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The *Hukou* System and Wage Gap between Urban and Rural Migrant Workers in China: A Meta-Analysis

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Abstract: This study performed a meta-analysis of 506 estimates extracted from 75 studies to estimate the effect size of rural household registration (*hukou*) on wage levels. Our meta-synthesis results indicated that the negative effect of rural *hukou* on wages is statistically significant; however, the effect size remains small in terms of the partial correlation coefficient. The results of the meta-regression analysis and test for publication selection bias indicated that the differences in the wage effect of *hukou* among genders, corporate ownership sectors, and periods are insignificant. We also found that publication selection bias is unlikely, and genuine evidence exists in the literature.

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Keywords: household registration (*hukou*) system, wage gap, rural migrant worker, synthesis, meta-regression analysis, publication selection bias, China

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1 Introduction

The household registration (*hukou*) system is a unique institution in contemporary China that has been in place since 1958. The imbalance in social resource allocation between urban and rural residents based on the *hukou* system has segmented China into a dual society structure (Cai, 2016). During the institutional transition period (after 1978), the Chinese government carried out market-oriented reforms and gradually deregulated the *hukou* system. However, discrimination against rural migrant workers (those who have rural *hukou* but work in urban areas) based on the *hukou* system still remains and has led to a wage gap between local urban workers (the group with local urban resident *hukou*) and rural migrant workers in China (Meng & Zhang, 2001; Zhang et al., 2016; Ma, 2018; Ma & Minami, 2022).

Some empirical studies have focused on the wage gap because it has academic and practical significance. First, it relates to income inequality. With market-oriented reform, income inequality has become severe since the 1990s (Sicular et al., 2020). As the wage gap between urban and rural migrant workers is a part of income inequality, it has attracted the attention of researchers (Meng & Zhang, 2001; Zhang et al., 2016; Ma, 2018; Zhang & Wu, 2019: Ma & Minami, 2022). Second, the issue is related to discrimination against rural migrant workers, which may lead to dissatisfaction with society among disadvantaged groups and threaten political governance. Although some empirical studies have investigated this issue, they suggest that the following is not clear: (i) how much the wage effect of *hukou* is in the long term during the market-oriented reform period, (ii) whether the wage effects of *hukou* differ among different groups (for example, men vs. women, public vs. private sector) and periods, (iii) whether there exists a publication selection bias, and (iv) whether these estimations are genuine evidence in the literature. This study fills the gaps in the literature.

This study estimated the size of the effect of rural *hukou* on wage levels in China using a meta-analysis approach. We conducted a meta-analysis of 506 estimates sourced from 75 studies published in English and Chinese. Our meta-synthesis results indicated that the negative wage effect of rural *hukou* is statistically significant, but it remains small in terms of the partial correlation coefficient (PCC), suggesting that there exists a small but significant wage gap between urban and rural migrant workers over a long period (from the 1980s to the 2010s). The results of a meta-regression analysis and test for publication selection bias indicated that the differences in the negative effect of rural *hukou* on wages among groups are insignificant, publication selection bias is not likely, and there is genuine evidence in the literature.

This study significantly contributes to the existing literature in three ways. First, it is the first to investigate the wage gap between urban and rural migrant workers in China based on a meta-analysis approach. An approach based on existing literature can provide new empirical evidence on this issue. Second, this study examines the differences in the wage effects of rural *hukou* among different groups that have not been considered in previous studies. Finally, this study, for the first time, provides evidence on whether there exists a publication selection bias or genuine evidence in the literature that may academically evaluate the quality of empirical studies in the field.

The remainder of the paper is organized as follows. Section 2 introduces the institutional background of the *hukou* system and develops testable hypotheses on the effect of rural *hukou* on wages for the meta-analysis. Section 3 explains the procedures used for searching and selecting the literature considered for the meta-analysis and overviews the selected studies. Section 4 performs a meta-analysis of the collected estimates and reports the results of hypothesis testing. Section 5 summarizes the major findings and concludes the paper.

2 Institutional Background and Hypothesis Development

2.1 Institutional Background: Hukou System in China

In China, the *hukou* system has played a vital role in economic society since the 1950s. Referring to previous studies (Chan & Zhang, 1999; Zhao & Zhang, 2021; Tang & Wu, 2022), we summarize the features of the *hukou* system in four periods as follows.

First, during the establishment period of the *hukou* system (1949–1958), the Chinese government carried out a strategy of giving priority to the development of heavy industry. It was necessary to transfer resources from the agricultural sector to the manufacturing sector. As most manufacturing corporations were in urban areas, the government implemented a set of labor and social security policies to ensure local urban workers' living. High-wage jobs in urban areas may attract the migration of surplus labor in rural areas (Minami & Ma, 2010; Ma & Minami, 2022). In order to prevent rural–urban migration, the Chinese government promulgated the *Regulations of the People's Republic of China on Household Registration* in 1958 to establish the *hukou* system nationwide. According to this system, the residents of China are divided into two groups: urban and rural residents based on the birthplace and *hukou* of their parents. Moreover, rural–urban migration was prohibited without the permission of the government.

Second, from 1958 to 1977, the *hukou* system was more strictly implemented, and rural–urban migration was largely prohibited. A rural *hukou* resident was allowed to move to an urban area only in three situations: (i) to work in an urban area by obtaining a recruitment certificate issued by the government, (ii) a rural *hukou* student who is admitted by a university and obtains an admission certificate issued by the government, and (iii) a rural resident who holds a certificate of migration permission issued by the government.

Third, during the 1980s–1990s, along with the implementation of the Household Responsibility System in rural areas, the agricultural industry developed significantly, and there existed a large amount of surplus labor in rural areas (Minami & Ma, 2010). Meanwhile, market-oriented reform promoted the rapid development of the private sector (for example, privately owned enterprises and foreign invested enterprises), which created a large labor demand for low-skilled workers. Rural–urban migration became necessary owing to push and pull forces. Therefore, the government embarked upon *hukou* system reform. On November 3, 1984, the government promulgated the *Notice of the State Council on the Issues of Farmers Entering and Registering in Towns*, stipulating that under the condition of self-care for rations, rural *hukou* residents and their relatives who work in towns (a type of small urban city that has the lowest level of urban administration management) as businessmen or long-term workers in township enterprises are allowed to register themselves as a part of the population in towns. The Ministry of Public Security promulgated the *Management Regulations of Urban Temporary Resident Population* in July 1985, and the *Pilot Program for the Reform of Household Registration Management System in Small Towns* in May 1997. However, although rural *hukou* residents were permitted to work in urban areas, the majority of them could not change their rural *hukou* to urban *hukou* (*nongzhuanfei*).[1]

Finally, since the 2000s, the Chinese government has started *hukou* system reform in middle- and large-sized cities and has been compelled to replace the *hukou* system with a residence permit system. Many middle- and large-sized cities have explored and innovated the reform of the *hukou* system (Tang & Wu, 2022). However, its influence of this system on Chinese society remains significant, even during recent years.

2.2 Hypothesis Development

[1] The percentage of population changing *hukou* from rural to urban was 0.15–0.20 percent in the 1980s (Chan & Zhang, 1999).

Based on economic theory, institutional transition background, empirical results in the literature, and the ground reality in China, we test two hypotheses in our meta-analysis.

Regarding the wage effect of *hukou*, according to discrimination theory (Becker, 1957), there remains discrimination against some disadvantaged groups (for example, migrants) in the labor market due to the preference of employers, customers, or colleagues in the workplace. When there is discrimination against rural migrant workers, there may remain a negative wage effect of rural *hukou*. As mentioned in Subsection 2.1, the implementation of the *hukou* system since 1958 has segmented China into a dual-structure society. Although the Chinese government has implemented *hukou* system reform since the 1980s, because the institutional transition follows the tenet of gradualism, we predict that there remains significant discrimination against rural migrant workers during the economic transition period, which leads to a negative effect of rural *hukou* on wages. Empirical studies have found that wage levels were lower for rural migrant workers than for their counterparts after controlling for covariates, including human capital factors (for example, Meng & Zhang, 2001; Ma, 2018; Ma & Minami, 2022). Therefore, we propose the following:

Hypothesis H_1: *Rural hukou negatively affects wage levels in China.*

We consider the wage effect of *hukou* among different groups. First, in terms of the wage effect of *hukou* by gender, on the one hand, most corporations that employ rural migrant workers are labor-intensive, privately owned corporations in the manufacturing or service sectors, and they require more young women. However, due to discrimination against rural migrants in childcare, child education, and medical care in urban areas (Lai et al., 2014; Wang, 2019; Ma, 2021), rural women of childbearing age have to return to rural areas (their hometowns), which may cause an insufficient labor supply of young rural women and reduce the wage gap among female workers. Therefore, the negative effect of rural *hukou* on wages may be smaller for women than for men. On the other hand, because the influence of the societal belief of male superiority based on Confucianism remains in China (especially in rural areas), rural households invest less in girls than boys (Wang & Cheng, 2021; Hu, 2022). When the education gap between local urban and rural migrant workers is greater for women than for men, the negative wage effect of rural *hukou* may be greater for women than for men. As the two effects may cancel each other out, there may be no significant difference in the wage effect of *hukou* by gender.

Second, we consider the difference in the wage effect of *hukou* by corporate ownership sector. On the one hand, because the influences of the ideology of socialist egalitarianism and employment equality policies on wage setting are smaller for the private sector than for the public sector, the probability of administration against the disadvantaged group in the private sector may be greater than that in the public sector (Ma & Li, 2022). Thus, the negative rural effect of rural *hukou* may be larger for the private sector than for the counterpart. On the other hand, because private corporations face fierce market competition, they are likely to set their employees' wages according to market mechanisms, which may reduce discrimination in the labor market (Becker, 1957). As these two opposing effects may cancel each other out, the difference in the wage effect of *hukou* between the private and public sectors may be insignificant.

Third, in terms of the wage effect of *hukou* by period, although a few studies have reported that the wage level of rural migrant workers became higher than that of local urban workers in the recent period (after 2013) (Zhang & Wu, 2019; Xing et al., 2021), as mentioned in Subsection 2.1, because the *hukou* system reform has been carried out based on a gradualism strategy, the system has not been reformed radically even in the recent period; therefore, discrimination against rural migrant workers based on the *hukou* system has not changed greatly under the institutional transition period. Numerous empirical studies highlight that a wage gap between urban and rural migrant workers is maintained across periods (Meng & Zhang, 2001; Zhang et al., 2016; Ma, 2018; Zhang & Wu, 2019; Ma & Minami, 2022). Thus, the disparity in the wage effect of *hukou* between different periods may be insignificant.

In summary, we predict that it is not possible to reject the following null hypothesis on the wage effect of *hukou* among the different groups:

Hypothesis H_2: *The wage effect of hukou does not vary between genders, corporate ownership sectors, and periods*.

We tested these two hypotheses by performing a meta-analysis in the following sections.

3 Literature Selection Procedure and Overview of Selected Studies

In this section, we first describe the procedure for searching the literature and then outline the selected studies subject to meta-analysis.[2]

Empirical studies on wages in China are numerous in both English and Chinese literature, and a large number of previous works report the wage effect of the *hukou* by using a *hukou* dummy variable in the Mincer-type wage function expressed by Eq. (1) as:

$$wage_i = a + \beta_1 experience_i + \beta_2 experience_i^2 + \beta_3 schooling_i + \vartheta \cdot hukou_i + \sum_{n=1}^{N} \beta_n \cdot x_n + \varepsilon_{i,} \quad (1)$$

where $wage_i$, $experience_i$, $schooling_i$, and $hukou_i$ are the wage level (log-transformed in most cases), years of work experience, years of schooling, and type of *hukou* of the *i*-th worker, respectively. $hukou_i$ often takes a value of 1 if the *i-th* worker has a rural *hukou* and a value of 0 when the worker has an urban *hukou*. x_n is the *n*-th wage determinant, ε_i is the random error term, and a is the constant term. β and ϑ represent the parameter of each variable to be estimated. The meta-analysis in this study targets the estimates of the coefficient ϑ.

As the first step, we search for studies in which the coefficient ϑ obtained as an outcome from the regression estimation of a Mincer-type wage function is available. We utilized the electronic academic literature databases of EconLit and Web of Science as well as the websites of leading academic publishers for English language literature[3] and the Chinese National Knowledge Infrastructure database, which is the largest academic literature database in China for Chinese language literature. In these databases and websites, we carried out an AND search for article titles using '*China*' and '*wage*' as keywords and then obtained more than 200 English and 3,000 Chinese papers.[4] We then inspected each of these collected works and narrowed down the literature to studies that provided relevant estimates. Consequently, we selected 21 and 54 studies in English and Chinese, respectively.[5]

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[2] The selection and coding of the studies followed the guidelines of Havránek et al. (2020).

[3] They refer to the following six publishers: Emerald Insight (https://www.emeraldinsight.com), Sage Journals (http://journals.sagepub.com), Science Direct (http://www.sciencedirect.com), Springer Link (https://link.springer.com), Taylor & Francis Online (https://www.tandfonline.com), and Wiley Online Library (https://onlinelibrary.wiley.com).

[4] The final literature search was conducted on February 1, 2023.

[5] The bibliography of these 75 selected research works is available upon request.

From the above 75 selected studies, we extracted 506 estimates.[6] The mean (median) number of collected estimates per study is 6.75 (6). We use the reversed values of the estimates of the urban *hukou* dummy variable together with the estimates of the rural *hukou* dummy variable to focus on the wage effect of rural *hukou*, indicating whether there exists a wage gap between local urban and rural–urban migrant workers.

We transformed all 506 collected estimates to PCCs to adjust the difference in the units of estimation results, with or without logarithmic transformation of the wage variable. PCC is a unitless statistic that measures the association of a dependent variable and the independent variable in question when other variables are held constant. It ranges between -1.00 and 1.00. When t_k and df_k denote the t value and degrees of freedom of the k-th estimate ($k = 1, ..., K$), respectively, the PCC (r_k) is calculated using the following equation:

$$r_k = \frac{t_k}{\sqrt{t_k^2 + df_k}}. \tag{2}$$

For the evaluation criterion of the correlation coefficient, Cohen (1988) suggested using the values of 0.10, 0.30, and 0.50 as cut-offs to distinguish between small, medium, and large effects, respectively. However, this criterion is set with a zero-order correlation, which is the correlation coefficient with no control variables. This is somewhat strict in economics research, in which a large number of control variables are usually employed in empirical studies. Therefore, Doucouliagos (2011) proposed 0.048, 0.112, and 0.234 as the lowest thresholds of small, medium, and large effects, respectively, as the new general standard in labor economics research (Doucouliagos, 2011, Table 3, p. 11). This study evaluates the wage effect of rural *hukou* in China in accordance with this standard.

Table 1 shows the descriptive statistics of the PCCs of the collected estimates as well as the results of a t-test of means and the Shapiro-Wilk normality test. **Figure 1** shows the kernel density estimation results. To test Hypothesis H_2, we computed descriptive statistics and estimated the kernel density by target gender type (male/female/gender unspecified), target corporate ownership sector type (public sector/private sector/corporate sector unspecified), and target period (1990s or before/2000s/2010s), in addition to those for all studies to examine Hypothesis H_1. As shown in **Table 1**, although the number of studies targeting a specific gender and corporate sector is limited, we can still perform a meta-analysis to test the two

[6] Estimates of interaction terms of the *hukou* dummy variable and other independent variables are not included in the meta-analysis in this study.

hypotheses.

According to the top row of **Table 1**, the mean and median of all 506 collected estimates are -0.042 and -0.035, respectively, in terms of PCC, and the *t*-test of means rejects the null hypothesis at the 1 percent level. In addition, Panel (a) of **Figure 1** displays a highly skewed distribution toward the negative side. These results imply that in China, rural *hukou* has a negative effect on wages, supporting Hypothesis H_1. The results indicate that rural migrant workers tend to receive lower wages than their counterparts (local urban workers), and that there may be discrimination against rural migrant workers in the Chinese urban labor market.

Furthermore, the descriptive statistics of the corporate sector and period in **Table 1** and the corresponding Panels (c) and (d) in **Figure 1** indicate that the wage effect of rural *hukou* is likely to differ between the public and private sectors and periods, in contrast to Hypothesis H_2. The descriptive statistics by gender in **Table 1** and Panel (b) of **Figure 1** do not demonstrate a remarkable gap between male and female workers from the viewpoint of the wage effect size of *hukou*, and hence are consistent with Hypothesis H_2.

Although the above descriptive statistics results suggest that the wage effect of *hukou* may vary by corporate ownership sectors and periods, it should be noted that they did not control for the influences of other factors (that is, control variables used in wage function, survey data, and analysis methods) on wages and did not consider the existence of publication selection bias. We should further synthesize and compare the collected estimates, taking into account their precision and heterogeneity as well as the possible influence of publication selection bias. The next section presents a meta-analysis to address these issues.

4 Meta-Analysis

A meta-analysis conventionally consists of three steps: (a) meta-synthesis of collected estimates, (b) meta-regression analysis (MRA) of heterogeneity across studies, and (c) testing for publication selection bias (Stanley & Doucouliagos, 2012; Iwasaki, 2020). We followed these standard procedures[7] and reported the results step by step.

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[7] The **Appendix** provides a methodological note regarding the meta-analysis applied in this study. The methodological description of this meta-analysis is kept to a minimum. For more details, see Borenstein et al. (2009) and Stanley and Doucouliagos (2012).

4.1 Meta-Synthesis

As the first step in the meta-analysis, **Table 2** presents the meta-synthesis results. As in **Table 1** and **Figure 1**, **Table 2** shows the synthesis results by gender, corporate ownership sector, and period, in addition to the results using all 506 collected estimates.

In Column (b) of **Table 2**, Cochran's *Q* test of homogeneity consistently rejected the null hypothesis at the 1 percent significance level, and the I^2 and H^2 statistics also suggested the presence of heterogeneity across studies in all 10 cases. Therefore, the synthesized effect sizes of the random-effects model in Column (a) are preferred to those of the fixed-effects model. With respect to the results of the unrestricted weighted least squares average (UWA) and weighted average of the adequately powered (WAAP) estimations in Column (c), in 8 of the 10 cases, a certain number of estimates whose statistical power exceeds the threshold of 0.80 were attained. Accordingly, we adopted the WAAP synthesis values, which are more reliable than those of the UWA and random-effects models. In **Table 2**, the selected synthesis values are highlighted in bold.

As shown in Column (c) of **Table 2**, the synthesized effect size for all studies is statistically significant at the 1 percent level and takes a negative value of -0.049 with the WAAP approach in terms of PCC. According to the Doucouliagos criteria (Doucouliagos, 2011), the effect size of rural *hukou* is slightly above the 'small' effect threshold, suggesting that there exists a significant negative effect of rural *hukou* on wages. These results support Hypothesis H_1.

A comparison of the synthesis values by gender reveals that the effect size of rural *hukou* on the wages of rural migrant male workers is estimated to be -0.042 with statistical significance at the 1 percent level, while that on the wages of rural migrant female workers is insignificant, suggesting that the negative effect of rural *hukou* is more pronounced for male workers than for female workers. Accordingly, Hypothesis H_2 is rejected in terms of the difference in the wage effect of *hukou* between genders.

With regard to the results by corporate ownership sector, both the synthesis values of the private and public sectors are not statistically different from zero, indicating that the difference in the wage effect of *hukou* between different corporate ownership sectors is insignificant. The results do not reject Hypothesis H_2 in terms of the wage effect of *hukou* by the corporate ownership sector.

Further, the synthesized effect sizes computed by period clearly reject Hypothesis H_2. In fact, the WAAP synthesis value for the 1990s or before accounts for -0.050 with statistical significance at the 1 percent level, while that for the 2000s is -0.041 and for the 2010s, it is -0.026. In other words, it is likely that China has experienced a decline in the *hukou* wage effect from a small scale to an economically insignificant level with advancing systemic transformation to a market-oriented economy.

In summary, the results of the meta-synthesis strongly reject Hypothesis H_2 except for the case of the corporate ownership sector.

4.2 Meta-Regression Analysis

The meta-synthesis presented in the previous subsection enables explicit hypothesis testing by providing point estimates as synthesized effect sizes. Nevertheless, it fails to sufficiently consider the influence of heterogeneity across the selected studies on their reported estimates. Therefore, this subsection examines the reliability of the synthesis results by estimating a multivariate meta-regression model in which diversity in study conditions is simultaneously controlled for.

With respect to meta-independent variables, in addition to those designed to capture differences in target gender, corporate ownership sector, and period, which are keys to testing Hypothesis H_2, we also employed a series of moderators regarding survey data used, wage type, wage payment period, type of wage variable, estimator, presence of control for selection bias, selection of control variables with potentially significant impact on estimates, and presence of an interaction term(s) with *hukou* dummy variable in the wage function. The names, definitions, and descriptive statistics of these variables are provided in **Table 3**. As expounded in the **Appendix**, the meta-independent variables were estimated along with the standard errors of the PCCs using six different estimators.[8]

Estimation results with all moderators from 'CHNS' to 'with an interaction term(s)' are reported in **Table 4**. As the results of the Hausman specification test of the models did not reject the null hypothesis (χ^2=23.18, p=0.1839), **Table 4** reports the estimates of the random-effects model as Model [5]. Here, we interpret the results based on the assumption that estimates that are not only statistically significant but also have the same sign in at least three of the five models constitute statistically robust estimates.

As demonstrated in **Table 4**, none of the key variables for Hypothesis H_2 testing,

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8 To avoid multicollinearity that may arise from the simultaneous estimation of a large number of independent variables, we inspected the correlation matrix and variance inflation factor (VIF) of all of the coded variables and, as a result, narrowed down the variables to the 26 listed in **Table 3** that fully met the criteria of a correlation coefficient of less than 0.7 and a VIF of less than 10.

from gender (for example, men) to period (for example, the 2010s) show robust estimates. The results indicate that when other study conditions are held constant, the wage effect of *hukou* does not significantly vary between genders, corporate ownership sectors, and periods, and consequently does not reject Hypothesis H_2. Based on these findings, we conjecture that the meta-synthesis results in Subsection 4.1 are strongly influenced by the study conditions across the selected works, and there may be a measurement bias when the study conditions are not considered in a meta-analysis.

The above result is reproduced in **Table 5**, which illustrates the estimation results of a meta-regression model with four moderators of CGSS, regular wage, OLS and trade union selected through a Bayesian model averaging (BMA) analysis, and a weighted-average least squares (WALS) estimation.[9] We again confirmed that both the MRA using full moderators and the MRA that takes model uncertainty into account produced estimates of the key variables that are approximately similar to those reported in **Table 2**.

4.3 Test for Publication Selection Bias

For the final step of the meta-analysis, we employed a funnel-asymmetry test (FAT), a precision-effect test (PET), and a precision-effect estimate with standard error (PEESE) for publication selection bias and the presence of genuine evidence in the literature.

Figure 2 illustrates the funnel plot of all 506 collected estimates. The results show that the estimates reported in the 75 selected studies do not form an ideal distribution from the viewpoint of statistical theory in that the shape of the plot must look like an inverted funnel in the absence of publication selection bias. If the true effect is assumed to be zero, as the dotted line in **Figure 2** depicts, the ratio of positive to negative estimates is 93:413; therefore, the null hypothesis that the number of positive estimates equals that of negative estimates is strongly rejected by a goodness-of-fit test (z = -14.226, p = 0.000). If the WAAP synthesis value reported in **Table 2** is assumed to be the approximate value of the true effect, as drawn by the solid line in **Figure 2**, the estimates have a ratio of 201:305, with a value of -0.049 being the threshold. Therefore, the null hypothesis that the ratio of estimates below the WAAP value versus those over it is 50:50 is again strongly rejected (z = 4.623, p = 0.000). In summary, both the funnel plot and goodness-of-fit test suggest that there is a high risk of publication selection bias in this research field.

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[9] See **Appendix Table A1** for the procedure of selecting moderators.

However, the FAT-PET-PEESE test procedure does not support the above findings. Specifically, as Panel (a) of **Table 6** shows, the null hypothesis that the intercept γ_0 is zero is rejected by the FAT in only two of the five models, suggesting a low likelihood of publication selection bias. Even when funnel symmetry is present, though, the selected studies may not contain genuine evidence. However, the PET rejects the null hypothesis that the coefficient of the inverse of the standard errors (γ_1) is zero in three models, meaning that the collected estimates contain evidence of a nonzero true wage effect of *hukou*. Furthermore, the PEESE approach in Panel (b) of **Table 6** shows that the coefficient (γ_1) is statistically significantly different from zero in all five models, indicating that the real scale of the true wage effect of rural *hukou* should be in the range of -0.0488 to -0.0296 in terms of PCC. In summary, the test results in **Table 6** strongly support Hypothesis H_1, consistent with the meta-synthesis results in **Table 2**.

As pointed out in the **Appendix**, the FAT-PET-PEESE method implicitly assumes a linear relationship between the standard error and publication selection bias, which may not be practical in this study. Therefore, we performed alternative estimations of publication selection bias-corrected effect size, using four models to check the robustness. **Table 7** presents the results. Although the synthesis value varies depending on the applied method, three of the four estimates demonstrate the existence of a statistically significant and economically meaningful negative wage effect of rural *hukou* in China and, accordingly, support Hypothesis H_1.

We also conducted the FAT-PET-PEESE procedure by gender, corporate ownership sector, and period. The test results are summarized in **Table 8**, along with those of all the studies mentioned above. As shown in this table, the test procedure failed to generate genuine empirical evidence for the wage effect of *hukou* except for that in the 2010s; thus, Hypothesis H_2 is not rejected.

To sum up, we judge that the test results of publication selection bias in this subsection strongly support the meta-synthesis results in Subsection 4.1, which support Hypotheses H_1 and H_2, as the MRA did in Subsection 4.2.

5 Conclusions

We conducted a meta-analysis to investigate the wage effect of *hukou* in China and compared the effects among different groups. Our meta-synthesis results indicated that the negative wage effect of rural *hukou* is statistically significant, but it is small in terms of PCC. Further, the results of PCCs also revealed that the wage effect of *hukou* may vary by gender and period. However, the results of the MRA and test for publication selection bias indicated that the negative effect of rural *hukou* on wages is not significantly different between genders, corporate ownership sectors, and periods.

Regarding the policy and practical implications based on these meta-analysis results, first, our study revealed that there remained a wage gap between urban and migrant workers during the market-oriented reform period (from the 1980s to the 2010s in this study). Empirical studies have highlighted the wage gap caused by discrimination against rural migrant workers (Meng & Zhang, 2001; Zhang et al., 2016; Ma, 2018; Zhang & Wu, 2019: Ma & Minami, 2022). The main reason for this is the incomplete reform of the *hukou* system, as mentioned in Subsection 2.1. To establish a fair society and support the sustainable development of the Chinese economy, the Chinese government should introduce fundamental *hukou* system reforms in the future.

Second, this study investigated the wage effect of *hukou* after controlling for human capital factors. It should be noted that, because public education expenditure is higher in urban than rural areas, there remains a large education differential between local urban and rural migrant workers. Ma (2018), Zhang and Wu (2019), and Ma and Minami (2022) indicated that the education differential between the two groups is the main factor generating the wage gap. The Chinese government should consider providing more public investment to education facilities in rural areas and more education subsidies targeting children in low-income rural households, which can be expected to reduce the opportunity inequality in the labor market between urban and rural *hukou* residents. This is expected to reduce the wage gap in the long term.

Finally, the results of the MRA (**Table 4**) indicated that the study conditions such as survey data, dependent variable type (for example, the total wage including the basic wage and bonus or only basic wage), and control variables used may affect the estimated results of the wage effect of *hukou*, suggesting that we should carefully estimate the wage functions considering the influences of these factors and compare the results based on different survey data and analysis methods for the issue in future research.

Appendix. Methodology of Meta-Analysis

In this appendix, we provide a short description of the methodology of the meta-analysis conducted in this study.

To synthesize PCCs, we used the meta-fixed-effect and meta-random-effects models. According to Cochran's Q test of homogeneity and the I^2 and H^2 heterogeneity measures, we adopted the synthesized effect size of one of these two models. In addition to the traditional synthesis method, we utilized the unrestricted weighted least squares average (UWA) approach proposed by Stanley and Doucouliagos (2017) and Stanley et al. (2017) as a new synthesis method. UWA is less influenced by excess heterogeneity than the traditional meta-fixed-effect model. The UWA method regards the synthesized effect size as a point estimate obtained from a regression that takes the standardized effect size as the dependent variable and the estimation precision as the independent variable. Specifically, we estimate Eq. (A1), in which there is no intercept term and the coefficient α is utilized as the synthesized value of the PCCs:

$$t_k = \alpha(1/SE_k) + \varepsilon_k, \quad \text{(A1)}$$

where *SE* is the standard error of the PCC of the *k*-th estimate and ε_k is a residual term. In theory, α in Eq. (A1) is consistent with the estimates of the meta-fixed-effects model.

Furthermore, Stanley et al. (2017) proposed conducting a UWA of estimates, the statistical power of which exceeds the threshold of 0.80, and called this estimation method the weighted average of the adequately powered (WAAP). Stanley et al. (2017) stated that WAAP synthesis has less publication selection bias than the traditional random-effects model. Accordingly, we adopted the WAAP estimate as the best synthesis value, whenever available. Otherwise, the traditional synthesized effect size was used as the second-best reference value.

Following the synthesis of the collected estimates, we conducted an MRA to explore the factors causing heterogeneity among the selected studies. More specifically, we estimated the following meta-regression model:

$$y_k = \beta_0 + \sum_{n=1}^{N-1} \beta_n x_{kn} + \beta_N SE_k + e_k, \quad \text{(A2)}$$

where y_k is the PCC (that is, r_k) of the *k*-th estimate, β_0 is a constant, x_{kn} denotes a meta-independent variable (also known as a moderator) that captures the relevant characteristics of an empirical study and explains its systematic variation from other empirical results in the literature, β_n denotes the meta-regression coefficient to be estimated, and e_k is the meta-regression disturbance term.

As pointed out by Iwasaki et al. (2020, 2022), there is no clear consensus among meta-analysts about the best model for estimating Eq. (A2). Hence, to check the statistical robustness of coefficient β_n, we performed an MRA using the following six estimators: (1) the cluster-robust weighted least squares (WLS), which clusters the collected estimates by study, computes robust standard errors, and is weighed by the inverse of standard error (1/*SE*) as a measure of estimate precision; (2) the cluster-robust WLS weighed by the degrees of freedom (*df*) to account for sample-size differences among the studies; (3) the cluster-robust WLS weighed by the inverse of the number of estimates in each study (1/*EST*) to avoid domination of the results by studies with large numbers of estimates; (4) the multilevel mixed-effects RLM estimator; (5) the cluster-robust random-effects panel GLS estimator; and (6) the cluster-robust fixed-effects panel LSDV estimator. We select either a random-effects model or a fixed-effects model according to the Hausman test of model specification.

As Havranek and Sokolova (2020) and Zigraiova et al. (2021) have argued, MRA involves the issue of model uncertainty in the sense that the true model cannot be identified in advance. In addition, there is a high risk that simultaneous estimation of multiple meta-independent variables could lead to multicollinearity. Accordingly, we estimated the posterior inclusion probability (PIP) and *t* value of each meta-independent variable other than the variables needed for hypothesis testing and the standard error of PCCs using the Bayesian model averaging (BMA) estimator and the weighted-average least squares (WALS) estimator, respectively. We adopted a policy of employing variables for which the estimates have a PIP of 0.50 or more in the BMA analysis and a *t* value of 1.00 or more in the WALS estimation as selected moderators in Eq. (A2).

For the final stage of the meta-analysis, we examined publication selection bias using a funnel plot by conducting a goodness-of-fit test of proportional distribution and by performing an MRA test procedure consisting of a funnel-asymmetry test (FAT), a precision-effect test (PET), and a precision-effect estimate with standard error (PEESE). These were proposed by Stanley and Doucouliagos (2012) and have been used widely in previous meta-studies.

A funnel plot is a scatter plot with the effect size (in this study, the PCC) on the horizontal axis and the precision of the estimate (1/*SE*) on the vertical axis. In the absence of publication selection bias, the effect sizes reported by independent studies vary randomly and symmetrically around the true effect size. Moreover, according to statistical theory, the dispersion of effect sizes is negatively correlated with the precision of the estimate. Therefore, the shape of the plot resembles an inverted funnel. In other words, if the funnel plot is not bilaterally symmetrical but deflected to one side, then an arbitrary manipulation of the study area in question is suspected, in the sense that estimates in favor of a specific conclusion (that is, estimates with an expected sign) are more frequently published.

The goodness-of-fit test examines the proportional distribution of the reported estimates. The test is performed based on either the assumption that the true effect size is zero or the assumption that the selected meta-synthesis value approximates the true effect. By conducting this univariate test, we inspected whether the estimates in question are distributed evenly around the true effect size.

The FAT-PET-PEESE procedure was developed to test publication selection bias and the presence of genuine evidence in a more rigid manner: FAT can be performed by regressing the t value of the k-th estimate on $1/SE$ using Eq. (A3), thereby testing the null hypothesis that the intercept term γ_0 is equal to zero.

$$t_k = \gamma_0 + \gamma_1(1/SE_k) + v_k, \quad \text{(A3)}$$

where v_k denotes the error term. When the intercept term γ_0 is statistically significantly different from zero, we can interpret the distribution of the effect sizes as asymmetric.

Even if there is a publication selection bias, a genuine effect may exist in the available empirical evidence. Stanley and Doucouliagos (2012) proposed examining this possibility by testing the null hypothesis that coefficient γ_1 is equal to zero in Eq. (A6). Rejection of the null hypothesis implies genuine empirical evidence. γ_1 is the coefficient of precision; therefore, it is referred to as PET.

Furthermore, Stanley and Doucouliagos (2012) stated that an estimate of the publication selection bias-adjusted effect size can be obtained by estimating Eq. (A4), which has no intercept. If the null hypothesis of $\gamma_1 = 0$ is rejected, then a nonzero true effect exists in the literature, and the coefficient γ_1 can be regarded as its estimate.

$$t_k = \gamma_0 SE_k + \gamma_1(1/SE_k) + v_k \quad \text{(A4)}$$

This is the PEESE approach.

To test the robustness of the regression coefficients obtained from the FAT-PET-PEESE procedure, we estimated Eqs. (A3) and (A4) using not only the unrestricted WLS estimator but also the WLS estimator with bootstrapped standard errors, the cluster-robust WLS estimator, and the unbalanced panel estimator for a robustness check. In addition to these four models, we also ran an instrumental variable (IV) estimation with the inverse of the square root of the number of observations used as an instrument of the standard error because ‘the standard error can be endogenous if some method choices affect both the estimate and the standard error. Moreover, the standard error is estimated, which causes attenuation bias in meta-analysis’ (Cazachevici et al., 2020, p. 5).

The FAT-PET-PEESE approach implicitly relies on the assumption that publication selection bias is linearly proportional to the size of the standard error, which might not be practical in some cases (Bajzik et al., 2020; Zigraiova et al., 2021). Advanced techniques have recently been developed to deal with the possible nonlinear relationship between the two. They include the 'Top 10' approach, proposed by Stanley et al. (2010), who discovered that discarding 90 percent of the published findings greatly reduces publication selection bias and is often more efficient than conventional summary statistics; the selection model, developed by Andrews and Kasy (2019), which tests for publication selection bias using the conditional probability of publication as a function of a study's results; the endogenous kinked model, suggested by Bom and Rachinger (2019), which presents a piecewise linear meta-regression of estimates of their standard errors with a kink at the cutoff value of the standard error below which publication selection bias is unlikely; and the *p*-uniform method, introduced by van Aert and van Assen (2021), which is grounded on the statistical theory that the distribution of *p*-values is uniform conditional on the population effect size. In this study, we applied these four techniques to provide alternative estimates of the publication selection bias-corrected effect size and compared them with the selected synthesized values and PEESE estimates for a robustness check.

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TABLE 1. Descriptive statistics of the partial correlation coefficients, *t* test and Shapiro–Wilk normality test of collected estimates

	K	Mean	Median	S.D.	Max.	Min.	Kurtosis	Skewness	*t* test [a]	Shapiro-Wilk normality test (*z*) [b]
All studies	506	-0.042	-0.035	0.054	0.180	-0.352	7.356	-0.855	-17.297 ***	7.232 †††
Target gender										
Male	47	-0.046	-0.037	0.049	0.039	-0.172	2.342	-0.368	-6.391 ***	0.883
Female	61	-0.047	-0.035	0.046	0.025	-0.208	3.873	-0.932	-7.957 ***	3.043 †††
Gender unspecified	398	-0.041	-0.034	0.056	0.180	-0.352	7.834	-0.902	-14.413 ***	6.937 †††
Target corporate sector										
Public sector	14	0.015	0.005	0.033	0.119	-0.011	8.444	2.485	1.711	3.678 †††
Private sector	16	-0.054	-0.025	0.107	0.180	-0.264	3.211	-0.076	-2.015 *	0.790
Corporate sector unspecified	476	-0.043	-0.037	0.052	0.147	-0.352	7.558	-0.974	-18.253 ***	6.927 †††
Target period										
1990s or before	54	-0.035	-0.031	0.051	0.180	-0.107	7.078	1.473	-5.087 ***	3.804 †††
2000s	184	-0.050	-0.048	0.057	0.147	-0.327	5.815	-0.382	-11.896 ***	3.926 †††
2010s	268	-0.037	-0.030	0.052	0.119	-0.352	9.241	-1.655	-11.659 ***	7.130 †††

Note: [a] *** and * denote that null hypothesis that mean is zero is rejected at the 1% and 10% levels, respectively.

[b] ††† and †† denote that null hypothesis of normal distribution is rejected at the 1% and 5% levels, respectively.

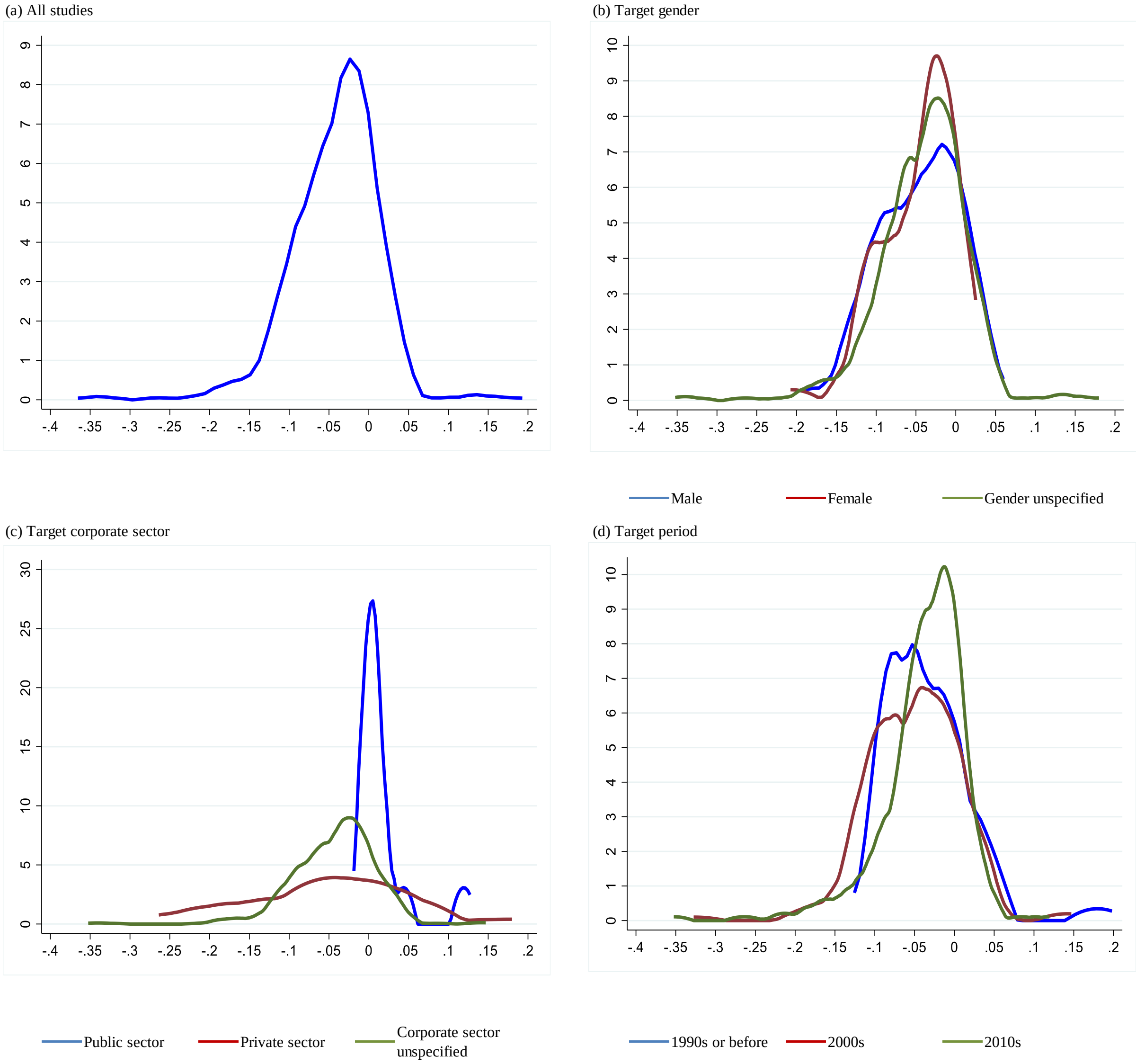

FIGURE 1. Kernel density estimation of collected estimates

Note: The vertical axis is the kernel density. The horizontal axis is the variable value.

Source: See Table 1 for the number of observations and descriptive statistics.

TABLE 2. Synthesis of estimates

		(a) Traditional synthesis		(b) Heterogeneity test and measures			(c) Unrestricted weighted least squares average (UWA)				
Study type	Number of estimates (K)	Fixed-effect model (z value) [a]	Random-effects model (z value) [a]	Cochran Q test of homogeneity (p value) [b]	I^2 statistic [c]	H^2 statistic [d]	UWA of all estimates (t value) [a e]	Number of the adequately powered estimates [f]	WAAP (weighted average of the adequately powered estimates) (t value) [a]	Median S.E. of estimates	Median statistical power
All studies	506	-0.032 *** (-67.34)	-0.042 *** (-17.30)	17594.50 *** (0.00)	95.55	22.48	-0.032 *** (-11.41)	110	**-0.049** *** **(-4.47)**	0.018	0.424
Target gender											
Male	47	-0.007 *** (-5.67)	**-0.042** *** **(-6.23)**	507.04 *** (0.00)	95.67	23.07	-0.007 * (-1.71)	0	- (-)	0.023	0.049
Female	61	-0.015 *** (-12.20)	-0.043 *** (-7.69)	601.82 *** (0.00)	94.16	17.14	-0.015 *** (-3.85)	6	**-0.002** **(-1.55)**	0.018	0.127
Gender unspecified	398	-0.040 *** (-71.98)	-0.041 *** (-14.51)	15658.18 *** (0.00)	95.45	21.97	-0.040 *** (-11.46)	129	**-0.040** *** **(-6.17)**	0.018	0.616
Target corporate sector											
Public sector	14	0.002 (1.25)	**0.007** **(1.61)**	53.04 *** (0.00)	86.34	7.32	0.002 (0.62)	0	- (-)	0.009	0.038
Private sector	16	-0.047 *** (-37.15)	-0.057 ** (-1.99)	5059.570 *** (0.000)	99.77	47.86	-0.047 * (-2.02)	11	**-0.047** **(-1.66)**	0.005	1.000

Corporate sector unspecified	476	-0.034	***	-0.043	***	11746.96	***	93.60	15.63	-0.034	***	99	**-0.030**	***	0.019	0.452
		(-62.35)		(-18.33)		(0.00)				(-12.54)			**(-4.72)**			
Target period																
1990s or before	54	-0.046	***	-0.039	***	244.81	***	80.49	5.13	-0.046	***	11	**-0.050**	***	0.021	0.616
		(-17.09)		(-5.96)		(0.00)				(-7.95)			**(-4.19)**			
2000s	184	-0.042	***	-0.049	***	1535.03	***	91.48	11.74	-0.042	***	55	**-0.041**	***	0.022	0.480
		(-38.02)		(-12.01)		(0.00)				(-13.13)			**(-8.50)**			
2010s	268	-0.029	***	-0.037	***	15664.47	***	97.04	33.76	-0.029	***	69	**-0.026**	***	0.017	0.413
		(-54.28)		(-11.44)		(0.00)				(-7.09)			**(-3.00)**			

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Selected synthesis values are emphasized in bold.

[a] Null hypothesis: The synthesized effect size is zero.

[b] Null hypothesis: Effect sizes are homogeneous.

[c] Ranges between 0 and 100% with larger scores indicating heterogeneity.

[d] Takes zero in the case of homogeneity.

[e] Synthesis method advocated by Stanley and Doucouliagos (2017) and Stanley et al. (2017).

[f] Denotes number of estimates with statistical power of 0.80 or more which is computed referring to the UWA of all collected estimates.

TABLE 3. Names, definitions, and descriptive statistics of meta-independent variables

Variable name	Definition	Descriptive statistics		
		Mean	Median	S.D.
Male	1 = if the sample is limited to male workers, 0 = otherwise	0.093	0	0.291
Female	1 = if the sample is limited to female workers, 0 = otherwise	0.121	0	0.326
Public sector	1 = if the sample is limited to workers of state-owned enterprises, 0 = otherwise	0.028	0	0.164
Private sector	1 = if the sample is limited to workers of privately owned enterprises, 0 = otherwise	0.032	0	0.175
2000s	1 = if average estimation year is in 2000s, 0 = otherwise	0.364	0	0.482
2010s	1 = if average estimation year is in 2010s, 0 = otherwise	0.530	1	0.500
CHNS	1 = if the survey results of China's Health and Nutrition Survey (CHNS) are used as the data source, 0 = otherwise	0.298	0	0.458
CGSS	1 = if the survey results of the Chinese General Social Survey (CGSS) are used as the data source, 0 = otherwise	0.172	0	0.378
Other household survey	1 = if the results of a household survey other than CHIP, CHNS, or CGSS are used as the data source, 0 = otherwise	0.455	0	0.498
Regular wage	1 = if regular wage is employed for empirical analysis, 0 = otherwise	0.773	1	0.419
Monthly	1 = if monthly wage is employed for empirical analysis, 0 = otherwise	0.320	0	0.467
Hourly	1 = if hourly wage is employed for empirical analysis, 0 = otherwise	0.409	0	0.492
Logarithm value	1 = if a logarithm value of wage is used as the dependent variable, 0 = otherwise	0.872	1	0.335
OLS	1 = if an OLS estimator is used for estimation, 0 = otherwise	0.711	1	0.454
IV/2SLS/3SLS	1 = if an IV, 2SLS, or 3SLS estimator is used for estimation, 0 = otherwise	0.057	0	0.233
Control for selection bias	1 = if the selection bias due to endogeneous labor participation is controlled for, 0 = otherwise	0.071	0	0.257
Occupation	1 = if the estimation simultaneously controls for occupation, 0 = otherwise	0.354	0	0.479

Age/age group	1 = if the estimation simultaneously controls for age or age group, 0 = otherwise	0.300	0	0.459
Work experience/tenure	1 = if the estimation simultaneously controls for work experience and/or tenure, 0 = otherwise	0.682	1	0.466
Health condition	1 = if the estimation simultaneously controls for the health condition of workers, 0 = otherwise	0.142	0	0.350
Firm size	1 = if the estimation simultaneously controls for the size of firms to which workers belong, 0 = otherwise	0.097	0	0.296
Trade union	1 = if the estimation simultaneously controls for trade unions, 0 = otherwise	0.107	0	0.309
Location fixed effects	1 = if the estimation simultaneously controls for location fixed effects, 0 = otherwise	0.526	1	0.500
Industry fixed effects	1 = if the estimation simultaneously controls for industry fixed effects, 0 = otherwise	0.431	0	0.496
With an interaction term(s)	1 = if the estimation is conducted with an interaction term(s), 0 = otherwise	0.008	0	0.089
S.E.	Standard error of partial correlation coefficient	0.021	0.018	0.014

TABLE 4. Meta-regression analysis of literature heterogeneity: Estimation using all moderators

Estimator (analytical weight in brackets)	Cluster-robust WLS [1/*SE*]	Cluster-robust WLS [*df*]	Cluster-robust WLS [1/*EST*]	Multi-level mixed effects RML	Cluster-robust random-effects panel GLS
Meta-independent variable (default study type)/model	[1]	[2]	[3]	[4]	[5] [a]
Sample gender (gender unspecified)					
Male	0.0241	0.0480**	0.0188	0.0017	0.0010
	(0.015)	(0.020)	(0.016)	(0.006)	(0.006)
Female	0.0219	0.0432**	0.0222	-0.0018	-0.0028
	(0.014)	(0.020)	(0.018)	(0.007)	(0.007)
Target corporate sector (corporate sector unspecified)					
Public sector	0.0015	-0.0446	0.0335	0.0129	0.0121
	(0.022)	(0.032)	(0.022)	(0.018)	(0.018)
Private sector	-0.0441	-0.0700*	-0.0597	0.0036	0.0048
	(0.044)	(0.039)	(0.044)	(0.020)	(0.018)
Target period (1990s or before)					
2000s	-0.0070	-0.0017	-0.0379***	0.0001	0.0011
	(0.012)	(0.010)	(0.014)	(0.013)	(0.013)
2010s	0.0042	0.0193	-0.0097	0.0085	0.0087
	(0.014)	(0.012)	(0.024)	(0.012)	(0.012)
Survey data (CHIPs)					
CHNS	0.0124	0.0360	0.0258	0.0304	0.0312
	(0.025)	(0.026)	(0.028)	(0.029)	(0.029)
CGSS	0.0409	0.0588*	0.0465*	0.0444	0.0440

	(0.028)	(0.030)	(0.027)	(0.028)	(0.029)
Other household survey	0.0045	0.0049	0.0162	0.0214	0.0214
	(0.023)	(0.024)	(0.027)	(0.025)	(0.026)
Wage type (Bonus wage)					
Regular wage	0.0385***	0.0586***	0.0284	0.0207	0.0189
	(0.014)	(0.016)	(0.017)	(0.015)	(0.016)
Wage payment period (annual)					
Monthly	0.0037	-0.0081	-0.0124	0.0026	0.0046
	(0.016)	(0.019)	(0.018)	(0.016)	(0.016)
Hourly	-0.0243	-0.0449**	-0.0151	-0.0108	-0.0090
	(0.016)	(0.020)	(0.016)	(0.015)	(0.015)
Wage variable type (actual value: Yuan)					
Logarithm value	-0.0070	-0.0058	-0.0081	-0.0158	-0.0176
	(0.025)	(0.021)	(0.028)	(0.034)	(0.036)
Estimator					
OLS (estimators other than OLS)	-0.0083	0.0025	-0.0164*	-0.0085	-0.0079
	(0.010)	(0.015)	(0.009)	(0.006)	(0.006)
IV/2SLS/3SLS	-0.0071	0.0016	0.0116	0.0242	0.0254
	(0.016)	(0.010)	(0.029)	(0.018)	(0.019)
Control for selection bias due to endogeneous labor participation					
Control for selection bias	0.0223	0.0241	0.0163	0.0101	0.0084
	(0.020)	(0.028)	(0.017)	(0.017)	(0.017)
Control variables					
Occupation	-0.0030	-0.0047	-0.0209	-0.0147	-0.0157

	(0.010)	(0.011)	(0.015)	(0.010)	(0.010)
Age/age group	0.0656 **	0.1058 ***	0.0107	0.0563 **	0.0606 **
	(0.027)	(0.033)	(0.028)	(0.022)	(0.024)
Work experience/tenure	0.0565 **	0.0945 ***	0.0146	0.0492 **	0.0524 **
	(0.025)	(0.030)	(0.024)	(0.024)	(0.026)
Health status	-0.0218	-0.0438 *	-0.0079	-0.0020	-0.0005
	(0.015)	(0.023)	(0.018)	(0.016)	(0.017)
Firm size	0.0189	0.0217	0.0252	0.0153	0.0148
	(0.018)	(0.024)	(0.017)	(0.011)	(0.011)
Trade union	0.0286	0.0438	0.0345	0.0053	0.0018
	(0.032)	(0.039)	(0.033)	(0.029)	(0.030)
Location fixed effects	-0.0055	-0.0044	0.0035	-0.0026	-0.0044
	(0.009)	(0.012)	(0.013)	(0.010)	(0.011)
Industry fixed effects	-0.0012	-0.0018	-0.0071	-0.0005	-0.0005
	(0.012)	(0.012)	(0.014)	(0.007)	(0.007)
Estimation with an interaction term(s)					
With an interaction term(s) (without interaction term)	0.0290	0.0501	-0.0036	-0.0105	-0.0105 *
	(0.035)	(0.041)	(0.033)	(0.006)	(0.006)
Standard error of partial correlation coefficient					
S.E.	-0.7551	-1.3597 *	-0.6055	-0.2445	-0.2386
	(0.488)	(0.731)	(0.520)	(0.327)	(0.345)
Constant	-0.1078 **	-0.1702 ***	-0.0451	-0.1116 ***	-0.1134 ***

	(0.044)	(0.057)	(0.040)	(0.037)	(0.039)
K	506	506	506	506	506
R^2	0.308	0.512	0.209	-	0.074

Note: Figures in parentheses beneath the regression coefficients are robust standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

[a] Hausman test: $\chi2$=23.18, p=0.1839

Source: See Table 3 for the definitions and descriptive statistics of meta-independent variables.

TABLE 5. Meta-regression analysis of literature heterogeneity: Estimation with selected moderators

Estimator	Cluster-robust WLS [1/*SE*]	Cluster-robust WLS [*df*]	Cluster-robust WLS [1/*EST*]	Multi-level mixed effects RML	Cluster-robust fixed-effects panel LSV
Meta-independent variable (default study type)/model	[1]	[2]	[3]	[4]	[5] [a]
Sample gender (gender unspecified)					
Male	0.0159 (0.014)	0.0367 * (0.020)	0.0137 (0.015)	0.0009 (0.006)	-0.0014 (0.006)
Female	0.0152 (0.012)	0.0313 * (0.019)	0.0104 (0.013)	-0.0029 (0.007)	-0.0059 (0.008)
Target corporate sector (corporate sector unspecified)					
Public sector	0.0159 (0.020)	-0.0198 (0.033)	0.0391 ** (0.016)	0.0208 (0.023)	0.0257 (0.034)
Private sector	-0.0302 (0.045)	-0.0456 (0.042)	-0.0558 (0.043)	0.0138 (0.029)	0.0285 (0.034)
Target period (1990s or before)					
2000s	-0.0134 (0.012)	-0.0184 (0.014)	-0.0409 ** (0.019)	0.0003 (0.013)	0.0051 (0.014)
2010s	-0.0021 (0.012)	-0.0067 (0.012)	-0.0195 (0.013)	0.0076 (0.011)	0.0081 (0.012)
Selected moderators					
CGSS	0.0418 *** (0.014)	0.0619 *** (0.020)	0.0376 *** (0.012)	0.0326 *** (0.012)	dropped

	(1)		(2)		(3)		(4)		(5)	
Regular wage	0.0363	***	0.0542	**	0.0123		0.0158		dropped	
	(0.013)		(0.021)		(0.011)		(0.013)			
OLS	-0.0194	**	-0.0148		-0.0288	***	-0.0183	***	-0.0139	**
	(0.008)		(0.013)		(0.008)		(0.005)		(0.006)	
Trade union	0.0318	*	0.0258		0.0332		0.0186		dropped	
	(0.019)		(0.023)		(0.027)		(0.022)			
Standard error of partial correlation coefficient										
S.E.	-1.1591	**	-2.1015	***	-0.5907		-0.3662		-0.3888	
	(0.525)		(0.778)		(0.518)		(0.423)		(0.601)	
Constant	-0.0391	***	-0.0413	**	-0.0100		-0.0499	***	-0.0307	**
	(0.014)		(0.020)		(0.018)		(0.015)		(0.013)	
K	506		506		506		506		506	
R^2	0.205		0.313		0.162		-		0.032	

Note: Figures in parentheses beneath the regression coefficients are robust standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Table 3 for definitions and descriptive statistics of the meta-independent variables. Selected moderators denote meta-independent variables with a PIP of 0.50 or more in the Bayesian model averaging (BMA) estimation and with a t value of 1.00 or more in the weighted-average least squares (WALS) estimation as reported in Appendix Table A1.

[a] Hausman test: $\chi2=13.92$, p=0.0840

Source: See Table 3 for the definitions and descriptive statistics of meta-independent variables.

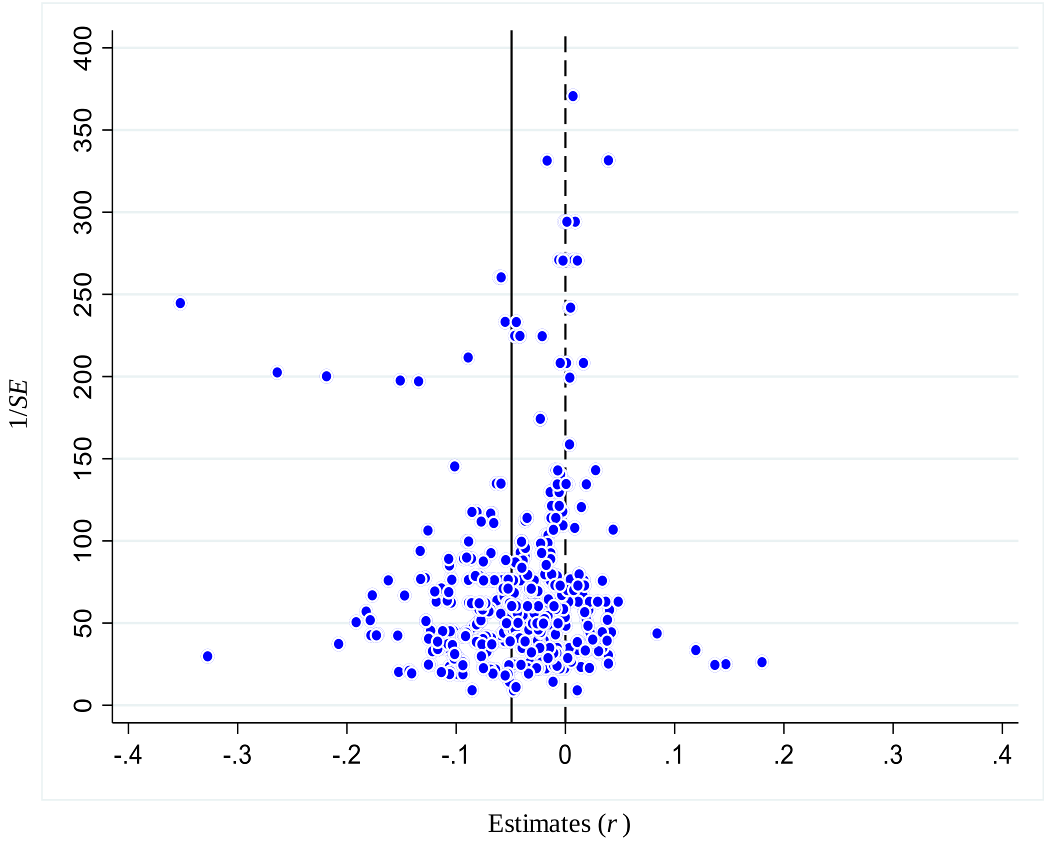

FIGURE 2. Funnel plot of partial correlation coefficients (K=506)

Note: The solid line indicates the synthesized effect size of -0.049 by WAAP estimation as reported in Table 2.

TABLE 6. Meta-regression analysis of publication selection bias

(a) FAT-PET test (Equation: $t=\gamma_0+\gamma_1(1/SE)+v$)

Estimator	Unrestricted WLS		WLS with bootstrapped standard errors		Cluster-robust WLS		Cluster-robust fixed-effects panel LSV		IV	
Model	[1]		[2]		[3]		[4][a]		[5]	
Intercept (FAT: H_0: $\gamma_0=0$)	-1.1955 (0.590)	**	-1.1955 (0.578)	**	-1.1955 (1.035)		2.1284 (4.231)		-0.5026 (0.535)	
$1/SE$ (PET: H_0: $\gamma_1=0$)	-0.0220 (0.011)	**	-0.0220 (0.010)	**	-0.0220 (0.019)		-0.0677 (0.058)		-0.0315 (0.006)	***
K	506		506		506		506		506	
R^2	0.048		0.048		0.048		0.048		0.039	

(b) PEESE approach (Equation: $t=\gamma_0 SE+\gamma_1(1/SE)+v$)

Estimator	Unrestricted WLS		WLS with bootstrapped standard errors		Cluster-robust WLS		Random-effects panel ML		IV	
Model	[6]		[7]		[8]		[9]		[10]	
SE	-19.1765 (11.001)	*	-19.1765 (10.707)	*	-19.1765 (20.382)		0.6008 (18.432)		9.4731 (23.526)	
$1/SE$ (H_0: $\gamma_1=0$)	-0.0296 (0.008)	***	-0.0296 (0.007)	***	-0.0296 (0.014)	**	-0.0488 (0.006)	***	-0.0479 (0.013)	***
K	506		506		506		506		506	
R^2	0.209		0.209		0.209		-		-	

Note: Figures in parentheses beneath the regression coefficients are standard errors. Models [3], [4], and [8] report standard errors clustered by study. Models [5] and [10] use the inverse of the square root of the number of observations used as an instrument of the standard error. *** and ** denote statistical significance at the 1% and 5% levels, respectively.

[a] Hausman test: $\chi2=7.43$, p=0.0064

TABLE 7. Alternative estimates of publication selection bias–corrected effect size

Method	Top 10[a]	Selection model[b]	Endogeneous kinked model[c]	*p*-uniform[d]
Model	[1]	[2]	[3]	[4]
Publication selection bias–corrected effect size	-0.0352 *** (0.010)	-0.0070 (0.008)	-0.0220 *** (0.004)	-0.0233 *** (0.001)
K	50	506	506	506

Note: Figures in parentheses are standard errors. *** denotes that the coefficient is statistically significantly different from zero at the 1% level.

[a] Arithmetic average of the top 10% most precise estimates (Stanley et al., 2010)

[b] Test for publication selection bias using the conditional probability of publication as a function of a study's results (Andrews and Kasy, 2019)

[c] Piecewise linear meta-regression of estimates on their standard errors with a kink at the cutoff value of the standard error below which publication selection bias is unlikely (Bom and Rachinger, 2019)

[d] Method based on the statistical theory that the distribution of p-values is uniform conditional on the population effect size (van Aert and van Assen, 2021)

TABLE 8. Summary of publication selection bias tests

Study type	Number of estimates (K)	Test results [a]		
		Funnel asymmetry test (FAT) (H$_0$: γ_0=0)	Precision-effect test (PET) (H$_0$: γ_1=0)	Precision-effect estimate with standard error (PEESE) (H$_0$: γ_1=0) [b]
All studies	506	Not rejected	Rejected	Rejected (-0.0488/-0.0296)
Target gender				
Male	47	Rejected	Not rejected	Not rejected
Female	61	Rejected	Not rejected	Rejected (-0.0138/-0.0082)
Gender unspecified	398	Not rejected	Rejected	Rejected (-0.0483/-0.0360)
Target corporate sector				
Public sector	14	Rejected	Not rejected	Not rejected
Private sector	16	Not rejected	Not rejected	Not rejected
Corporate sector unspecified	476	Not rejected	Rejected	Rejected (-0.0370/-0.0256)
Target period				
1990s or before	54	Rejected	Not rejected	Not rejected
2000s	184	Not rejected	Not rejected	Rejected (-0.0239/-0.0188)
2010s	268	Not rejected	Rejected	Rejected (-0.0422/-0.0208)

Notes:

[a] The null hypothesis is rejected when more than three of five models show a statistically significant estimate. Otherwise not rejected.

[b] Figures in parentheses are PSB-adjusted estimates. If two or more estimates are reported, the left and right figures denote the minimum and maximum estimates, respectively.

Appendix TABLE A1. Meta-regression analysis of model uncertainty for selection of moderators

Estimator	Bayesian model averaging (BMA)				Weighted-average least squares (WALS)		
Meta-independent variables/model	[1]				[2]		
	Coef.	S.E.	*t*	PIP	Coef.	S.E.	*t*
Focus regressors							
Male	-0.0013	0.0084	-0.16	1.00	0.0015	0.0085	0.18
Female	0.0018	0.0079	0.23	1.00	0.0021	0.0079	0.26
Public sector	0.0413	0.0155	2.66	1.00	0.0360	0.0155	2.32
Private sector	-0.0124	0.0140	-0.88	1.00	-0.0154	0.0140	-1.10
2000s	-0.0167	0.0087	-1.92	1.00	-0.0162	0.0090	-1.79
2010s	-0.0064	0.0091	-0.71	1.00	-0.0084	0.0104	-0.81
SE	-0.3647	0.2762	-1.32	1.00	-0.2852	0.2233	-1.28
Auxiliary regressors							
CHNS	-0.0004	0.0032	-0.14	0.06	0.0022	0.0123	0.18
CGSS	0.0273	0.0078	3.51	0.98	0.0271	0.0119	2.28
Other household survey	0.0000	0.0025	-0.02	0.06	0.0052	0.0106	0.49
Regular wage	0.0228	0.0089	2.57	0.94	0.0172	0.0071	2.41
Monthly	0.0015	0.0045	0.33	0.14	0.0069	0.0067	1.03
Hourly	-0.0017	0.0047	-0.36	0.16	-0.0059	0.0069	-0.85
Logarithm value	0.0003	0.0028	0.11	0.06	-0.0020	0.0085	-0.24
OLS	-0.0179	0.0085	-2.09	0.88	-0.0114	0.0058	-1.98
IV/2SLS/3SLS	-0.0020	0.0063	-0.31	0.13	-0.0109	0.0096	-1.14
Control for selection bias	0.0066	0.0136	0.49	0.24	0.0206	0.0107	1.93
Occupation	-0.0001	0.0013	-0.07	0.05	-0.0024	0.0049	-0.49
Age/age group	0.0069	0.0110	0.63	0.38	0.0191	0.0104	1.84
Work experience/tenure	0.0016	0.0070	0.23	0.12	0.0133	0.0100	1.33
Health condition	-0.0004	0.0031	-0.13	0.07	-0.0090	0.0081	-1.10
Firm size	0.0016	0.0058	0.29	0.12	0.0113	0.0098	1.15
Trade union	0.0195	0.0160	1.22	0.68	0.0182	0.0129	1.41
Location fixed effects	-0.0015	0.0038	-0.38	0.17	-0.0029	0.0050	-0.57
Industry fixed effects	0.0000	0.0013	-0.01	0.05	0.0019	0.0057	0.34

With an interaction term(s)	0.0005	0.0066	0.08	0.05	0.0150	0.0255	0.59
K		506				506	

Notes: See Table 3 for definitions and descriptive statistics of the meta-independent variables. Estimate of the intercept is omitted. *SE* and PIP denote standard errors and posterior inclusion probability, respectively. In theory, the PIP of focus regressors is always 1.00 in Model [1].