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Navigating economic growth targets: the role of innovation-driven strategies in regional talent allocation in China

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As China's economy transitions into a stage of high-quality development, the shift from a factor-driven growth model to an innovation-driven one has become crucial. This paper utilizes panel data from 258 cities in China spanning from 2004 to 2019 to investigate the impact of growth targets at different stages of economic development on regional talent allocation. Additionally, it explores whether long-term innovation-driven strategies can counterbalance the imbalances in regional talent allocation caused by short-term growth target constraints. The findings of this study are as follows: (1) Economic growth target constraints significantly hinder regional talent allocation, with particularly pronounced effects in non-capital and non-innovative cities. Conversely, innovation-driven approaches substantially enhance talent allocation efficiency, demonstrating stronger impacts in non-capital cities and innovation hubs. (2) Mechanistic analysis reveals dual pathways: Growth targets exacerbate local protectionism and market fragmentation, thereby impeding marketization processes and talent mobility. In contrast, innovation-driven strategies foster industrial agglomeration upgrading, creating self-reinforcing cycles for talent concentration. (3) Moreover, the impact of innovation-driven on regional talent allocation is influenced by the intensity of economic growth target constraints, showing a threshold effect. Specifically, the higher the intensity of local economic growth target constraints, the smaller the effect of innovation-driven on regional talent allocation.

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Introduction

In the realm of governance, talent has emerged as a crucial determinant in the competition for comprehensive national power, given the complexities of the international environment, technological revolution, and external shocks (Colvin, 2006; Lewis and Heckman, 2006; Gallardo-Gallardo et al., 2015). The 19th National Congress of the Communist Party of China (CPC) positioned talent as the linchpin for national advancement and international competitiveness. Similarly, the 20th CPC Congress emphasized talent as the primary resource and innovation as the core driver of development. As China's economy transitions to high-quality development, its traditional latecomer advantages driven by factor inputs are diminishing. Talent, a key driver of modern economic growth, plays a pivotal role in enhancing regional innovation capabilities and industrial upgrading (Farndale et al., 2014; Malik, 2021; Lucas, 1988; Wu and Liu, 2021). Efficient talent allocation not only strengthens regional innovation capacity and knowledge spillover absorption (Borensztein et al., 1998) but also fosters knowledge-intensive industries, enabling synergistic growth among the real economy, innovation ecosystems, finance sectors (Celik, 2023; Shakhnov, 2022). Optimal talent allocation can propel breakthroughs in scientific research and economic development (Qian, 2010; Shakhnov, 2022).

However, the criteria for official promotion have shifted from exclusively political to economic performance metrics, incentivizing local governments to set higher economic growth targets to outperform peers (Li et al., 2019). While ambitious targets may stimulate short-term economic activities (Guo et al., 2022), they risk homogenizing industrial structures across regions. Excessive focus on immediate outcomes often redirects fiscal investments to quick-return sectors, undermining endogenous economic dynamism (Wu et al., 2019; Li et al., 2019). Faced with rigid growth targets, local governments may resort to unconventional strategies and short-termism when market-driven development falls short (Zhang et al., 2022). This can exacerbate regional market fragmentation, impede talent mobility through protectionist policies, and perpetuate allocative imbalances (Liu et al., 2022). Thus, investigating how growth target constraints contribute to persistent regional talent disparities remains critical, given the current research gap.

General Secretary Xi Jinping has emphasized that high-quality development relies on innovation-driven strategies, with talent as the foundational element (Gu et al., 2020). However, a persistent east-west imbalance in talent distribution persists, misaligned with national strategic needs (Gu et al., 2020; Chen, 2022). To address this, the CPC Central Committee and the State Council issued the 2020 policy "Opinions on Improving Market-Based Allocation of Production Factors," highlighting talent recruitment mechanisms. Yet, excessive intervention risks overconcentration and "talent congestion" in specific regions (Gu et al., 2020). Distorted interregional allocation further stifles innovation potential, hindering high-quality development (Chen, 2022).

In recent years, scholarly attention has predominantly centered on the examination of talent allocation across two primary dimensions. Firstly, within the context of industries, numerous scholars contend that the distribution of talent across various sectors remains markedly imbalanced (Gradstein, 2019; López and Torres, 2020; Dong et al., 2022). Furthermore, some researchers have conducted estimations to quantify the extent of talent misallocation between industries, revealing a notable degree of distortion (Hsieh and Klenow, 2009; McMillan et al., 2014; Vollrath, 2014). According to data extracted from the "2020 China Labor Statistics Yearbook," the top five industries employing undergraduate and graduate graduates are education, public administration and social organizations, manufacturing,

health and social work, and finance. The current talent structure across industries in China assumes a "pyramid" shape, characterized by a discernible surplus of low-level labor, an increasing presence of middle-level labor, and a substantial shortage of high-level talent. Secondly, Second, intersectoral studies highlight talent overconcentration in public sectors and finance, linked to administrative monopolies and distorted incentives (Li et al., 2022; Li and Yin, 2017; Marin and Vona, 2023; Shi, 2018). Notably, the proportion of elite graduates entering finance has surged since the 1970s (Goldin and Katz, 2008).

Within existing literature, scholarship predominantly concentrates on industry/sector-specific talent allocation while largely overlooking the spatial distribution of talent. This oversight is critical, as the successful implementation of innovation strategies fundamentally depends on optimal spatial talent allocation. Current policies targeting talent attraction during innovation-driven development attempt to resolve regional mismatches and improve allocative efficiency. This raises two pivotal questions: Can innovation-driven approaches effectively correct regional talent allocation imbalances? As urban development priorities evolve from short-term economic targets to long-term innovation goals, might China's persistent regional talent disparities be resolved? To address these gaps, this study constructs an integrated analytical framework incorporating growth target constraints, innovation initiatives, and talent allocation dynamics across 258 Chinese cities (2004–2019). Our investigation is to investigate how short-term economic growth target constraints and long-term innovation-driven models shape regional talent allocation patterns, providing novel insights for optimizing the spatial distribution of human capital and advancing high-quality innovation-oriented development across regions. The contributions of this paper are twofold. First, diverging from prior scholarship predominantly focused on industry/sector-specific talent allocation, we pioneer spatial-temporal analysis of talent distribution patterns across regions, establishing a novel spatial lens for talent allocation research. Second, through longitudinal examination Second, adopting a longitudinal perspective, this study examines how sustained innovation-driven strategies mitigate regional talent allocation imbalances induced by short-term growth target constraints, providing actionable pathways to optimize spatial distribution of human capital and advance innovation-oriented regional development.

Theoretical basis and hypothesis

Economic growth target and regional talent allocation. The establishment of economic growth targets serves as a pivotal mechanism through which local governments intervene in market dynamics, yet this practice often inadvertently undermines regional talent allocation. As Zhang et al. (2022) demonstrate, local governments frequently exceed growth benchmarks set by higher-level authorities to gain competitive advantages in political tournaments, prioritizing short-term economic achievements over sustainable development. This target-driven governance, rooted in performance-oriented incentives (Christopher and Hood, 2006), creates a systemic mismatch between policy ambitions and regional realities. Officials, compelled to deliver rapid economic results, disproportionately allocate resources to capital-intensive sectors such as infrastructure and real estate—areas that generate immediate GDP growth but neglect long-term investments in human capital. Zhang et al. (2022) further note that such practices often coincide with protectionist policies that restrict cross-regional resource flows, exacerbating talent outflow by stifling innovation ecosystems and labor market mobility. Concurrently, as Perri and Andersson (2014) highlight in their

analysis of regional protectionism, these measures artificially distort market signals, shielding low-productivity industries from competition while discouraging high-skilled talent from settling in regions with limited career prospects. The cumulative effect of these distortions erodes the institutional foundations necessary for talent retention—education budgets stagnate, R&D initiatives lose funding priority, and innovation-driven enterprises face regulatory barriers. Over time, the rigid pursuit of growth targets transforms into a self-defeating cycle: regions achieve short-term economic gains at the expense of depleting their human capital reserves, ultimately diminishing their competitiveness in inter-regional talent competition. This institutional paradox, wherein growth targets designed to enhance regional performance instead degrade its talent allocation capacity, underscores our hypothesis that excessive target-setting structurally impedes the development of endogenous growth drivers.

Hypothesis 1. The economic growth target constraints can inhibit the improvement of regional talent allocation.

With an increasing emphasis on innovation-driven development at the central government level, the performance appraisal of local officials will increasingly incorporate incentives related to innovation development. Consequently, their short-term economic behaviors will be constrained by the influence of innovation development targets and the policy effects of local governments aligning with innovation-driven strategies. The constraints serve to mitigate the negative impact of economic growth target pressures on regional talent allocation. The clamping effect manifests at three levels: First, driven by the incentives of innovation-driven development goals, local governments will no longer singularly pursue short-term benefits when attracting investment in enterprises. Instead, they will gradually consider the scientific and technological capabilities and innovation potential of resident enterprises. Consequently, they will establish entry barriers and implement screening processes for enterprises, simultaneously instituting preferential land policies to foster service and high-tech industries. For instance, commercial land prices may be reduced, and concessions for industrial land scaled back. These measures will result in the reduction of capital-intensive industrial enterprises and the expansion of technology-intensive industrial enterprises. This shift will enlarge the market demand for regional innovation factors and product supply, directly weakening the adverse impact of economic growth targets on regional talent allocation.

Second, in light of the dual assessment of incentives for innovation-driven development and economic growth targets, local governments will adjust their investment strategies. For instance, they will actively monitor and increase investments in key industries and enterprises with a focus on innovation. Additionally, they will facilitate innovative enterprises in accessing low-interest loans from commercial banks and assist them in seizing opportunities for IPO listing financing in the capital market. These measures will significantly alleviate the financing constraints faced by enterprises, reduce the risk of innovation failure resulting from interruptions in innovation investment, and provide a solid capital foundation for enterprises to enhance their research and development (R&D) investment efforts. Moreover, local governments will implement a range of policies oriented towards innovation-driven development to attract a larger number of high-quality talents. This concerted effort aims to align with the effective implementation of local innovation-driven strategies and mitigate the adverse impact of economic growth target constraints on regional talent allocation.

Third, local governments must align their policy regulations with the implementation of innovation-driven strategies within their respective regions. This alignment serves to enhance the effectiveness of innovation policies. Facilitating the mobility of

innovative talents across regions is crucial for advancing the implementation of innovation-driven strategies. Consequently, local governments will gradually transition from enacting protectionist policies to implementing talent attraction and innovation cooperation policies, aiming to better align with local innovation-driven strategies. These measures not only help overcome administrative barriers and market segmentation resulting from growth target constraints but also create favorable conditions for talent mobility, thereby mitigating the negative impact of economic growth target constraints on regional talent allocation. Particularly, remote and underdeveloped regions will further strengthen their talent attraction and innovation cooperation policies to effectively implement innovation-driven strategies. This, in turn, facilitates the redistribution of talent and enhances the incentives for establishing educational institutions in remote and underdeveloped areas. Consequently, this addresses the issue of inadequate talent supply in such regions, thus fostering improvements in the regional allocation of talents. Based on these observations, we propose the following hypothesis.

Hypothesis 2. The innovation-driven can restrain the negative impact of the growth target constraints on the regional talents allocation, and the two together can effectively promote the level of regional allocation of talents and improve the imbalance of regional talents allocation in China.

The mechanism of economic growth target constraints on regional talent allocation. The advancement of marketization serves as a critical catalyst for dismantling institutional barriers and fostering cross-regional talent mobility, which directly addresses structural inefficiencies in skill-job matching by allowing labor resources to flow toward areas of highest productivity (Shi and Wang, 2020). However, the rigid enforcement of economic growth targets introduces countervailing forces that distort these market mechanisms. When growth targets are prioritized, local governments—particularly those operating in regions with overlapping resource endowments and comparable economic profiles—engage in zero-sum competition to meet or exceed these benchmarks. This competitive pressure incentivizes jurisdictions to adopt protectionist policies, such as imposing informal barriers on talent outflow or subsidizing domestic industries at the expense of external competitors, thereby fragmenting what should be an integrated national market into isolated regional enclaves (Su et al., 2021).

The intensity of growth target constraints amplifies market segmentation through two reinforcing channels. First, in regions with homogeneous economic structures, officials face heightened incentives to “hoard” local resources—including skilled labor—to avoid comparative disadvantage in performance evaluations. This manifests in bureaucratic practices that prioritize short-term retention over long-term allocative efficiency, such as restricting talent mobility through residency permits or preferential hiring quotas for local graduates. Second, the myopic focus on quantifiable growth metrics crowds out investments in institutional frameworks necessary for sustainable talent circulation, such as credential recognition systems or cross-regional innovation partnerships. Consequently, talent allocation efficiency degrades as workers face artificial constraints in accessing high-productivity roles, while employers in skill-scarce regions struggle to fill vacancies despite latent demand. The resulting mismatch not only depresses individual productivity but also entrenches regional disparities, creating a self-reinforcing cycle where protectionism begets further market fragmentation.

Market segmentation poses significant challenges to labor markets and hampers the advancement of marketization, particularly in economically disadvantaged regions, thereby

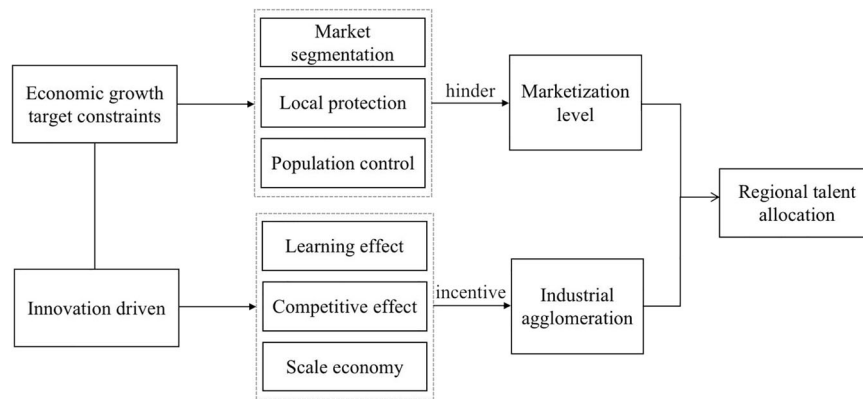


Fig. 1 Theoretical framework.

impeding talent mobility (Victorisz and Harrison, 1973). Furthermore, from an urban perspective, the imposition of economic growth target constraints compels local governments to implement population control measures and erect barriers to inter-district migration in order to address social issues stemming from excessive population influx. Consequently, this exacerbates regional disparities and reinforces regional segmentation. Moreover, the excessive setting of economic growth targets may lead local governments to adopt aggressive tax incentives, heavily rely on off-budget revenues, and pursue an extensive development model, all of which diminish a city's appeal to talented individuals. Consequently, an overly stringent economic growth target constraints fosters local protectionism, market segmentation, and population control, hindering the progression of marketization. This not only discourages talent mobility and impedes the exchange of diverse knowledge but also undermines efforts to attract and retain talent, thus impeding the advancement of regional talent allocation (Zhou et al., 2018). Hence, we posit the following hypothesis.

Hypothesis 3. The economic growth target constraints inhibit the level of regional talent allocation by hindering the level of marketization.

The mechanism of innovation-driven on regional talent allocation. As China's economy transitions to a stage of high-quality development, there is an urgent need for the economic growth engine to shift from a factor-driven approach to an innovation-driven one. The implementation of an innovation-driven strategy has not only facilitated the growth of China's new industries but has also expedited the transfer of industries from the eastern to the western regions through the adjustment of regional industrial structures. This industrial transfer, as a means of facilitating the flow of factors, has resulted in the movement of talent resources between regions, consequently promoting the redistribution of talent (Fu et al., 2021; Zhu and Zhang, 2021). The rational allocation of talent is instrumental in advancing the transformation of scientific and technological advancements and serves as a crucial intellectual foundation for industrial clusters through the establishment of efficient mechanisms for talent cooperation and exchange. An innovation-driven growth model enables the optimization of production costs, efficient utilization of innovation resources, and the concentration of factor resources such as technology and human capital through the clustering of enterprises in industrial parks. This fosters greater exchange and sharing of innovation services within the agglomeration, while also promoting knowledge spillover effects among enterprises and enhancing independent innovation capacity within the cluster. Furthermore, the organized relocation of enterprises to industrial parks facilitates the spatial optimization of industries in both

inflow and outflow areas, facilitating specialized division of labor. This dynamic adjustment and integration of talent and industrial structure ultimately stimulate the utilization of talent skills (Acemoglu, 1995).

Moreover, industrial agglomeration generates a competitive environment within the same industry, prompting enterprises to increase their investment in innovation and thereby attracting and accumulating a significant number of high-level talents. Additionally, the expansion of industrial agglomeration not only creates a demand for investment and technological innovation talents (Cheng, 2016) but also generates employment opportunities with better development prospects, further enticing talent. Hence, industrial agglomeration fosters talent concentration, facilitating effective communication channels, promoting vertical and horizontal linkages within the industrial chain, optimizing the structure of industrial clusters, and ultimately expanding the scale of agglomeration. Consequently, we propose the following hypothesis.

Hypothesis 4. The innovation-driven can promote industrial clustering and thus improve the regional allocation of talents.

Summarize the above, Fig. 1. is the theoretical framework of this paper.

Methodology and data

Model specification. Studying the effects of economic growth target constraints or innovation-driven on regional allocation of talent separately may overestimate or underestimate the effects of both on regional allocation of talent. Therefore, economic growth target constraints and innovation-driven are studied in a unified framework with regional allocation of talent. The following benchmark economic model was constructed.

$$RTA_{i,t} = \alpha_0 + \alpha_1 EGC_{i,t} + \alpha_2 ID_{i,t} + \alpha_3 EGC_{i,t} \times IG_{i,t} + \beta X_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where, $RTA_{i,t}$ refers to the level of regional talent allocation of city i in t year. $EGC_{i,t}$ is the economic growth target constraints. $IG_{i,t}$ denotes the innovation-driven. $X_{i,t}$ contains a set of control variables. $\varepsilon_{i,t}$ is the error term.

Variable declaration

Dependent variable: *Regional allocation of talents (RTA).* We measure RTA in three main steps: first, the proportion of regional employment structure of research talents is selected. We use the proportion of research employees ($TL_{i,t}$) in each region to the national research employees in that year to measure. Second, we use the ratio of regional research employees ($TL_{i,t}$) to local employees ($L_{i,t}$) as the talent allocation fitting indicator. Then,

Table 1 Marketization index system of principal component method.

Variables	Definition
Relationship between government and market	Proportion of regional fiscal expenditure in local GDP
Development of non-state-owned economy	Proportion of the total number of private and individual employees in the number of local employees
Product market development	Measured by the number of local enterprises
Growth degree of factor market	Share of foreign direct investment in GDP
Market service environment	Proportion of business service employees in the number of employees

following the practice of the Frontiers of China's Economic Growth Group (2014), the talent allocation adjustment factor is measured by dividing the talent allocation fitting indicator by the ratio of the value added of the region's output to the national GDP. Finally, the product of the talent regional employment structure ratio and the adjustment factor is used to express the talent allocation variable, which is calculated as follows. The steps are as follows.

$$RTA_{i,t} = \frac{TL_{i,t}}{\sum_{i=1}^{258} TL_{i,t}} \times \left(\frac{TL_{i,t}}{L_{i,t}} \div \frac{GDP_{i,t}}{\sum_{i=1}^{258} GDP_{i,t}} \right) \quad (2)$$

Independent variable: Economic growth target (EGC) and Innovation-driven (IG). Based on the study by Shen et al. (2021), the variable of economic growth target (EGC) in this paper is measured by the expected annual growth target presented in the work reports of the governments of various prefecture-level cities. Since it is not possible to measure IG directly, but the urban innovation index can indirectly reflect the innovation level of a region. The urban innovation index is a comprehensive set of indicator systems that can intuitively reflect the degree of a city's innovation - driven development. On the one hand, innovation input indicators, such as the proportion of R & D expenditure, reflect the intensity of a city's resource investment in innovation and the degree of its emphasis. On the other hand, innovation output indicators, like the number of patents, demonstrate the amount of innovation achievements. The greater the number, the stronger the innovation vitality. In addition, innovation environment indicators, covering the number of innovation entities such as universities, research institutions, and innovative enterprises, reflect the vitality and potential of urban innovation. The more innovation entities there are, the greater the opportunities for innovation exchanges and cooperation, and the stronger the driving force for innovation - driven development. Therefore, the urban innovation index can be used to measure the degree of a city's innovation - driven development. Therefore, this paper uses the city innovation index from the 2017 China City and Industry Innovation Power Report to measure the IG, and the missing values are completed by interpolation.

Mechanism variables: marketization level and industrial agglomeration. Based on the above theoretical analysis, we argue that EGC will further restrain RTA by inhabiting marketization level (MK). We use a principal component approach to measure marketability. The indicators are shown in Table 1. On the one hand, industrial agglomeration (IA) can produce scale effects and externalities, reduce production costs and transaction costs of enterprises, and improve the efficiency of economic growth. On the other hand, it can form a "labor pool", provide talent support for technological innovation, form endogenous growth momentum, and thus promote the regional allocation of talents. The location entropy index can reflect the geographical spatial distribution of industries more accurately, so this paper uses the

location entropy index of secondary industry output value to measure the level of industrial agglomeration in each region.

Control variables. Salary incentive (SI), industry structure upgrade (ISU), foreign investment reliance (FIR), education support (ES), talent mobility (TM). Talent mobility is calculated as follows.

$$TM_{i,t} = \frac{TL_{i,t} - TL_{i,t-1} - TL_{i,t} \times \left(n_{i,t} \times \frac{TL_{i,t}}{N_{i,t}} \right)}{TL_{i,t}} \times 100\% \quad (3)$$

Where, $n_{i,t}$ is the natural population growth rate in period t in region i . $N_{i,t}$ is the total population in period t in region i . The rest of the variables are defined as in equation 2.

Data sources. This study focuses on 258 cities in China. Although the latest data for the cities has been updated until 2021, the economic fluctuations caused by the impact of the pandemic during 2020-2022 have been abnormal. If we were to use data from 2004-2021 for the research, the distortion caused by the pandemic impact would affect the results of this study. In fact, we are preparing to conduct research on the impact of the pandemic on the regional talent allocation effect. At that time, we will compare the research conclusions with those of this study. Therefore, the observation period for this study is from 2004 to 2019, and the data sources include "China Statistical Yearbook," "China Population and Employment Statistics Yearbook," "China Urban Statistics Yearbook," "China Provincial and City Economic Development Yearbook," and various provincial and municipal statistical yearbooks. For the few missing data points, interpolation is used for supplementation. To eliminate the impact of economic price changes on statistical data, some indicators are calculated with the base year of 2000, using the GDP deflator for conversion. In addition, a variance inflation factor (VIF) test was conducted for multicollinearity, and it was found that all VIF values were less than 10. Therefore, there is no serious multicollinearity issue among the variables. Specific variable descriptive statistics are provided in Table 2.

Results and discussion

Baseline regression. It can be seen from the previous theoretical analysis that both the economic growth target constraints and the innovation-driven can have an impact on the regional allocation of talents. Then, after the transformation of economic growth mode from factor-driven to innovation-driven in the stage of high-quality economic development, whether the long-standing imbalance of talent regional allocation in China can be improved. In order to accurately identify the effect size of growth target constraints and innovation-driven on talent regional allocation, the Hausman test is conducted on the model Eq. (1) of this paper. The fixed-effects model is applied by the Hausman test, so the fixed-effects model is used to regress Eq. (1). The stability of the regression results of the independent variables is ensured by stepwise regression. The estimation results are shown in Table 3.

Table 2 Descriptive statistics.

Variable	Unit	Mean	Std.Dev.	Min	Max
Regional allocation of talents (RTA)	%	0.020	0.040	0.000	0.443
Economic growth target (EGC)	%	0.111	0.030	0.045	0.330
Innovation-driven (IG)	%	14.478	74.478	0.005	2073.283
Salary incentive (SI)	Yuan	40700.72	22398.29	6207.11	321000
Industry structure upgrade (ISU)	%	2.259	0.146	1.831	2.832
Foreign investment reliance (FIR)	%	0.022	0.027	0.000	0.775
Talent mobility (TM)	%	0.106	2.297	-0.993	108.21
Education support (ES)	%	0.182	0.045	0.000	0.494
Marketization (MK)	%	0.069	0.050	0.004	0.451
Industrial agglomeration (IA)	%	0.899	0.361	0.002	1.844
Instrumental Variable (IG)	Time(s)	1.720	2.196	0.000	13.000

The number of observed values is 4128.

Table 3 Benchmark regression results.

Variables	(1) RTA	(2) RTA	(3) RTA	(4) RTA	(5) RTA	(6) RTA	(7) RTA	(8) RTA
EGC	-2.784*** (0.509)	-3.002*** (0.506)	-3.131*** (0.506)	-2.773*** (0.509)	-2.588*** (0.511)	-2.702*** (0.516)	-2.684*** (0.516)	-2.642*** (0.517)
IG		0.146*** (0.021)	0.135*** (0.021)	0.122*** (0.021)	0.111*** (0.021)	0.112*** (0.021)	0.111*** (0.021)	0.108*** (0.021)
EGC × IG			0.011*** (0.002)	0.009*** (0.002)	0.010*** (0.002)	0.010*** (0.002)	0.010*** (0.002)	0.010*** (0.002)
SI				-0.452*** (0.084)	-0.471*** (0.084)	-0.481*** (0.085)	-0.486*** (0.085)	-0.484*** (0.085)
ISU					1.669*** (0.461)	1.651*** (0.461)	1.666*** (0.460)	1.647*** (0.461)
FIR						0.015 (0.010)	0.015 (0.010)	0.016 (0.010)
TM							0.010*** (0.004)	0.010*** (0.004)
ES								0.044 (0.032)
Constant	-0.891*** (0.146)	-1.455*** (0.166)	-1.844*** (0.188)	2.866*** (0.900)	1.451 (0.980)	1.624* (0.987)	1.660* (0.986)	1.761* (0.989)
Observations	4128	4128	4128	4128	4128	4128	4128	4128

*** and ** denote significance at the 1% and 5% levels, respectively. Cluster robust standard errors are in parentheses.

Column (1) of Table 3 shows the regression results of economic growth target constraints on regional talent allocation. The results show that the regression coefficient of the economic growth target constraints on talent regional allocation is -2.784 and passes the significance test at the 1% level. After adding other variables one by one in columns (2) to (8), the coefficients of EGC remain negative at the 1% level, indicating that the growth target constraints significantly inhibit the level of regional allocation of talent, and this finding is robust. Thus research Hypothesis 1 is verified. The reason lies in that higher economic growth targets usually focus on large-scale economic expansion in the short term, and a large amount of resources will be invested in fields that can yield quick results in the short term, such as large-scale infrastructure construction. These fields tend to be labor-intensive in talent absorption and it is difficult to fully exert the value of high-end and innovative talents. At the same time, in order to achieve high-growth targets, the policy orientation may be more inclined towards traditional industries, thereby squeezing the development space of emerging industries and making it impossible for talents to achieve rational allocation in fields with greater development potential and innovation demands. In addition, high-growth targets will prompt enterprises to over-focus on short-term interests, attach too much importance to

scale expansion while neglecting talent cultivation, and ignore the optimization of the long-term talent structure. This leads to an imbalance between talent allocation and industrial demands and ultimately results in a low level of talent allocation.

Column (2) of Table 3 is the regression result after the innovation-driven variables are included on the basis of growth goal constraints. The regression coefficient of IG is significantly positive, indicating that innovation-driven can significantly promote the regional allocation of talents. This is principally because innovation-driven is actually talent-driven, and various policies have been introduced in various places under the incentive of innovation-driven, which not only improve the enthusiasm of talent flow, but also help improve the enthusiasm of local schools to increase the supply of talents, thus enhancing the level of regional allocation of talents. Innovation-driven promotion of local development of knowledge-intensive and strategic emerging industries. The support for strategic emerging industries is conducive to providing a favorable external environment for the development of talents' innovation potential. At the same time, it also generates new jobs and provides opportunities for talents to display their talents, which enhances the attractiveness of talents and thus promotes the concentration of talents and facilitates the improvement of the regional talent

allocation level. In addition, under the incentive of innovation-driven, localities have enhanced their support for innovation, which is conducive to enhancing the enthusiasm of talents, stimulating their innovative vitality, and thus improving the efficiency of talent allocation. Therefore, the innovation-driven can effectively promote the improvement of the regional talent allocation level.

Column (3) is the regression result after adding the growth goal constraints and innovation-driven interaction item on the basis of column (2). The result shows that the regression coefficient of $EGC \times IG$ is significantly positive. This result is still valid after adding control variables one by one in columns (4) to (8), which indicates that the combined effect of growth goal constraints and innovation-driven can promote the improvement of talent regional allocation level. Thus, research Hypothesis 2 is verified. This means that with the transformation of the mode of economic growth from factor-driven to innovation-driven, the imbalance of regional talent allocation in China can be improved. This is mainly because with the transformation of the economic development mode, the setting of local economic growth goals will change from “hard constraints” to “soft constraints”, which will help reduce the pressure on the government’s growth goals. Under the guidance of innovation-driven, local governments will focus on the development of high-tech industries, improve the entry threshold for enterprises, and introduce policies conducive to innovation. Therefore, the introduction of innovation-driven will reduce the technological innovation crowding caused by the pressure of economic growth goals, provide a good innovation environment for talents, and thus promote technological innovation. In pursuit of innovation goals, local governments will also increase their support for enterprises and tax concessions. The R&D subsidy of enterprises not only plays a policy-oriented role, but also can effectively reduce the risk of innovation failure due to the interruption of innovation investment, thus creating conditions for talents to play their innovative potential. Therefore, with the transformation of the mode of economic growth from factor-driven to innovation-driven, the imbalance of regional talent allocation in China will be improved.

From the perspective of control variables, salary incentives show a significant inhibiting effect on the regional allocation of talent, while industrial structure upgrading, foreign capital dependence, talent mobility, and educational support all demonstrate a significant promoting effect on the regional allocation of talent. Regarding salary incentives, it may be because the wage elasticity of the ordinary labor force is higher than that of talent. An increase in wage levels will lead to an influx of the labor force, which has a crowding-out effect on talent. At the same time, the decline in the relative wage levels of talent and the ordinary labor force will not only reduce the enthusiasm of talent for work but also put the local area at a disadvantage in regional talent competition, and may even lead to the loss of existing talent. Therefore, the increase in regional wage levels will inhibit the improvement of local talent allocation levels. In terms of industrial structure upgrading, it will drive the development of industries towards the knowledge-intensive direction, promote the evolution of industries towards high-value-added, knowledge-intensive, and strategic emerging directions, thus giving rise to corresponding talent demand and promoting talent aggregation. This is conducive to the exertion of agglomeration effects and the absorption of knowledge spillover effects, thereby improving the regional allocation of talent. As for foreign capital dependence, in the high-quality development stage, the government will raise the threshold for the entry of foreign-funded enterprises and tend to introduce technology-intensive enterprises. These enterprises often have significant technological spillover effects, creating conditions for the

absorption and transformation of external spillover effects by talents in the region, and thus enhancing the efficiency of talent output. Therefore, the increase in foreign capital dependence can promote the improvement of regional talent allocation levels. In terms of talent mobility, it can not only enhance the connections between enterprises but also alleviate the problem of talent misallocation, facilitating the release of talent’s innovative potential. At the same time, the exertion of knowledge spillover effects during the process of talent mobility is also conducive to the development of emerging industries and the spatial agglomeration of similar industries. Both the development of emerging industries and the talent positions derived from industrial agglomeration can lead to an influx of talent, thereby improving the regional allocation of talent. Regarding educational support, under the innovation-driven model, various regions place great emphasis on talent introduction. For underdeveloped areas, it is not only difficult to attract talent, but also to face the risk of talent loss. When external talent introduction is not feasible, improving educational support for self-cultivation can solve the dilemma of difficulty in attracting talent from the supply side, thereby alleviating the insufficiency of regional talent allocation and promoting the improvement of the level of regional talent allocation.

Robustness tests

Endogenous treatment. From the previous analysis, it can be found that the economic growth target constraints play a suppressive role in the regional talent allocation, and the innovation-driven plays a facilitating role in the regional talent allocation. Talent, as the core driver of innovation, plays a crucial role in achieving regional economic growth targets. At the same time, it is also an important tool for the government to intervene in the economy and implement the innovation-driven development strategy. Therefore, there may be a causal relationship between regional talent allocation and economic growth target constraints, and innovation-driven. Considering that the lagged terms are not an effective method for measuring instrumental variables, we use the frequency of words such as “innovation - driven, technology - driven, innovation - leading” in the government work reports of various provincial governments as the instrumental variables for innovation - driven development to address the endogeneity problem, and the regression results are shown in column (1) of Table 4. It can be seen that the results are in line with the benchmark regression results.

Alternative indicators. To make the conclusions of this paper more reliable, considering the possible regression bias caused by time-lag, we re - estimate the econometric model of this paper using the lagged terms of growth target constraints and innovation drive. The regression results are shown in Column 2 of Table 4. We also change the measurement method of growth target constraints. Specifically, we use the provincial growth target values of the provinces where each city is located to measure the degree of growth target constraints of each city. The results are presented in Column (3) of Table 4. In addition, given that the values of the explained variable in this paper range from 0 to 1, considering the possible regression bias caused by the regression method, we further adopt the Tobit regression model to eliminate the regression bias caused by the regression method. The results are shown in Column (4) of Table 4. The results in Columns (2) to (4) are consistent with the benchmark regression results, indicating that our research findings are robust and reliable.

Heterogeneity analysis. Considering the obvious administrative hierarchy of cities in China, the intensity of economic growth

Table 4 Robustness tests.

Variables	(1) Endogenous treatment RTA	(2) Treatment of time-lag RTA	(3) Change the measurement method of EGC RTA	(4) Change the empirical method RTA
EGC	-2.850* (1.700)	-3.090*** (0.531)	-3.158*** (0.711)	-0.059*** (0.013)
IG	0.610*** (0.224)	0.116*** (0.023)	0.110*** (0.018)	0.001** (0.001)
EGC× IG	0.135** (0.061)	0.012*** (0.003)	0.008*** (0.003)	0.0005*** (0.000)
Control variables	Yes	Yes	Yes	Yes
Constant	-18.302*** (5.142)	1.550 (1.052)	-1.562*** (0.518)	0.001 (0.022)
Observations	4128	3870	4128	4128

***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Cluster robust standard errors are in parentheses.

Table 5 Regression results for provincial capitals and non-capital cities.

Variables	Capital cities (1) RTA	Non-capital cities (2) RTA	Capital cities (3) RTA	Non-capital cities (4) RTA
EGC	-0.808 (0.758)	-2.412*** (0.464)	-1.852* (1.091)	-3.324*** (0.797)
IG	-0.001 (0.054)	0.096*** (0.019)	-0.003 (0.053)	0.099*** (0.019)
EGC× IG	0.007*** (0.002)	0.022*** (0.004)	0.007*** (0.002)	0.025*** (0.005)
Control variables	Yes	Yes	Yes	Yes
Constant	-2.926** (1.320)	-1.873*** (0.549)	-2.643** (1.331)	-1.977*** (0.560)
Observations	480	3648	480	3648

*** and ** denote significance at the 1% and 5% levels, respectively. Cluster robust standard errors are in parentheses.

target constraints varies greatly among cities at different administrative levels due to the existence of layers of economic growth targets. So, what kind of differences exist in the impact of different growth target constraints on the regional allocation of talents? In addition, the implementation of China's innovative city pilot policy shows that there is a significant gap in the level of innovation-driven cities in China. So, is there any difference in the impact of innovation-driven on the regional allocation of talents among different types of cities? Based on this, the study sample is further divided into provincial capital city sample and non-capital city sample according to the administrative level of cities, and the study sample is divided into innovative city sample and non-innovative city sample according to the list of different batches of innovative cities, and equation (1) is re-estimated, and the regression results are shown in Table 5 and Table 6.

Column (1) of Table 5 shows the regression results for the provincial capital city sample, and column (2) shows the regression results for the non-provincial capital city sample. The regression coefficient of the *EGC* in provincial capitals is -0.808, but it does not pass the significance test. The regression coefficient of the *EGC* in non-capital cities is -2.412, and it passes the significance test at the 1% level. This indicates that the growth target constraints in non-capital cities have a more significant inhibitory effect on the regional allocation of talent compared to the capital cities. The comparison also finds that the innovation-

driven in non-capital cities has a better effect on the regional allocation of talent. The regression coefficient of the *EGC*× *IG* is significantly positive for both provincial and non-capital cities, and the coefficient is larger for non-capital cities. This indicates that the marginal effect of the growth target constraints and innovation-driven interaction term on regional allocation of talent is stronger in non-capital cities. This implies that the shift of economic growth model to innovation-driven can improve the imbalance of talent allocation in provincial and non-capital cities, it is mainly because under the innovation - driven development model, on the one hand, innovation gives rise to emerging industries, creating a large number of demands for high - end talents. This attracts talents to flow out of traditional industries, breaking the original imbalance in talent allocation caused by short-term growth targets. On the other hand, innovation promotes the flow of talents among regions, optimizing the talent distribution. Moreover, the government's supporting policies also guide talents to flow to areas with a shortage of talents. Through these combined efforts, the imbalance in regional talent allocation caused by short - term growth target constraints is offset.

Column (1) of Table 6 shows the regression results for the sample of innovative cities, and column (2) shows the regression results for the sample of non-capital cities. The regression coefficient of the *EGC* in innovative cities is -1.025, but it does not pass the significance test. The regression coefficient of *EGC* in non-innovative cities is -2.432, and it passes the significance test at the 1% level. This indicates that the growth target constraints have a more significant inhibitory effect on regional allocation of talent in non-innovative cities than in innovative cities. Similarly, the comparison finds that innovation-driven cities are more effective in promoting regional allocation of talent. The regression coefficient of the *EGC*× *IG* is significantly positive in both innovative and non-innovative cities, and the regression coefficient is more significant in innovative cities, indicating that the improvement of talent regional allocation by the interaction term between growth target constraints and innovation-driven is better in innovative cities. This implies that the higher the level of innovation-driven, the better the improvement of the effect of growth target constraints on regional allocation of talent.

Columns (3) and (4) of both Table 5 and 6 show the results of the sub-sample regressions of equation (1) re-estimated by changing the growth target constraints measure. Comparing columns (3) and (4) with columns (1) and (2) of the corresponding table, respectively, we find that the sign and significance of the regression coefficients on the regional allocation of talent do not change for either the growth target

Table 6 Regression results for innovative and non-innovative cities.

Variables	Innovative cities (1) RTA	Non-innovative cities (2) RTA	Innovative cities (3) RTA	Non-innovative cities (4) RTA
EGC	-1.025 (0.777)	-2.432*** (0.501)	-1.269 (1.128)	-3.705*** (0.877)
IG	0.185*** (0.030)	0.073*** (0.023)	0.189*** (0.030)	0.076*** (0.023)
EGC × IG	0.007*** (0.002)	0.010* (0.005)	0.007*** (0.002)	0.011* (0.006)
Control variables	Yes	Yes	Yes	Yes
Constant	-0.176 (0.951)	-2.254*** (0.615)	-0.215 (0.959)	-2.256*** (0.627)
Observations	1168	2960	1168	2960

***, **, and * denotes significance at the 1%, 5%, and 10% levels, respectively. Cluster robust standard errors are in parentheses.

Table 7 Results of the mediating mechanism test.

Variables	(1) MK	(2) RTA	(3) IA	(4) RTA
EGC	-0.159*** (0.013)	-2.595*** (0.422)		
MK		1.845*** (0.385)		
IG			0.053*** (0.005)	0.133*** (0.018)
IA				0.021** (0.008)
Control variables	Yes	Yes	Yes	Yes
Constant	0.083*** (0.002)	-3.887*** (0.322)	-0.942*** (0.042)	-2.506*** (0.485)
Observations	4128	4128	4128	4128

***, **, and * denotes significance at the 1%, 5% and 10% levels, respectively. Cluster robust standard errors are in parentheses.

constraints or the innovation-driven or the interaction term between the two, indicating that the conclusions drawn in the previous section are robust.

Test of mechanisms. From the above analysis, it can be seen that growth target constraints can have a significant impact on regional talent allocation. From the analysis of the mechanism of growth target constraints on regional talent allocation, it is concluded that growth target constraints affect regional talent allocation by affecting the level of marketization. To verify this assumption, the following mediation effect model is constructed.

$$M_{i,t} = \beta_0 + \beta_1 F_{i,t} + \beta X_{i,t} + \varepsilon_{i,t} \quad (4)$$

$$RTA_{i,t} = \alpha_0 + \alpha_1 F_{i,t} + \alpha_2 M_{i,t} + \beta X_{i,t} + \varepsilon_{i,t} \quad (5)$$

Where, $M_{i,t}$ denotes the mediating variable, including MK and IA. $F_{i,t}$ refers to the independent variable, including EGC and IG.

Table 7 reports the mediating mechanism test results. The regression results in Column (1) prove that economic growth target constraints inhibited the marketization at a significance level of 1%. Further introducing marketization into the model, the results in Column (2) show that the coefficient of MK was significantly positive, and the coefficient of EGC was also positive. Combining the regression results of Column (1) and (2), we can see that the level of marketization had a mediating effect, and thus research Hypothesis 3 was verified. The regression results in

Column (3) prove that innovation-driven promoted the industrial agglomeration at a significance level of 1%. Further introducing industrial agglomeration into the model, the results in Column (4) show that the coefficient of IA was significantly positive, and the coefficient of IG was also positive. Combining the regression results of Column (3) and (4), we can see that the level of marketization had a mediating effect, and thus research Hypothesis 4 was verified.

Further discussion

Nonlinear analysis. The research concludes that both growth target constraints and innovation drive have an impact on regional talent allocation. The heterogeneity analysis shows that innovation drive moderates the influence of growth target constraints on regional talent allocation, and as the degree of innovation drive increases, the inhibitory effect of growth target constraints on regional talent allocation will be alleviated. How will the effect of innovation drive on regional talent allocation at varying intensities of growth target constraints? Based on this, we use threshold regression to further test the impact of innovation drive on regional talent allocation under different intensities of growth target constraints through the following model.

$$RTA_{i,t} = \alpha_0 + \alpha_1 IG_{i,t} + \alpha_2 IG_{i,t} \times I(EGC_{i,t} \leq \eta) + \alpha_3 EGC_{i,t} \times I(EGC_{i,t} > \eta) + \alpha_4 EGC_{i,t} \times IG_{i,t} + \beta X_{i,t} + \varepsilon_{i,t} \quad (6)$$

Where, $I(\cdot)$ indicates indicating function. η is the threshold value to be estimated. The rest of the variables are defined as in Eq. (1).

From the test results in Table 8, it can be seen that under the influence of growth target constraints, there is a single threshold effect for the impact of innovation drive on regional talent allocation. Since the test results of the double threshold and triple threshold do not pass the significance level test, the optimal number of thresholds for the influence of growth target constraints on the impact of innovation drive on regional talent allocation is 1. The threshold value of the single threshold obtained through the test is 0.08.

The results of the threshold regression are shown in Table 9. From the estimation results, the impact of innovation-driven on regional talent allocation is influenced by economic growth target constraints. When $EGC < 0.08$, the estimated coefficient of IG is 0.159, while when $EGC > 0.08$, the estimated coefficient of it is 0.099. The above results indicate that growth target constraints will inhibit the impact of innovation-driven on regional talent allocation. Moreover, the greater the intensity of growth target constraints, the weaker the effect of innovation-driven on regional talent allocation. This is mainly because, with the

Table 8 Threshold effect test.							
Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	1124.769	0.274	39.280	0.016	25.132	29.635	43.597
Double	1122.764	0.273	7.340	0.448	17.057	21.042	31.813
Triple	1120.340	0.273	8.900	0.308	15.460	20.594	29.174

Table 9 Results of threshold regression.		
Variables	(1) coefficients	(2) t-value
EGC ($IG \leq 0.08$)	0.159*** (0.018)	8.75
EGC ($IG > 0.08$)	0.099*** (0.018)	5.40
Controle	Yes	
Constant	−2.413*** (0.477)	−5.04
Observations	4128	
F	65.13	
*** and ** denote significance at the 1% and 5% levels, respectively. Cluster robust standard errors are in parentheses.		

increasing strictness of GDP assessment at all levels, the stronger the growth target constraints are, the more likely local areas are to choose projects that can yield quick results in order to achieve the targets. They will concentrate resources on such projects, which leads to the squeezing out of resources in the fields of science, technology, and innovation. This is not conducive to creating an innovative environment, reduces the attractiveness to innovative talents, and thus weakens the promoting effect of innovation-driven on talent allocation.

Conclusions and policy implications

This paper takes growth target orientation at different stages of economic development as an entry point to explore the mechanisms of the effects of short-term economic growth target constraints and long-term innovation-driven on the regional allocation of talent in China. And with the panel data of 258 cities in China from 2004-2019, we examine the effect of growth target constraints and innovation-driven on regional allocation of talents. The results show that the growth target constraints have a significant inhibitory effect on talent regional allocation, and the innovation-driven can effectively promote the level of talent regional allocation. The mechanism analysis reveals that the growth target constraints cause local protection and market segmentation, which negatively affect the regional allocation of talents by inhibiting market enhancement and hindering the flow of talents. The innovation-driven can promote the regional allocation of talents by promoting the level of industrial agglomeration. Furthermore, the heterogeneity analysis finds that the growth target constraints in non-capital cities and non-innovative cities has a more significant inhibitory effect on talent regional allocation. The innovation-driven in non-capital cities has a stronger effect on the regional allocation of talent, and the innovation-driven in innovative cities has a better effect on the regional allocation of talent. In addition, the impact of innovation-driven on regional talent allocation is influenced by the intensity of growth target constraints, and there is a single threshold effect. Moreover, the higher the intensity of growth

target constraints, the less conducive it is to the exertion of the effect of innovation-driven on regional talent allocation.

Based on the conclusions drawn in this study, the following policy suggestions are proposed. (1) Set moderate economic growth targets, and optimize conditions for talent development. The government should change the development concept of GDP growth as the core, and set economic growth targets in accordance with its own situation and within its capabilities. In the formulation of economic growth, targets need to consider their own resource factor endowment, and actively create a soft environment for talent development. Develop local advantageous industries and provide opportunities for talents to display their talents. (2) Strengthen the innovation-driven to lead and build a platform for talent enhancement. Localities should take the innovation-driven as the guide and the direction of industrial development as the basis to tap the interest of educated people to achieve “education according to their abilities”. Education is the basis for talent generation, and relying on individual investment alone is particularly likely to lead to a lack of education supply and even an unfair distribution of education, thus requiring government intervention in education supply, including investment in education and regulation. In the investment to boost the level of talent accumulation at the same time to build a platform for the independent improvement of talent, in the incentive of talent innovation at the same time should also pay attention to its structural optimization. In particular, it is important to improve the match between talent and industrial structure, so as to enhance the competitiveness of regional talent by improving the match between talent and industrial structure, and leading to technological innovation. (3) Pay attention to the disparity of regional resource endowments and moderate horizontal market competition. Each region should carry out reasonable and orderly competition, and moderate competition can force each region to create a more favorable business environment and talent development environment to promote local development. Regions can avoid excessive accumulation of human capital in economically developed regions while crowding out the talent resources in less developed regions. (4) Strengthen the effective allocation of the talent market and break down the barriers of talent flow. We should respect the market economy and talent supporting synergistic development law under the innovation-driven development strategy, and clarify the concept of “innovation-driven is talent-driven”. By playing the role of the government and the market, break down the barriers to the flow of talent in order to smooth the flow of talent channels, and strengthen the support of the strategy of strengthening the talent.

Data availability

The data generated and analyzed during this study, namely the DNEG, are included as supplementary information file to this article.

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References

- Acemoglu D (1995) Reward structures and the allocation of talent. *Eur Econ Rev* 39(1):17–33
- Borensztein E, De Gregorio J, Lee JW (1998) How does foreign direct investment affect economic growth? *J Int Econ* 45(1):115–135
- Celik MA (2023) Does the cream always rise to the top? The misallocation of talent in innovation. *J Monetary Econ* 133:105–128
- Chen Y (2022) Misallocation of Talent and Innovation: evidence from China. *Appl Econ* 54(14):1598–1624
- Cheng Z (2016) The spatial correlation and interaction between manufacturing agglomeration and environmental pollution. *Ecol Indic* 61:1024–1032
- Christopher H, Hood C (2006) Gaming in targetworld: The targets approach to managing British public services. *Public Admin Rev* 66(4):515–521
- Colvin G (2006) What is take to be great. *Fortune* 30:88–96
- Dong F, Jia Y, Wang S (2022) Speculative Bubbles and Talent Misallocation. *J Econ Dyn Control* 141:104393
- Farndale E, Pai A, Sparrow P, Scullion H (2014) Balancing individual and organizational goals in global talent management: A mutual-benefits perspective. *J World Bus* 49(2):204–214
- Fu S, Ma Z, Ni B, Peng J, Zhang L, Fu Q (2021) Research on the spatial differences of pollution-intensive industry transfer under the environmental regulation in China. *Ecol Indic* 129:107921
- Gallardo-Gallardo E, Nijs S, Dries N, Gallo P (2015) Towards an understanding of talent management as a phenomenon-driven field using bibliometric and content analysis. *Hum Resour Manag Rev* 25(3):264–279
- Goldin C, Katz LF (2008) Transitions: Career and family life cycles of the educational elite. *Am Econ Rev* 98(2):363–69
- Gradstein M (2019) Misallocation of talent and human capital: Political economy analysis. *Eur Econ Rev* 118:148–157
- Gu H, Meng X, Shen T, Wen L (2020) China's highly educated talents in 2015: Patterns, determinants and spatial spillover effects. *Appl Spat Anal Policy* 13(3):631–648
- Guo J, Liu M (2022) Experimental state rescaling, goal-oriented governance, and urban transformation in China: The case of Lanzhou. *Geoforum* 137:72–82
- Hsieh CT, Klenow PJ (2009) Misallocation and manufacturing TFP in China and India. *Q J Econ* 124(4):1403–1448
- Lewis RE, Heckman RJ (2006) Talent management: A critical review. *Hum Resour Manag Rev* 16(2):139–154
- Li S, Yin, H (2017) Government-enterprise talent allocation and economic growth: an empirical study based on China's city data. *Econ Res J*, (4):78–91
- Li S, Zhou Z, Wu C (2022) Trade openness and human capital allocation: From a perspective of occupational choice between public sector and private sector. *China Econ Q Int* 2(4):252–264
- Li X, Liu C, Weng X, Zhou LA (2019) Target setting in tournaments: theory and evidence from China. *Econ J* 129(623):2888–2915
- Liu F, Nan T, Wang X (2022) Causes and evolution characteristics of green innovation efficiency loss: the perspective of factor mismatch under local government competition. *Sustainability* 14(14):8338
- Lucas Jr RE (1988) On the mechanics of economic development. *J Monet Econ* 22(1):3–42
- López JJ, Torres J (2020) Size-dependent policies, talent misallocation, and the return to skill. *Rev Econ Dyn* 38:59–93
- Malik A, De Silva MT, Budhwar P, Srikanth NR (2021) Elevating talents' experience through innovative artificial intelligence-mediated knowledge sharing: Evidence from an IT-multinational enterprise. *J Int Manag* 27(4):100871
- Marin G, Vona F (2023) Finance and the reallocation of scientific, engineering and mathematical talent. *Res Policy* 52(5):104757
- McMillan M, Rodrik D, Verduzco-Gallo Í (2014) Globalization, structural change, and productivity growth, with an update on Africa. *World Dev* 63:11–32
- Perri A, Andersson U (2014) Knowledge outflows from foreign subsidiaries: The tension between knowledge creation and knowledge protection: Evidence from the semiconductor industry. *Int Bus Rev* 23(1):63–75
- Qian H (2010) Talent, creativity and regional economic performance: the case of China. *Ann Reg Sci* 45(1):133–156
- Shakhnov K (2022) The allocation of talent: Finance versus entrepreneurship. *Rev Econ Dyn* 46:161–195
- Shen F, Liu B, Luo F, Wu C, Chen H, Wei W (2021) The effect of economic growth target constraints on green technology innovation. *J Environ Manage* 292:112765
- Shi L, Wang J (2020) Research on the Dynamic Effect of Factor Marketization Reform Based on Structural Evolution and Economic Growth. *Int J Non-linear Sci* 30(2/3):110–115
- Shi M Y (2018) Sectoral Booms and Misallocation of Managerial Talent: Evidence from the Chinese Real Estate Boom. *International Monetary Fund*
- Su X, Yang X, Zhang J, Yan J, Zhao J, Shen J, Ran Q (2021) Analysis of the impacts of economic growth targets and marketization on energy efficiency: evidence from China. *Sustainability* 13(8):4393
- Vietorisz T, Harrison B (1973) Labor market segmentation: positive feedback and divergent development. *Am Econ Rev* 63(2):366–376
- Vollrath D (2014) The efficiency of human capital allocations in developing countries. *J Dev Econ* 108:106–118
- Wu N, Liu Z (2021) Higher education development, technological innovation and industrial structure upgrade. *Technol Forecast Soc Change* 162:120400
- Wu Y, Zhu X, Groenewold N (2019) The determinants and effectiveness of industrial policy in China: A study based on Five-Year Plans. *China Econ Rev* 53:225–242
- Zhang Y, Mao W, Zhang B (2022) Distortion of government behaviour under target constraints: Economic growth target and urban sprawl in China. *Cities* 131:104009
- Zhou Y, Guo Y, Liu Y (2018) High-level talent flow and its influence on regional unbalanced development in China. *Appl Geogr* 91:89–98
- Zhu B, Zhang T (2021) The impact of cross-region industrial structure optimization on economy, carbon emissions and energy consumption: A case of the Yangtze River Delta. *Sci Total Environ* 778:146089

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Author contributions

Shenshen Si: Conceptualization, Data curation, Methodology, Formal analysis, Writing-original draft. Yan Jiang: Conceptualization, Data curation, Formal analysis, Writing-review & editing. Jing Li: Formal analysis, Supervision, Writing-review & editing.

Competing interests

The authors declare no competing interests.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors. The data used in this paper is based on secondary data, which is available in the public domain for research purposes.

Informed consent

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