\theta-1}$.

Labor market clearing. Aggregate labor demand equals the supply of production workers:

$$\alpha n_E\, A_E w^{-1/\nu}(1-\nu)^{1/\nu}\,\tilde{z}_E + (1-\alpha)n_M\, A_M w^{-1/\nu}(1-\nu)^{1/\nu}\,\tilde{z}_M = 1-n,$$

where $n = \alpha n_E + (1-\alpha)n_M$. Substituting $\tilde{z}_e = \frac{\theta}{\theta-1}\Lambda(1-1/\theta)n_e^{-1/\theta}$ and using the indifference conditions to eliminate $w^{-1/\nu}$ term-by-term yields the linear identity

$$\alpha\Big(1+\frac{\kappa}{x_E}\Big)n_E + (1-\alpha)\Big(1+\frac{\kappa}{x_M}\Big)n_M = 1, \qquad \kappa = \frac{1-\nu}{\nu}\frac{\theta}{\theta-1}.$$

Solution. Define $D := \alpha\big(1+\frac{\kappa}{x_E}\big) + (1-\alpha)\big(1+\frac{\kappa}{x_M}\big)\mathcal{R}$. The unique solution is

$$n_E = \frac{1}{D}, \qquad n_M = \frac{\mathcal{R}}{D}, \qquad n = \alpha n_E + (1-\alpha) n_M.$$

Prices and GDP. Using $z_{\min}(e) = \Lambda(1-1/\theta) n_e^{-1/\theta}$ and the indifference conditions gives

$$\begin{aligned} w &= \Lambda^\nu (1-1/\theta)^\nu (A_E x_E)^\nu\, \nu^\nu (1-\nu)^{1-\nu}\, n_E^{-\nu/\theta}, \\ \omega_E(z) &= z\,\Lambda^{\nu-1}(1-1/\theta)^\nu (A_E x_E)^\nu\, \nu^\nu (1-\nu)^{1-\nu}\, n_E^{(1-\nu)/\theta}, \\ \omega_M(z) &= z\,\Lambda^{\nu-1}(1-1/\theta)^\nu (A_M x_M)^\nu\, \nu^\nu (1-\nu)^{1-\nu}\, n_M^{(1-\nu)/\theta}. \end{aligned}$$

GDP per worker equals

$$y = \Lambda^\nu \left[\, \alpha A_E\, n_E^{1-1/\theta} + (1-\alpha) A_M\, n_M^{1-1/\theta}\, \right]^\nu (1-n)^{1-\nu}.$$

First best. Setting $x_E = x_M = 1$ removes all distortions. One implementation is $s_E = 0$ and $s_M = \phi^{-1} - 1$, which yields

$$n = \frac{1}{1+\kappa}, \qquad \frac{n_M}{n_E} = \Big(\frac{A_M}{A_E}\Big)^\theta.$$

This is the unique optimal allocation that maximizes GDP.

B.2 Proof of M-economy equilibrium

Special case of §B.1 with $\alpha = 0$, $s_E = s_M = 0$.

B.3 Proof of M-economy first best

Special case of §B.1 with $\alpha = 0$, $s_M = \phi^{-1} - 1$.

B.4 Proof of M-economy with manager wage subsidy

Special case of §B.1 with $\alpha = 0$, $s_E = 0$.

B.5 Proof of E-M equilibrium with Pareto tails

Special case of §B.1 with $s_E = s_M = 0$.

B.6 Proof of E–M first best

Proof of Proposition 7. Special case of §B.1 with $s_E = 0$, $s_M = \phi^{-1} - 1$. This sets $x_E = x_M = 1$, yielding $n_M/n_E = (A_M/A_E)^\theta$ and $n_* = 1/(1+\kappa)$. □

Proof of Proposition 3. Compare equilibrium ($x_M = \phi < 1$) with first best ($x_M = 1$). Since $\phi < 1$ raises the coefficient on n_M in the labor identity, monotone comparative statics imply $n_M < n_M^*$, $n_E > n_E^*$, and $n < n_*$. □

Proof of Proposition 8. The between-group term is maximized when $n_M/n_E = (A_M/A_E)^\theta$, which holds iff $\phi = 1$. □

B.7 Proof of GDP per worker in the E-M economy

See §B.1. The formula holds for any (n_E, n_M) regardless of subsidies.

B.8 Derivation: Elasticities near zero subsidies

Using the general equilibrium formulas from §B.1, differentiate GDP with respect to $\ln x_M$ and $\ln x_E$ and evaluate at $s_E = s_M = 0$ (i.e., $x_E = 1$, $x_M = \phi$). Let $u := 1 - 1/\theta$, $\rho := (\phi A_M/A_E)^\theta$, $D := \alpha(1+\kappa) + (1-\alpha)(1+\kappa/\phi)\rho$, and $w_E := \alpha A_E n_E^u/B$, $w_M := 1 - w_E$ where $B := \alpha A_E n_E^u + (1-\alpha) A_M n_M^u$.

Using $\partial_{\ln x_M} \ln \mathcal{R} = \theta$ and $\partial_{\ln x_E} \ln \mathcal{R} = -\theta$, the elasticities are

$$\partial_{\ln x_M} \ln n_E = -\delta_M, \quad \partial_{\ln x_M} \ln n_M = \theta - \delta_M,$$

$$\partial_{\ln x_E} \ln n_E = \delta_E, \quad \partial_{\ln x_E} \ln n_M = -\theta + \delta_E,$$

where

$$\delta_M := \frac{(1-\alpha)\rho[\theta + \kappa\phi^{-1}(\theta - 1)]}{D}, \qquad \delta_E := \frac{\alpha\kappa + (1-\alpha)\theta(1+\kappa/\phi)\rho}{D}.$$

Applying the chain rule to $y = \Lambda^\nu[\alpha A_E n_E^u + (1-\alpha) A_M n_M^u]^\nu (1-n)^{1-\nu}$ yields

$$\left.\frac{d\ln y}{d\ln(1+s_M)}\right|_0 = \nu u\big[w_E(-\delta_M) + w_M(\theta - \delta_M)\big] - \frac{1-\nu}{1-n}\big[\alpha n_E(-\delta_M) + (1-\alpha)n_M(\theta - \delta_M)\big],$$

$$\left.\frac{d\ln y}{d\ln(1+s_E)}\right|_0 = \nu u\big[w_E(\delta_E) + w_M(-\theta + \delta_E)\big] - \frac{1-\nu}{1-n}\big[\alpha n_E(\delta_E) + (1-\alpha)n_M(-\theta + \delta_E)\big].$$