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Ownership Dynamics and Firm Performance in an Emerging Economy: A Meta-Analysis of the Russian Literature[†]

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Abstract: This paper provides a meta-analysis of studies on the effect of ownership on the performance of Russian firms over 20 years of rapid institutional and economic changes. We review 29 studies extracted from the EconLit and Web of Science databases with a total of 877 relevant estimates. We find that the government negatively affects company management regardless of its administrative level. In contrast, private ownership is positively associated with firm performance. The effect size and statistical significance are notably varied among different types of private ownership. While the effect of insider (employee and management) ownership is comparable to that of foreign investors, the effect of domestic outsider investors is considerably smaller. Our assessment of publication selection bias reveals that the existing literature does not contain genuine evidence for a series of ownership types and, therefore, some of the findings have certain limitations.

JEL classification numbers: D22, G32, H32, P26, P31.

Keywords: Privatization, Corporate Ownership, Firm Performance, Meta-analysis, Publication Selection Bias, Russia

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1. Introduction

The relationship between ownership and performance has, in recent decades, drawn considerable attention in academia, business circles, and government. The performance effects of state ownership and various types of private ownership, including ownership by managers, employees, blockholders, institutional investors, and foreign entities, have been at the heart of the debate. For example, Cornett et al. (2007) studied the impact of institutional ownership on firm performance in the US and found a positive relationship between a firm's operating cash flow returns and the presence of institutional investors, except for those having business relationships with the firm. Fakhfakh et al. (2012) investigated the comparative productivity of labor-managed and conventional firms in France and found—contrary to conventional wisdom—that labor-managed firms are not smaller, less productive, or slower-growing than conventional firms. Many of these issues are of particular importance in the developing world (Claessens and Yurtoglu, 2013) or in times of economic crises (Beuselinck et al., 2015). For example, a recent contribution by Greenaway et al. (2014) evaluated the pros and cons of foreign ownership and provided evidence that some domestic ownership is necessary to ensure the optimal performance of Chinese firms. Beuselinck et al. (2015) re-evaluated the role of state ownership during the Great Recession and showed that European firms with government ownership experienced a smaller drop in firm value as compared to fully private firms.

Empirically assessing the effect of various ownership forms and patterns on corporate performance is regarded to be an extremely difficult task. Standard observational data, even those of high quality, do not usually allow the establishment of causal links between ownership and performance. Furthermore, suitable quasi-experiments that address the ownership-performance puzzle are relatively rare (Atanasov and Black, 2016; Roberts and Whited, 2013). Coles et al. (2012), for example, provide an excellent account of the difficulties in assessing the role of managerial ownership using observational data. In particular, they concluded that standard techniques such as proxy variables, fixed effects, and instrumental variables might not be successful in solving the problem of simultaneity bias in the ownership-performance context.

Against this background, the transformation of ownership in the former communist bloc countries has long been regarded as a unique laboratory for testing the pros and cons of various ownership forms and arrangements (Frydman et al., 1997; Gugler et al., 2014). Indeed, according to Frydman et al. (1997), transition countries were

characterized by a great diversity of ownership forms in the early stages of their evolution, with state enterprises, partially privatized ones, fully privatized ones (with very different ownership patterns), and—importantly—de novo or originally private firms co-existing and competing against each other. Moreover, these forms often emerged regardless of their efficiency for particular types of business (e.g., due to specific rules regarding privatization), resulting in some of these ownership forms being partially dysfunctional. Finally, the lack of alternative mechanisms of corporate governance that could otherwise substitute for the role of owners (e.g., the market for corporate control and bankruptcy enforcement) provides an excellent opportunity to disclose the "true" effect of ownership, net of the effect of the other mechanisms. In a similar vein, Gugler et al. (2014) pointed out the potential benefits of studying the evolution of ownership and control and their effect on firm productivity after an initial shock associated with the fall of the Iron Curtain.

Unsurprisingly, the process of ownership transformation in Central and Eastern Europe has received considerable attention in economics literature. The first empirical analyses date back to the mid-1990s, including contributions by Earle et al. (1996), Smith et al. (1997), Claessens and Djankov (1999), and others. Since then, hundreds of studies on privatization and ownership transformation as well as their effects on firm performance have been published, including in renowned economics journals. Surprisingly, however, only several papers offer a thorough systematization of their findings, primarily for the early period of moving from plan to market. In particular, Djankov and Murrell (2002) reviewed 37 studies, mostly from the 1990s, of which 13 were based on Russian data, and two additional multi-country studies covered Russia. Iwasaki (2007) summarized the evidence of the link between ownership and the restructuring of former state-owned enterprises based on 50 studies from the 1990s and early 2000s, while Estrin et al. (2009a) analyzed the effects of privatization in the post-communist economies and, where relevant, China, based on 34 studies that employed fixed effects or IV estimators.

This paper provides a review and meta-analysis of studies that focus on the effect of ownership on the performance—measured by sales and output, efficiency, productivity, firm value, exports, and restructuring—of firms in Russia during most of the transition period. Russia is a particularly interesting object of study for several reasons. First, the distinctive character of the Russian privatization policy generated a great variety of ownership forms and patterns within a very short time frame. In particular, privatization in Russia resulted in widespread employee ownership and

created oligarchs and business groups, while maintaining the state's substantial presence in a number of strategic sectors, including the oil, gas, and military industries. Second, the country saw dynamic changes and adjustments in the control and ownership structures of firms, which provides the researcher with remarkable variation in key variables of interest. Third, Russia is the largest post-socialist economy and an important emerging market, with a considerable number of studies and, perhaps, the richest evidence concerning the relationship between ownership and performance among all transition countries.

Several features of our paper make it novel and original, especially as compared to earlier studies by Djankov and Murrell (2002), Estrin et al. (2009a), and, in particular, Iwasaki (2007). The first is our special focus on the link between ownership and performance that puts aside other issues related to the transformation of firms in Russia. A second is the time span from the late 1980s to 2009 that essentially covers the entire period of rapid institutional and economic changes. The next distinct feature is a thorough and systematic search of relevant studies on the topic. Finally, the paper addresses publication selection bias in a very careful and thorough way, providing important insights into the reliability of the key results regarding ownership and performance in the existing literature.

The studies for our review and meta-analysis were selected in January 2016 from the EconLit and Web of Science databases. We used a combination of two terms, including one from *privatization*, *ownership*, *firm performance*, or *restructuring* and another one from *Russia*, *transition economies*, or *the former Soviet Union*. This allowed us to identify approximately 600 searched works. Analysis of their content narrowed the literature list to those containing estimates that could be utilized for meta-analysis in this paper. As a consequence, our analysis is based on 29 studies.

The results of meta-synthesis and meta-regression analysis (MRA) using a total of 877 estimates collected from the above-mentioned 29 previous studies indicate that the Russian government negatively affected company management regardless of its administrative level. In contrast, private ownership is positively associated with firm performance and restructuring. However, the effect size and statistical significance are notably varied among different ownership types: Insider (employee and management) ownership is comparable to foreign ownership in terms of effect size, while domestic outsider ownership shows a smaller effect size than that of inside and foreign ownership. With respect to the statistical significance of empirical evidence, foreign investors are greatly superior to domestic owners. We also found that individual Russian investors

and commercial banks could not reform their companies effectively, while domestic non-bank financial institutions and company groups and holdings successfully promoted their invested firms. With respect to insider ownership, it has been proven that managerial ownership was remarkably favorable for the promotion and restructuring of Russian firms, greatly outperforming employee ownership. With only a few exceptions, these findings correspond well with our testable hypothesis built on the theoretical discussions in the previous literature. Our assessment of publication selection bias, however, revealed that the existing literature does not contain genuine evidence for a series of ownership types and, accordingly, the above arguments have certain limitations.

The remainder of this paper is organized as follows: Section 2 reviews the history of privatization and ownership dynamics in Russia and presents our testable hypothesis. Section 3 describes our procedure for literature selection and overviews the studies selected for meta-analysis. Section 4 synthesizes collected estimates and performs MRA. Section 5 assesses the presence and the extent of publication selection bias. Section 6 summarizes the major findings and concludes the paper.

2. Russian Privatization, Ownership Dynamics, and Hypothesis Development

2.1. A Snapshot of Russian Privatization

Russian privatization, and, more broadly, the process of ownership transformation in the country over the last 25 years, is often regarded as an unprecedented social experiment in world economic history. In the 1980s, Russia's economy was dominated by state enterprises, which accounted for more than 90% of employment in the country. Within just a few years, since the start of the market reforms in the early 1990s, the government transferred most small businesses to private ownership (small privatization) and took crucial steps toward privatizing the bulk of large and medium-sized enterprises (large privatization). The process was accompanied by the entry of new private businesses, typically small firms, some of which subsequently grew to become publicly traded companies. As a result, according to official statistics, the number of private firms already exceeded the number of state firms by the mid-1990s. As **Figure 1** shows, by the turn of the century, private sector employment exceeded that of the public sector. This withdrawal of the state from the economy is confirmed by the dynamics of investments by ownership type, illustrated in **Figure 2**, which also indicates the remarkable growth of the private sector. Still, even now, the Russian state—from the federal to the municipal level—retains a considerable share of the country's productive

assets. Government ownership is particularly widespread among large and strategically important firms, including those listed on the stock exchange, such as Gazprom, Rosneft, Rostelecom, and Sberbank.

What are the key features and milestones of the ownership transformation process in Russia?[1] The Russian government launched its main privatization program in mid-1992. The program classified state enterprises into three categories: (a) small enterprises, to be sold by competitive bidding or lease buyouts; (b) large enterprises, to be converted to joint stock companies first (corporatization), and then privatized through a mass-privatization program; and (c) medium-sized enterprises, which could use either method. Some enterprises, such as most public utilities and firms in the defense sector, were exempted from this round of privatization. However, firms in retailing and consumer services were required to take part in the small privatization, and mass privatization was required for about 5,000 large enterprises and more than 15,000 medium-sized ones.

The use of several methods and sub-methods of privatization envisaged in the governmental program eventually led to a great variety of ownership patterns among Russian firms. The main privatization process, which took place between 1992 and 1994 and is known as mass privatization, combined two main techniques: management-employee buyouts and the mass privatization. Besides, some elements of the competitive sale of enterprise shares for cash, through cash auctions and investment tenders, were also incorporated at this stage of privatization.

Associated with mass privatization, the Russian government distributed to the population around 150 million vouchers, each with a face value of 10,000 rubles. Since vouchers were freely circulating securities, people could use them as a means of payment when purchasing enterprise shares at voucher auctions, could sell them, or could invest them in specially created voucher investment funds.

The management-employee buyout component stemmed from the substantial privileges given by the state to managers and employees of the enterprises offered for privatization. The program granted these groups the opportunity to receive a significant fraction of shares either for free or with substantial discounts. Under the existing regulations, it was not unusual for managers and employees to accumulate a controlling block of shares (51% and even more) in their companies.

[1] Due to space constraints, we provide only a brief account of Russian privatization. Interested readers can find further details in Boycko et al. (1995), Hare and Muravyev (2003), and other references in our review, as well as in numerous additional sources.

Finally, the last component of privatization, the competitive sale of shares at investment tenders or cash auctions, typically involved 10 to 20 percent of an enterprise's shares. In an investment tender, which was a competition between investors to buy a block of shares, bidders had to agree to provide the company with additional assistance in the form of capital investments or technology. Similarly, cash auctions also produced capital for enterprises.

When the mass privatization program was accomplished in mid-1994, the government announced a shift in its priorities. The emphasis was placed on maximizing privatization revenues, with case-by-case sales assuming the role of the principal privatization method. The start of the case-by-case sales program, known as loans-for-shares privatization, was very controversial, if not actually rigged. By 1995, the Russian government was desperate to increase its revenues from privatization but faced substantial opposition in parliament, including a direct ban on privatizing enterprises in the oil industry. In March 1995, a consortium of the largest Russian banks proposed lending funds to the government, taking blocks of shares in large and strategic enterprises as collateral. In particular, blocks of shares would be auctioned to the banks, and the bank that offered the largest loan would be the winner. The banks were required to hold the shares until September 1, 1996, and, in case the government did not repay the loans, could sell them and take one-third of the capital gains. Of 29 enterprises selected for the loans-for-shares privatization, only 12 finally took part, of which half were in the oil sector. All but two blocks were sold by the banks from 1996–1998, mostly to the banks' affiliates. The government raised over a billion US dollars; however, the non-transparency of the auctions immediately caused a public uproar over privatization. Numerous attempts to revise the results of the loans-for-shares privatization, mostly on the part of the communist-influenced parliament, contributed to the insecurity of property rights and, apparently, delayed the restructuring of some of the companies concerned.

Overall, during case-by-case privatization, most revenues typically came from one or two major transactions in a given year; however, their size varied dramatically from one year to the next. Most privatization transactions were prepared with a known buyer in mind, typically an existing blockholder, as the presence of large and controlling shareholders in Russian companies reduced the interest of potential external buyers to purchase minority ownership stakes.

Since the mid-2000s, Russia continued privatization using case-by-case sales; however, at the same time, it initiated the renationalization of selected businesses (see,

e.g., Chernykh, 2011, for an in-depth analysis). The two most famous examples of Russian renationalization are the cases of Yukos in 2003–2005 and Bashneft in 2014, in which even *bona fide* buyers of shares were punished. In parallel, the government established a number of state corporations (e.g., RosTech) that consolidated some of the remaining key productive assets in the hands of the state. Overall, the state remains visible in the economy, especially in selected industries, such as oil and gas, machine building, and banking. However, state ownership is virtually absent in some other industries, including wholesale and retail trade and ferrous and non-ferrous metallurgy, as well as the chemical industry.

2.2. The Dynamics of Ownership in Russian Firms

Although the previous subsection gives an idea of the massive withdrawal of the state from the economy over the last 25 years, there is a broader question about the dynamics of various ownership patterns in Russian firms. Providing a clear picture of the process of ownership change is not an easy task, as there are no detailed official statistics on the distribution of ownership in the Russian economy.[2] One must resort to estimates from previous studies, which exhibit considerable variation depending on the exact population being studied, the sampling method, the mode of data collection, and other details.[3] This obviously complicates comparisons, both across space and over time. Nevertheless, key features of the dynamics of ownership can still be inferred, even from samples that are not necessarily representative, provided that the methods of sampling and data collection do not change much over time.

Table 1 shows the evolution of ownership by different groups of owners using data from the Russian Economic Barometer survey (e.g., Aukutsionek et al., 2011), which has been run for two decades without major changes in methodology, including the block of ownership questions. Importantly, this survey samples industrial firms, primarily medium-sized ones. Data from this source show a gradual decline in insider ownership (except for 2013, when an increase in insider ownership was largely driven

[2] The Russian statistical agency (Rosstat) only distinguishes between several broad and, therefore, vague categories of ownership, such as state ownership, municipal ownership, mixed state-private ownership, private ownership, mixed Russian-foreign ownership, foreign ownership, and ownership by nonprofit organizations.

[3] For example, some studies draw samples from the population of all registered companies, while others focus on publicly-traded companies, or on privatized firms, largest firms, firms from specific sectors (most commonly industrial firms and banks), firms from particular regions, etc.

by a drop in the sample size) and a rise in outsider ownership. More remarkably, within the insider group, there is a dramatic decline in employee ownership and a rapid increase in managerial ownership. Among outside owners, individuals, other enterprises, and, to some extent, holding companies have sizeable ownership stakes. The state has retained, on average, a constant share of 7–9 percent throughout the period. In the sampled firms, ownership by banks, investment funds, and foreigners has always been negligible, with little change over time.[4]

Table 2 shows the dynamics of ownership concentration in Russian firms. Here, the data refer to publicly traded companies from 1995–2015. Although the data presented come from four distinct sources, they are comparable in key variables of interest. We observe that the fraction of companies with a controlling owner (holding at least 50% of the company's shares) has been rapidly growing, from 45% in 1995–1997 to 73% in 2015. At the same time, the fraction of widely held companies (in which the largest shareholder has less than 25% of shares) has declined from 29% to a mere 5%. In addition, there has been a notable reduction in government ownership. Nevertheless, 28% of publicly traded firms remain controlled by the state, even in 2015. This is in sharp contrast to smaller firms surveyed by the Russian Economic Barometer.

Overall, summarizing the above data as well as data from other sources (see, in particular Dolgopyatova, 2009, and Iwasaki, 2007), we conclude that Russian privatization initially resulted in a relatively dispersed ownership structure of firms, with substantial shares held by insiders (managers and employees), the general public, and institutional investors, but also with considerable residual blocks retained by the state. Insiders, taken together, obtained controlling blocks of shares in most enterprises. However, despite the fact that employee ownership by far exceeded managerial ownership, corporate control was, in most cases, concentrated in the hands of managers (Blasi, 1997).

The period since the completion of mass privatization has seen the rapid erosion of insider ownership, especially employee ownership. To a considerable extent, this has been driven by labor attrition (the "degeneration of employee ownership," see Kalmi, 2003, for instance) but also, and perhaps more importantly, by a massive sale of shares by employees to both managers and outside investors as well as by managers to outside

[4] Other sources often report larger ownership by financial institutions and foreigners throughout the period under study and also emphasize the difference between medium-sized non-traded firms and large traded companies (e.g., Iwasaki, 2007).

investors. The main outcome has been the emergence of concentrated ownership patterns, with managers and new outside investors becoming key shareholders (Dolgopyatova, 2009). Among the latter, business groups and holding companies, often controlled by one or several wealthy individuals ("oligarchs"), became significant shareholders (see Estrin et al., 2009b).

Last, but not least, in parallel to these processes, the new private sector has been growing rapidly. In certain sectors, such as wholesale and retail trade and mobile telecommunications, de novo firms have gained the dominant position. It is difficult to assess the role of these firms in the entire economy, as the official statistics only differentiate between state and private sectors and do not separate the private sector into the parts comprising de novo firms and privatized enterprises.[5] What is clear is that the share of the state sector declined, the private sector grew, and the size distribution of firms became more and more similar to that of mature market economies (Mitra et al., 2014).

Importantly, the initial ownership structures and those emerging in the post-privatization period were influenced by factors that were not necessarily related to firm performance and, in this sense, exogenous. In particular, the ownership patterns appearing in the course of privatization, especially in the early stages, were often predetermined by the specifics of firms. This is, for example, true of the emergence of dual class stock companies, in which managers and employees were given preferred (non-voting) shares. These companies were established when managers and employees of state enterprises offered for privatization were short of funds to buy a controlling block of shares, the value of which was linked to the book value of enterprise assets. Therefore, most large and capital-intensive firms were transformed into dual class stock companies without a majority control by insiders (Muravyev, 2013). In a similar vein, the decline of employee ownership occurred partially due to natural "degeneration," when labor attrition is not compensated for by mechanisms extending ownership to new employees. Finally, Chernykh (2011) shows that renationalization in Russia in the 2000s was not driven by firm performance, pointing out that "the government neither systematically 'cherry-picks' best performers nor addresses market failures by rescuing national champions in financial distress" (p. 1237).

[5] This is a methodological challenge as privatized enterprises and de novo firms split and merge with each other over the course of years, which makes it virtually impossible to assign them either to the privatized subsector or to the de novo subsector of the economy.

Overall, during the last 25 years, the Russian economy has been characterized by a great variety of ownership forms and patterns, often driven by exogenous factors, and a dynamic change in the control and ownership structures of firms. These features provide the researcher with unique variation, both across space and over time, for estimating the effect of ownership on firm performance.

2.3. Hypotheses Development

In this section, we develop testable implications regarding the effect of various ownership forms and patterns characteristic of Russian firms on their performance. In doing so, we primarily rely on theory and only occasionally refer to specific features of Russia's privatization and firm ownership.

State (government) ownership. Most economists regard this type of ownership with a degree of skepticism. Its main deficiency is the lack of ownership incentives for bureaucrats involved in the governance of state firms (Vickers and Yarrow, 1991). Shleifer (1998) also suggests that bureaucrats and politicians may interfere in state-owned firms, including outright expropriation for personal gains. Thus, the effects of incentives and intervention predict that state ownership will have a negative impact on firm performance. Therefore, our first hypothesis maintains that:

H1: *State ownership is associated with lower firm performance.*

A number of scholars hypothesize that the level of governments may matter. A model developed by Che and Qian (1998), for example, suggests that ownership by local government may limit state predation, increase the provision of local public goods, and decrease costly revenue hiding. However, Desai and Goldberg (2001) argue that regional and local governments may impose distortions on enterprises in order to protect local employment. Overall, Cheung et al. (2010) note that "the distinction between central and local governments has received little attention in the academic literature" (p. 671), which ultimately makes the effect of ownership by different levels of government an empirical matter. Our subsequent analysis will shed some light on this unresolved issue.

Domestic outsider investors. This is a quite heterogeneous group of owners, comprised of individuals, banks and other financial institutions, non-financial companies, and business groups. The channels whereby these groups of owners may affect firm performance are very diverse: from improvements in corporate governance to better access to finance and modern technologies. For example, ownership by banks may help reduce financing constraints, while company membership in a business group

may facilitate intra-group technology transfers. From the perspective of corporate governance, a key factor that affects the impact of these shareholders on firm performance—in addition to shareholder identity—is the size of their ownership stakes. Since the seminal contribution by Berle and Means (1932), it is well known that small owners are prone to free riding, which may ultimately leave managers uncontrolled. The concentration of ownership in the hands of large shareholders is seen as a natural remedy to this problem, although it creates incentives for large shareholders to expropriate minority owners through the extraction of the private benefits of control (Shleifer and Vishny, 1997). Another key issue for institutional investors is that they themselves are agents who act on the behalf of their own shareholders. This raises an important question: who monitors the monitors? Overall, we hypothesize that as compared to governments, domestic outsider owners as a whole have a positive effect on firm performance due to stronger incentives.

H2: *Ownership by domestic outsider investors is associated with improved firm performance.*

However, given the great diversity of owners within this group, we also formulate a number of sub-hypotheses concerning particular types of outsider investors.

Individual shareholders. This group of owners is mostly represented—at least in large publicly traded companies—by atomistic shareholders, who are traditionally associated with the free-rider problem that leads to a lack of control over managers (Berle and Means, 1932). In smaller firms, individual shareholdings may be larger and even take the form of family ownership. This is important in view, for example, of the evidence that firms in which large blocks are held by the founding family perform better than firms with other types of blockholders (e.g., Andres, 2008).

In Russia, this group of owners was initially represented by atomistic investors who either were former employees or purchased shares at voucher auctions, as well as descendants of these two groups. More concentrated patterns of ownership by individuals appeared as a result of the redistribution of shares in the post-privatization period, in particular, due to the sell-off of shares by employees. Such shareholdings also emerged thanks to the growth of new private firms. Still, family ownership is not yet particularly common in Russia (Estrin et al., 2009b), and the bulk of individual shareholders possess small and negligible stakes in their firms. Therefore, we expect that ownership by individual shareholders, as a whole, has a negative effect on firm performance.

H2.1: *Ownership by individuals is negatively related to firm performance.*

Financial institutions. This group includes banks and non-bank financial institutions, such as mutual funds, pension funds, and insurance companies. The pros and cons of ownership by this group of investors are widely debated. The negative effects of these shareholders on firm performance may stem from the fact that the corporate governance of firms is not their primary business, that they may have short-term horizons (Bushee, 2001), and that they prefer to keep relatively small stakes for reasons of liquidity (Coffee, 1991). However, they usually have better opportunities to access and process information about the firms they invest in, which may improve monitoring. There are also potential differences in the impact of banks versus non-bank financial institutions stemming from the banks' wider opportunities (and greater incentives) to be involved in corporate governance because of the lending relationship with the firm. In fact, as noted by Shleifer and Vishny (1997), large creditors have incentives similar to those of large shareholders to monitor the management of their investee firms. Therefore, we advance the following hypothesis:

H2.2: *Ownership by banks and financial institutions is positively related to firm performance.*

Business groups, holdings, and domestic non-financial companies. These types of shareholders normally hold sizeable ownership stakes in the company; they are also typically related to the company through business ties, e.g., via supplier-customer chains. These two facts amplify the incentives and extend the opportunities of these shareholders to take an active position in the corporate governance of the investee firm. However, they may also expand the potential for large shareholders to extract private benefits through, for example, transfer pricing, to the detriment of minority shareholders (Shleifer and Vishny, 1997).

It may be argued that both the pros and cons of ownership by domestic non-financial companies are amplified in a holding or in a business group.[6] Indeed, as noted by Young et al. (2008), a business group can make up for weak institutional environments in capital, labor, and product markets, for example, through the transfer of technology or intra-group allocation of capital. This strength may be particularly important in emerging economies characterized by underdeveloped institutions and markets. The main

[6] A business group can be defined as a collection of legally independent firms that are linked by economic ties, including, but not restricted to, ownership.

drawback of the business group is difficulties in coordinating and allocating resources between the group members as well as the potential for unfair intra-group transactions that benefit controlling shareholders, especially in large and loosely affiliated business groups characterized by low transparency. Nevertheless, we still expect this type of owners to have a positive effect, due to their large ownership stakes, and, as a result, strong incentives for improving performance.

H2.3: *Ownership by non-financial companies and business groups is associated with improved performance of firms.*

Foreign investors. The existing literature tends to see the effect of foreign ownership on firm productivity in a positive light. The channels for improved firm performance include better access to modern technologies, including managerial ones, access to foreign markets, reduced financial constraints, and better corporate governance. An important factor in predicting the effect of foreign ownership on corporate performance is the investor's country of origin. It has been argued that the higher the technological gap between home and host countries, the stronger the effect (e.g., Benfratello and Sembenelli, 2006). It has also been pointed out that the type foreign ownership, whether originating from direct investments or portfolio investments, may matter. As compared to foreign corporate investors, foreign institutional investors typically invest in different industries, hold smaller ownership stakes, and have shorter planning horizons, which may explain their weaker incentive to intervene in the investee firms (Douma et al., 2006).

Since, according to Rosstat, the bulk of foreign investment in Russia takes the form of direct investments from developed economies, we expect to find a positive relationship between foreign ownership of Russian firms and their performance:

H3: *Foreign ownership is associated with improved performance of firms.*

Insiders (managers and employees). In the spirit of the early literature on corporate governance in Russia and other transition countries, we refer to these groups of owners as "insiders" (e.g., Earle et al., 1996). However, since the second half of the 1990s, there has been a growing understanding that the interests of these two groups and their impact on firm performance may be very different. In drawing hypotheses concerning insider ownership, we, therefore, consider managers and employees separately.

Managers. Ownership by managers impacts on firm performance through two major channels: incentive alignment and entrenchment. Managerial ownership provides managers with monetary incentives to maximize profit and, thus, improves company performance (Jensen and Meckling, 1976). On the other hand, managerial ownership promotes the entrenchment of managers, which is especially costly when they are insufficiently qualified or prefer to live an easy life (Morck et al., 1988). In the early stages of Russia's move to a market economy, a critical question was whether old managers who had been appointed in the Soviet era were able to run firms in a market environment. Indeed, Shleifer and Vasiliev (1996) suggested that, in the USSR, managers were appointed for their adherence to communist ideology or their proficiency in lobbying the government for credits and securing the delivery of inputs rather than for the managerial skills required and valued in a market economy. On the other hand, even in the old system, managers were highly capable individuals who, when provided with right incentives, could potentially restructure and improve the performance of the firms they ran. In addition, the lack of managerial skills could have been just a temporary phenomenon due to the replacement, including the routine turnover, of managers. Therefore, our next hypothesis is:

H4.1: *Ownership by managers is associated with improved performance of firms.*

Employees. The literature highlights several potential benefits of employee ownership of the firm, including better work incentives, enhanced incentives to invest in firm-specific human capital, and improved industrial relations. However, these benefits may be easily counterbalanced by the limited access to financing, high risk-aversion among employees, and difficulties in collective decision-making due to the varied preferences of workers (Hansmann, 1996). In addition, bad managers may use employee ownership as an entrenchment mechanism (Aubert et al., 2014). Overall, the theoretical predictions are inconclusive, and many see the effect of employee ownership ultimately as an empirical issue (Kalmi, 2003). We therefore hypothesize that:

H4.2: *Employee ownership has neither a positive nor a negative effect on firm performance.*

The rest of the paper tests these hypothesis based on the existing studies of Russia, starting with a description of the methodology in the following section.

3. Literature Selection Procedure and Overview of Studies Selected for Meta-

analysis

As mentioned in the Introduction, in order to find studies that empirically examined the relationship between ownership structure and firm performance and restructuring in post-privatization Russia, we first searched the EconLit and Web of Science databases for research works that contained a combination of two terms, including one from *privatization*, *ownership*, *firm performance*, or *restructuring* and another one from *Russia*, *transition economies*, or *the former Soviet Union*. The final literature search was carried out in January 2016. Then, we examined the contents of approximately 600 searched works and narrowed the literature list to those containing estimates that could be meta-analyzed in this paper. As a result, we selected a total of 29 studies.

Table 3 shows an outline of the selected studies. Twenty-one of the 29 studies deal with the mining and manufacturing industry, while seven studies cover a broad range of industries. The service industry was investigated only in Barberis et al. (1996). These 29 works cover the 25 years from 1985 to 2009 as a whole. Six types of indices were adopted as the firm performance variables introduced in the left-hand side of regression models estimated in these preceding studies. The sales and output volume was utilized as a dependent variable in 13 of the 29 studies, followed by restructuring activities in 12 studies,[7] efficiency and productivity indices in 10 studies, firm value in four studies, and export entry/volume in two studies. To examine the impacts of post-privatization ownership structure, these preceding works used 15 types of variables, from whole state to employees. Of 29 selected studies, 15 investigated the relationship between whole state ownership and firm performance, while 11 and 10 studies examined the influence of ownership by foreign investors and managers, respectively. Less than 10 studies dealt with other types of corporate owners. Hereinafter, we call this classification the *basic category of ownership* variable.

From the 29 studies outlined above, we collected a total of 877 estimates (30.2 per study, on average). **Figure 3** illustrates the breakdown of these collected estimates by the basic category of ownership variable. Managers make up the largest share (160 estimates). All state, employees, and foreign investors follow (117, 106, and 102 estimates, respectively). In the meta-analysis, we also use an aggregated category of ownership variables, which consists of (a) all state, (b) all domestic outsider investors, (c) foreign investors, and (d) all insiders. The breakdown of collected estimates by the

[7] The indices of restructuring activities are comprised of R&D and innovation activities, capital investment, and indices of comprehensive restructuring.

aggregated classification is shown in **Figure 4**. Reflecting researchers' strong interest in insider control of privatized enterprises in Russia, the selected 29 studies provide the richest evidence regarding insider ownership (335 estimates), followed by that of domestic outside ownership, state ownership, and foreign ownership (279, 161, and 102 estimates, respectively).

In next section, we synthesize the collected estimates described above and perform MRA to examine the testable hypotheses presented in Section 2.

4. Meta-synthesis and Meta Regression Analysis

4.1. Methodology

First, we outline the meta-synthesis and MRA to be conducted in this section. Hereinafter, K denotes the total number of collected estimates (k=1, 2, …, K). The partial correlation coefficient (PCC) and the t value are employed to synthesize the collected estimates. The PCC is a measure of the association of a dependent variable and the independent variable in a question when other variables are held constant. The PCC is calculated in the following equation:

$$r_k = \frac{t_k}{\sqrt{t_k^2 + df_k}}, \quad (1)$$

where t_k and df_k denote the t value and the degree of freedom of the k-th estimate, respectively. The standard error (SE) of r_k is given by $\sqrt{(1 - r_k^2)/df_k}$. We synthesize PCCs by a fixed-effect meta-analysis and a random-effects meta-analysis, and, in accordance with the homogeneity test, we adopt the synthesized effect size of one of these two models as the reference value.

Following Djankov and Murrell (2002), we combine t values using the next equation:

$$\overline{T_w} = \sum_{k=1}^{K} w_k t_k \Big/ \sqrt{\sum_{k=1}^{K} w_k^2} \quad \sim \quad N(0,1). \quad (2)$$

Here, w_k is the weight assigned to the t value of the k-th estimate. As the weight w_k in Eq. (2), we utilize a 10-point scale to mirror the quality level of each relevant study $(1 \leq w_k \leq 10)$.[8] Moreover, we report not only the combined t value, $\overline{T_w}$, weighted by the quality level of the study, but also the unweighted combined t value,

[8] For more details on the method of evaluating the quality level, see Appendix of this paper.

$\overline{T_u}$. As a supplemental statistic for evaluating the reliability of the above-mentioned combined *t* value, we also report Rosenthal's fail-safe N (*fsN*).

Following the synthesis of collected estimates, we conduct an MRA to control for the factors causing heterogeneity between selected studies. To this end, we estimate the meta-regression model:

$$y_k = \beta_0 + \sum_{n=1}^{N} \beta_n x_{kn} + e_k\,, \quad k = 1, 2, \cdots, K, \quad (3)$$

where y_k is the PCC or the *t* value of the *k*-th estimate; x_{kn} denotes a meta-independent variable that captures 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 (Stanley and Jarrell, 2005). To check the statistical robustness of coefficient β_n, we perform an MRA using the following six estimators: the cluster-robust ordinary least squares (OLS) estimator, which clusters the collected estimates by study and computes robust standard errors; the cluster-robust weighted least squares (WLS) estimator, which uses either the above-mentioned quality level of the study, the number of observations, or the inverse of the standard error (1/*SE*) as an analytical weight; the multilevel mixed effects restricted maximum likelihood (RML) estimator; and the unbalanced panel estimator (i.e., cluster-robust fixed-effects estimator or cluster-robust random-effects estimator).

4.2. Synthesis of Collected Estimates

Figure 5 illustrates the kernel density estimation of the PCC and the *t* value of the 877 estimates collected from the 29 studies listed in **Table 3** by an aggregated category of ownership variables. As shown in Panel (a) of this figure, the distribution of the PCC of state ownership is biased toward the negative direction. In contrast, the distribution of all kinds of private ownership is positively skewed. The median of the PCC is -0.0166 for state ownership, while those for domestic outsider investors, foreign investors, and insiders are 0.0467, 0.0266, and 0.0772, respectively. These facts suggest that the existing literature tends to report the superiority of private entities over the state as reformers of Russian enterprises.

With respect to the *t* value, Panel (b) of **Figure 5** indicates that most of the collected estimates are concentrated in a range between -5.0 and 5.0, irrespective of differences in ownership types. Actually, 824 of the 877 estimates (94.0%) fit in this range. At the same time, state ownership has a long tail in the negative direction, and the estimates of

foreign investors are distributed with a long tail in the positive direction, suggesting that the previous studies found highly statistically significant impacts of state and foreign ownership on enterprise restructuring as compared with domestic private ownership.

The results of the meta-synthesis of the collected estimates are reported in **Table 4**. Column (a) of the table shows synthesized PCCs, and Column (b) reports combination *t* values. With regard to the PCC, we adopt the synthesized effect size of the random-effects model as the reference value, except for the ownership variables of whole domestic financial institutions, domestic non-bank financial institutions, and other domestic non-financial companies, the homogeneity test of which accepts the null hypothesis. For these three kinds of ownership, we refer to the fixed-effect model. Panel (a) of **Figure 6** illustrates these adopted synthesized effect sizes. Panel (b) of the same figure draws combined *t* values weighted by research quality.

As shown in **Table 4** and **Figure 6**, the results of the meta-synthesis indicate that, independently of its administrative level, Russian government negatively affected the performance and restructuring activities of state-owned enterprises, and its impact is highly statistically significant. In fact, the synthesized effect size and combined *t* value weighted by the research quality of all state are -0.029 and -4.581, respectively. This general finding of a negative effect of government ownership is consistent with our hypothesis H1. The data also suggest that central and regional/local governments exhibit similar effects in terms of both the effect size and the statistical significance. This seems to be a new finding, closing the gap in the existing literature regarding the effect of various levels of government (see Cheung et al., 2010). In contrast to the effects of government, the effects of all domestic outsider investors, foreign investors, and all insiders are positive and significant, suggesting that private entities developed their own companies more successfully than did the state.

At the same time, however, we notice that a remarkable gap exists between private owners: In terms of the effect size, foreign investors and all insiders exhibit a similar synthesized PCC value (0.064 and 0.069, respectively), while all domestic outsider investors show a much smaller one (0.039). With regard to the statistical significance of empirical evidence, foreign investors demonstrate a conspicuous level of combined *t* value (10.123), and it greatly exceeds that of all insiders and all domestic outsider investors (5.190 and 2.544, respectively). This finding is in line with our hypothesis H3, which predicts the superior performance of foreign-owned firms. As expected, the meta-synthesis also unveils that the effect on firm performance and restructuring greatly varies among different types of domestic outsider investors, albeit not necessarily fully in line

with the hypotheses advanced in Section 2. In particular, both the synthesized value of the PCC and the combined *t* value weighted by research quality are not statistically different from zero in the case of outsider individual investors (for which hypothesis H2.1 predicted a negative performance effect) and commercial banks (for which hypothesis H2.2 envisaged a positive performance effect). Meanwhile, those of non-bank financial institutions and non-financial corporate owners that include company groups and holdings are positive and significant, which is consistent with hypotheses H2.2 and H2.3. Concerning insider ownership, managers largely outperform employees both in the effect size (0.110 vs. 0.039) and statistical significance (5.001 vs. 2.725). Again, this difference in the effect of the two groups of insiders is in line with our previous discussion and hypotheses H4.1 and H4.2, albeit for insider ownership we expected no effect on firm performance.

The above findings are profoundly interesting for understanding the relationship between ownership structure and firm performance, both in Russia and more broadly. Traditional meta-synthesis, however, does not take into account the possible heterogeneity of literature. As a next step, we will test whether the results of the meta-synthesis reported in **Table 4** and **Figure 6** can be reproduced simultaneously while controlling for various study conditions.

4.3. Meta-regression Analysis

In this subsection, we estimate a meta-regression model designed to control factors that may cause heterogeneity in the preceding studies. We introduce the PCC or the *t* value into the left-hand side of the regression equation defined in Eq. (3), while on the right-hand side, we adopt a total of 43 meta-independent variables. As **Table 5** shows, in the course of MRA, along with the divergence of ownership variable types, we take into consideration differences in other characteristics of ownership variables, the benchmark index of firm performance variables, the target industry, the type and information source of data used for estimation, the estimation period, the estimator, the treatment for endogeneity between dependent variables and ownership variables, the equation type, and control variables that may strongly influence the estimation results, as well as the degree of freedom and the quality level of the study.

The estimation results are reported in **Table 6**. Here, the types of ownership variables correspond with the aggregated category in **Figure 4**, and *all state* is selected as the default category. With reference to unbalanced panel regression models [6] and [12], the Hausman test, which compares fixed with random effects, does not reject the

null hypothesis in either case, and, hence, we report the random-effects models. The Breusch-Pagan test, however, does not reject the null hypothesis that the variance of the individual effects is zero. Therefore, the estimation results of models [6] and [12] are rarely different from those of OLS models [1] and [7], respectively. The WLS models are sensitive to the analytical weights chosen. Nevertheless, some variables are repeatedly estimated at significance levels of 10% or less.

In Panel (a) of **Table 6**, the meta-independent variables that capture differences in ownership variable types are significantly estimated with a positive sign in four or five models, suggesting that the effect sizes of all three kinds of private ownership are robustly higher than that of the state. Again, this is in line with our hypotheses outlined in Section 2. The coefficients of foreign investors and all insiders are positive and almost on a par with each other. From this viewpoint, all domestic outsider investors lag behind these two types of private owners. These results imply the inferiority of outsider investors to foreign investors and insiders as reformers of Russian companies in the post-privatization period.

The gap between different corporate ownerships becomes more distinct when they are compared to each other in terms of the statistical significance of their impact on firm performance and restructuring. In fact, according to Panel (b) of **Table 6**, the meta-independent variables of foreign investors and all insiders show a positive and significant estimate in all six models. Furthermore, the coefficient of foreign investors exceeds that of all insiders in every case.[9] Again, this is broadly consistent with our discussion and hypotheses presented in Section 2. On the other hand, the coefficient of all domestic outsider investors is also estimated with a positive sign but is insignificant in the three models. Therefore we cannot affirm that, on average, domestic outsider investors are statistically different from the state in terms of *t* values.

We also estimated Eq. (3) using the basic category of ownership variables. **Table 7** shows the results. Here, whole state is utilized as the default category. In Panel (a) of the table, we confirm that, among domestic outsider investors, whole domestic outsider investors, whole domestic financial institutions, domestic non-bank financial institutions, and domestic company groups and holdings are robustly higher than whole state in terms of the effect size. Foreign investors and managers are also given a significant and positive estimate in four or five models. On the other hand, the

[9] The Wald test rejects the null hypothesis that the coefficients of foreign investors and all insiders are equal at a significance level of 5% in all six models.

coefficient of domestic outsider individual investors, whole domestic outsider institutional investors, domestic banks, other domestic non-financial companies, whole insiders, and employees are insignificant in four or more models. In regard to the statistical significance of collected estimates, only four categories of private entities, consisting of whole domestic outsider investors, domestic non-bank financial institutions, foreign investors, and managers, exhibit robust and positive estimates in Panel (b) of **Table 7**. As compared to the previously reported estimates, the effect of employee ownership becomes mostly insignificant, which corresponds well to our hypothesis H4.2. Another interesting finding is the insignificance of ownership by banks, which confirms the previously reported results. The fact that we do not find ownership by banks to have any effect on firm performance while we establish a positive effect for ownership by other financial institutions is rather unexpected; most of the literature does find such ownership to have a positive performance effect. However, our finding is broadly in line with new evidence that casts some doubt on the effectiveness of bank ownership in emerging markets (e.g., Luo et al., 2011).

In summary, the estimation results of meta-regression models that control for heterogeneity among the preceding studies are largely consistent with the results of the meta-synthesis described in the previous subsection. Before interpreting the major findings in this section, we will conduct the final step of meta-analysis: tackling the issue of publication selection bias.

5. Assessment of Publication Selection Bias

5.1. Methodology

To examine publication selection bias, we use the funnel plot and the Galbraith plot. We also estimate a meta-regression model that is designed especially for this purpose. If the funnel plot is not bilaterally symmetrical but is 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 (i.e., estimates with an expected sign) are more frequently published (type I publication selection bias). Meanwhile, the Galbraith plot is utilized for testing another arbitrary manipulation, in the sense that estimates with higher statistical significance are more frequently published, irrespective of their sign (type II publication selection bias). In general, the statistic, $|(\text{the } k-\text{th estimate} - \text{the true effect})/SE_k|$, should not exceed the critical value of ±1.96 by more than 5% of the total estimates. In other words, when the true effect does not exist, and there is no

publication selection, the reported *t* values should vary randomly around zero, and 95% of them should be within a range of ±1.96. The Galbraith plot tests whether the above relationship can be observed in the statistical significance of the collected estimates, thereby identifying the presence of type II publication selection bias.

In addition to the two scatter plots mentioned above, we also conduct estimations of the meta-regression models, which have been developed to examine in a more rigorous manner the two types of publication selection bias and the presence of the true effect.

We can test for type I publication selection bias by regressing the *t* value of the *k*-th estimate on the inverse of the standard error (1/*SE*) using the following equation:

$$t_k = \beta_0 + \beta_1(1/SE_k) + v_k, \quad (4)$$

thereby testing the null hypothesis that the intercept term β_0 is equal to zero. In Eq. (4), v_k is the error term. When the intercept term β_0 is statistically significantly different from zero, we can interpret the distribution of the effect sizes as being asymmetrical. For this reason, this test is called *the funnel asymmetry test* (FAT). Meanwhile, type II publication selection bias can be tested by estimating the next equation, where the left side of Eq. (4) is replaced with the absolute *t* value:

$$|t_k| = \beta_0 + \beta_1(1/SE_k) + v_k\,, \quad (5)$$

thereby testing the null hypothesis of $\beta_0 = 0$ in the same way as the FAT.

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 the coefficient β_1 is equal to zero in Eq. (4). The rejection of the null hypothesis implies the presence of a genuine effect. They called this test *the precision-effect test* (PET). Moreover, they also stated that an estimate of the publication-selection-bias-adjusted effect size can be obtained by estimating the following equation that has no intercept:

$$t_k = \beta_0 SE_k + \beta_1(1/SE_k) + v_k, \quad (6)$$

thereby obtaining the coefficient β_1. This means that if the null hypothesis of $\beta_1 = 0$ is rejected, then the non-zero effect does actually exist in the literature, and the coefficient β_1 can be regarded as its estimate. Stanley and Doucouliagos (2012) called this procedure *the precision-effect estimate with standard error* (PEESE) approach. To test the robustness of the regression coefficient, we estimate Eqs. (4) to (6) above using not only the OLS estimator but also the cluster-robust OLS estimator and the unbalanced

panel estimator,[10] both of which treat possible heterogeneity among the studies.

As mentioned above, we basically follow the FAT-PET-PEESE approach advocated by Stanley and Doucouliagos (2012) as test procedures for publication selection bias. However, as our first step, we also test for type II publication selection bias using Eq. (5), as this kind of bias is very likely in the literature regarding transition economies.

5.2. Results

Figure 7 illustrates a funnel plot of PCCs against the respective inverse of the standard errors by the aggregated category of ownership variables. Panel (b) of this figure shows a bilaterally symmetric and inverted funnel-shaped distribution in both cases when either zero or the mean value of the top 10 percent most-precise estimates (0.0195) is used as an approximate value of the true effect, suggesting that the type I publication selection bias is unlikely to occur in empirical evidence regarding the ownership effect of domestic outsider investors on firm performance and restructuring.[11] Similar characteristics can be confirmed in Panel (b) of the same figure, which is based on the estimates of insider ownership. In contrast, Panel (c) displays an asymmetric distribution of PCCs irrespective of the assumption of the true effect, thus, strongly suggesting the presence of type I publication selection bias in the collected estimates of foreign ownership. According to Panel (a) of this figure, the same type of bias is also highly likely in the case of state ownership, if we assume that the true effect is zero.

The Galbraith plots of *t* values and the corresponding inverse of the standard errors are represented in **Figure 8**. From this figure, we can confirm that, in all cases, far more than 5% of the estimates are out of the range of ±1.96 or the two-sided critical values of the 5% significance level.[12] This tendency is especially notable in the case of foreign investors. In addition, even if we assume that the mean value of the top 10 percent most-precise estimates stands for the true effect, we can still find a clear excess of estimates

[10] To estimate Eqs. (4) and (5), we use either the cluster-robust random-effects estimator or the cluster-robust fixed-effects estimator according to the results of the Hausman test of the random-effects assumption. With regard to Eq. (6), which does not have an intercept term, we report the random-effects model estimated by the maximum likelihood method.

[11] The method for assuming the mean of the top 10% most-precise estimates is the approximate value of the true effect along the lines of Stanley (2005).

[12] In fact, the percentage share of estimates in which the respective absolute *t* values are equal to or exceed 1.96 with regard to all state, all domestic outsider investors, foreign investors, and all insiders accounts for 16.8%, 19.4%, 54.9%, and 34.0%, respectively, and the null hypothesis that the rate is 5.0% is strongly rejected by the proportion test in all four cases.

for which the statistic $|(\text{the } k-\text{th estimate} - \text{the true effect})/SE_k|$ transcends the critical value of 1.96. Actually, the rate based on the estimates of state ownership accounts for 30.4%, and the corresponding rates are 18.6% for domestic outsider ownership, 55.9% for foreign ownership, and 19.1% for insider ownership.[13] Accordingly, regardless of the differences in ownership types, the likelihood of type II publication selection bias can be regarded as being very high in this study area.

Table 8 reports the estimation results of the meta-regression models specially designed to examine publication selection bias and the presence of genuine empirical evidence. In Panel (a) of the table, the null hypothesis that the intercept term (β_0) is zero in Eq. (4) is rejected at the 1% significance level in Models [1] to [3], indicating the strong presence of the type I publication selection bias in the empirical evidence of state ownership. From Models [4] to [12], all of the cluster-robust OLS and unbalanced panel models accept the null hypothesis. These results suggest that arbitrary manipulation to report evidence in favor of a specific conclusion is improbable in the study of private ownership including foreign investors. With respect to type II publication selection bias, Panel (b) indicates its likelihood, except for foreign investors, because two or three models reject the null hypothesis that the intercept term, (β_0) in Eq. (5), is equal to zero using estimates of all state, and all domestic outsider investors, as well as all insiders.

Furthermore, according to Panel (c) of **Table 8**, the coefficient of the inverse of the standard error (β_1) in Eq. (6) is estimated with statistical significance at the 1% level in Models [25], [26], and [27], suggesting that the extant literature listed in **Table 3** may include genuine evidence concerning the effect of state ownership. We obtained the same results with regard to foreign investors and all insiders. However, in Panel (a) of the same table, the null hypothesis that the coefficient of the inverse of the standard error (β_1) is zero in Eq. (4) is not rejected by two or more models in the case of these two kinds of private ownership as in the case of all domestic outsider investors. Therefore, we cannot adopt the coefficient β_1 of Eq. (6) as the publication-bias-adjusted effect size for foreign investors and insiders. With respect to state ownership, we can say that the non-zero effect does exist, and its value may range between -0.0602 and -0.0589.

Table 9 summarizes the above findings. It also reports test results by the basic category of ownership variables. As shown in this table, the funnel asymmetry test (FAT)

[13] The proportion test rejected the null hypothesis that estimates in which the statistic $|(\text{the } k-\text{th estimate} - \text{the true effect})/SE_k|$ exceeds the critical value of 1.96 account for 5% of the all estimates, not depending on the ownership type.

rejects the null hypothesis in six of 18 cases, while the test for type II publication selection bias does so in 11 cases. The precision-effect estimate with standard error (PEESE) indicates that the collected estimates contain non-zero genuine evidence for 11 cases. However, the precision-effect test (PET) proves that the publication-bias-adjusted effect size cannot be adopted for domestic non-bank financial institutions and managers or foreign investors and all insiders, as mentioned above. To identify the truth effect of post-privatization ownership on firm performance and restructuring in Russia, the further accumulation of highly precise estimates is required.

6. Conclusions

In this paper, based on a total of 877 estimates collected from 29 previous studies, we carried out a meta-analysis to examine the effect of the ownership structure on firm performance and restructuring in Russia. The results of the meta-synthesis and MRA conducted in Section 4 indicate that it is likely that the Russian government negatively affected company management, regardless of administrative level. In fact, as a whole, the previous studies reported a negative and statistically significant impact of state ownership.

On the other hand, the preceding studies demonstrated that private ownership is positively associated with performance and the restructuring of Russian companies as a whole. However, it is also suggested that the effect size and statistical significance are remarkably varied among different types of owners. We found that insider ownership is comparable with foreign investors in terms of effect size, while domestic outsider investors also exhibit a positive impact on their own companies, but their effect size is much smaller than those of insiders and foreign owners. With respect to the statistical significance of the empirical evidence, foreign investors are superior to domestic owners by a large margin. Moreover, it is possible that domestic outsider investors are not significantly different from the state in terms of this aspect.

Referring to the results of the meta-analysis based on the basic category of ownership variables, we also found that Russian individual investors and commercial banks could not reform their companies effectively. In contrast, it is highly probable that domestic non-bank financial institutions and company groups and holdings promoted their invested firms successfully. Concerning insider ownership, it has been proven that managerial ownership is favorable for promoting firm performance and restructuring and greatly outperforms employee ownership from this point of view.

In the context of the Russian economy, but also more broadly, we interpret the above results as follows:

First, privatization seems to have been a success story in the sense of improved firm performance. Our analysis is, thus, in line with the bulk of previous studies that document the detrimental effects of government ownership on firms at various levels of governments. However, our findings still do not go so far as to praise Russian privatization, as it might have had negative impacts along other socio-economic dimensions, including unemployment, income inequality, or even mortality—issues that are still heavily debated (Stuckler et al., 2009).

Second, our analysis shows that employee ownership, while extremely unstable, is not necessarily detrimental to firm performance, and managerial ownership is strongly associated with improved firm performance. Thus, the Yeltsin government's reliance on insider privatization in the early 1990s, which at the time was largely driven by political considerations as well as by the lack of outside buyers, does not appear to be a major fault of the reform program.

Third, we document a strong effect of foreign ownership on firm productivity. Again, this result is consistent with the findings in the literature that foreign investors from technologically more advanced countries play an important positive role in a restructuring economy. This finding may be important in the light of the current debate in the country regarding possible directions of economic, social, and political developments, including the country's openness to the world.

A number of caveats are due. Despite our focus on the largest transition economy, which has been studied more than other countries of the CEE region, the number of high-quality works is still limited and does not allow analysis over time. Thus, we cannot say much about changes in the nature of the ownership-performance relationship over the last decades, although such changes are very likely due to the evolution of Russia's institutional environment. In particular, Russia has made good progress in shaping its institutions of corporate governance over the last 20 years, especially in terms of legal protection, which was virtually absent in the 1990s.

Next, the results may partially reflect the difficulties of tracing true ownership structures in the surveyed empirical studies. This is a general problem stemming from less-than-perfect ownership transparency in Russia. It mainly manifests itself in the common use of nominees (Gugler et al., 2014) and complicated ownership arrangements, such as pyramids and cross-ownership, making it extremely difficult to identify the

ultimate owners (Chernykh, 2008). Whether and how the surveyed research works were able to deal with this problem is beyond the scope of our analysis.

We also acknowledge that endogeneity and selectivity issues in the original papers that we surveyed may potentially impact our results. Although the view of Russian privatization as a natural experiment is appealing—and indeed, details of the privatization program coupled with enterprise characteristics often predetermined the post-privatization ownership structure—selection issues (e.g., "cherry picking" by foreign investors) cannot be ruled out completely. Not all of the studies that we surveyed acknowledged this issue, and only a few attempted to explicitly take it into account, e.g., by using instrumental variable techniques.

Nevertheless, we believe that the results of the meta-analysis in this paper provide valuable insight into the consequences of Russian privatization—an unprecedented social experiment in world economic history—as well as into the general controversy over the economic consequences of various forms and patterns of ownership. However, as the existing literature does not contain genuine evidence for a series of ownership types, which we document in the publication selection bias analysis, further research may be necessary to bring the controversy to a final conclusion.

APPENDIX
Method for Evaluating the Quality Level of a Study

This appendix describes the evaluation method used to determine the quality level of the studies subjected to our meta-analysis.

For journal articles, we used the rankings of economics journals published as of November 1, 2012, by IDEAS—the largest bibliographical database dedicated to economics and available freely on the Internet (http://ideas.repec.org/)—as the most basic information source for our evaluation of quality level. IDEAS provides the world's most comprehensive ranking of economics journals, and as of November 2012, 1173 academic journals were ranked.

We divided these 1173 journals into 10 clusters, using a cluster analysis based on overall evaluation scores, and assigned each of these journal clusters a score (weight) from 1 (the lowest journal cluster) to 10 (the highest).

For academic journals that are not ranked by IDEAS, we referred to the Thomson Reuters Impact Factor and other journal rankings and identified the same level of IDEAS ranking-listed journals that correspond to these non-listed journals; we have assigned each of them the same score as its counterparts.

Meanwhile, for academic books and book chapters, we have assigned a score of 1, in principle; however, if at least one of the following conditions is met, each of the relevant books or chapters uniformly received a score of 4, which is the median value of the scores assigned to the above-mentioned IDEAS ranking-listed economics journals: (1) The academic book or book chapter clearly states that it has gone through the peer review process; (2) its publisher is a leading academic publisher that has external evaluations carried out by experts; or (3) the research level of the study has been evaluated by the authors as being obviously high.

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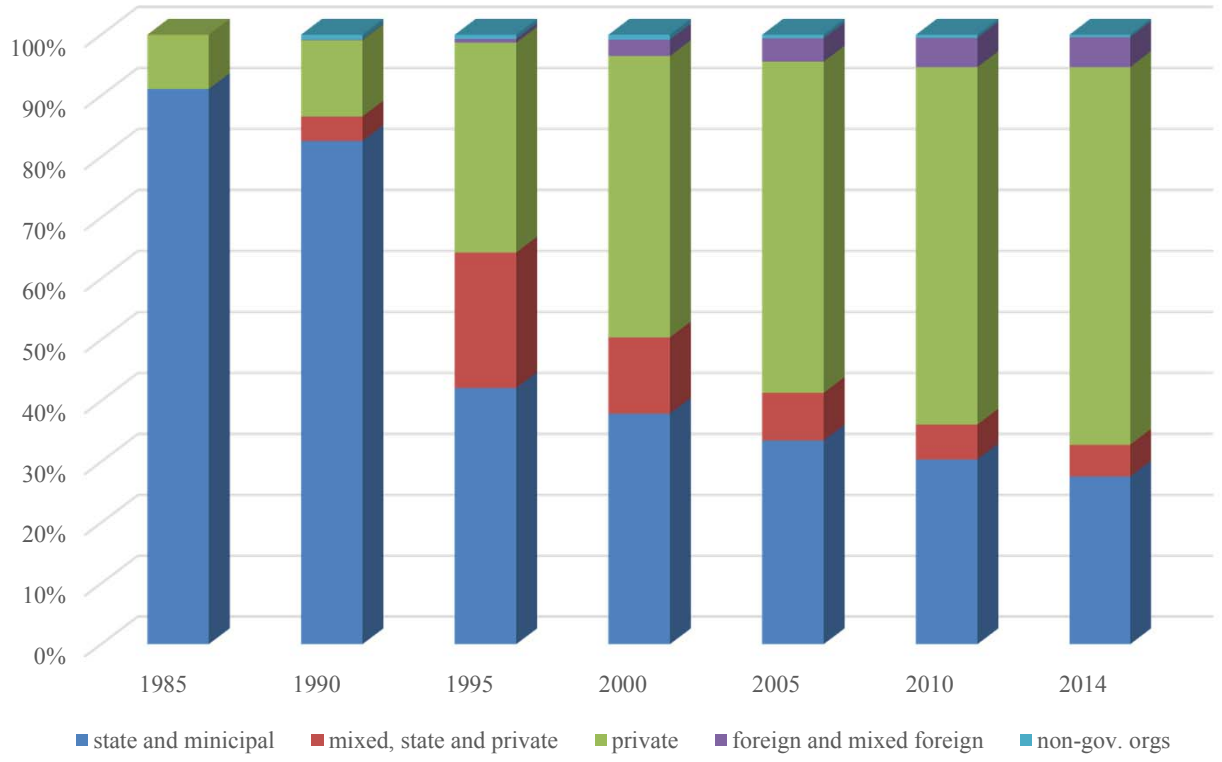
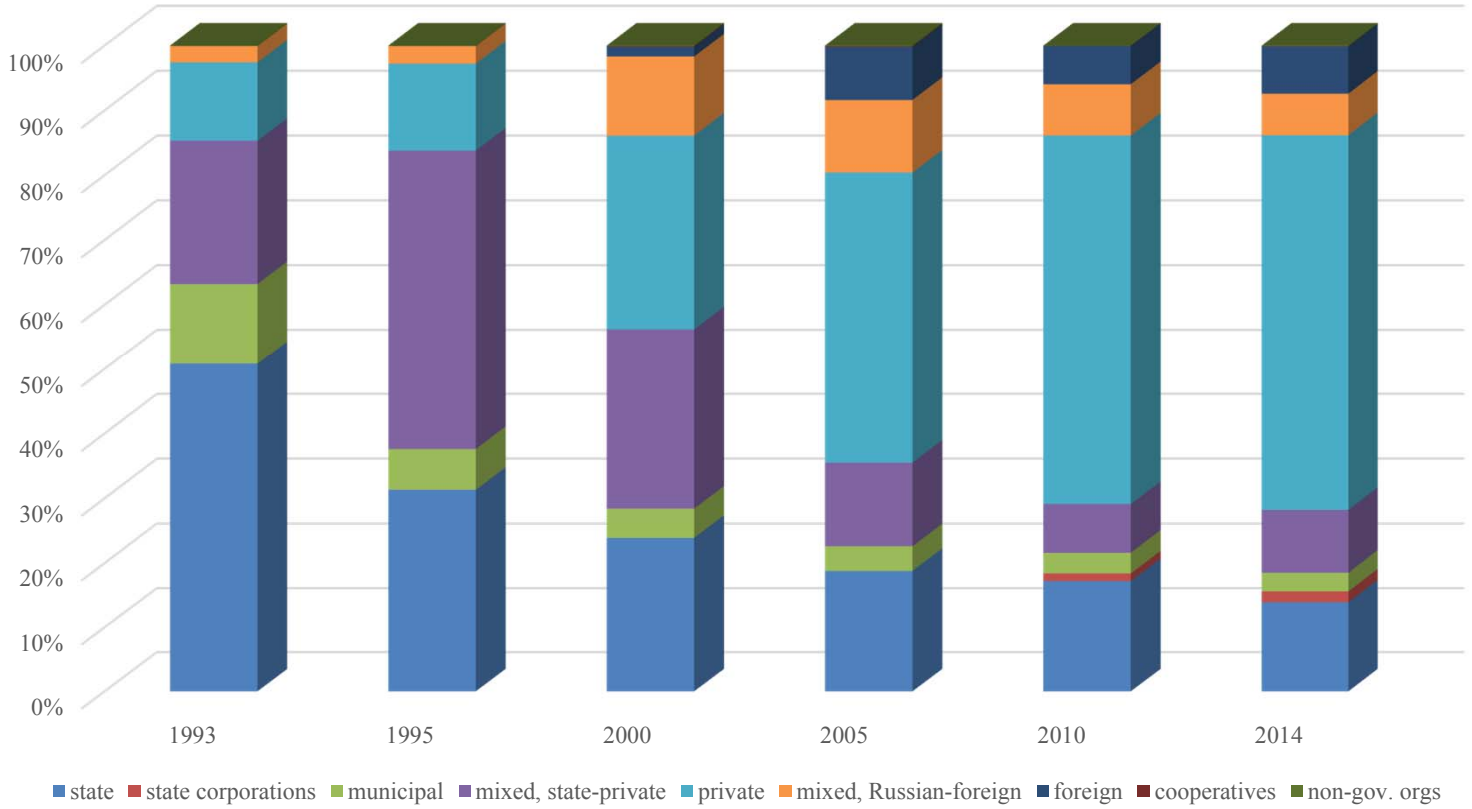
Figure 1. The dynamics of employment by sectors, 1985–2014: Share of sectors in total employment (%)



Source: Authors' illustration based on data from the Russian Statistical Agency (Rosstat)

Figure 2. The dynamics of investment by sector, 1993–2014: Investmant in fixed assets by sector (% of total investment)



Source: Authors' illustration based on data from the Russian Statistical Agency (Rosstat)

Table 1. Dynamics of ownership by shareholder identity—industrial companies

Group of owners/Year	Cumulative ownership stake of the group				
	1995	2001	2007	2011	2013
Insiders, including	**54**	**50**	**51**	**48**	**59**
Managers	11	19	35	41	47
Employees	43	28	13	5	9
Subsidiary firms	n/a	3	3	2	3
Outsiders, including	**37**	**42**	**40**	**43**	**34**
Individuals	11	22	13	20	10
Other enterprises	16	12	18	14	7
Commersial banks	1	1	2	0	2
Investment funds	4	3	0	0	0
Holding companies	4	4	6	6	15
Foreign investors	1	0	0	3	0
Government	**9**	**7**	**9**	**9**	**7**
Total	100	100	100	100	100
Sample size	136	154	102	87	49

Sources: Aukutsionek et al. (2011; 2013)

Table 2. Dynamics of ownership concentration—publicly traded companies

Ownership stake of the largest shareholder/Year	Percent of firms in each category of ownership concentration				
	1995-1997	2000-2002	2010	2012	2015
Less than 25%	29	15	13	8	5
Between 25% and 50%	26	38	27	32	22
Above 50%	45	47	60	60	73
Direct and indirect government ownership above 50%	39	34	33	30	28
Sample size	303	435	90	131	120

Sources: The 1995–1997 data are extracted from the database used in Kuznetsov and Muravyev (2001). The 2000–2002 data are based on Chernykh (2008). The data from 2010 are taken from Standard & Poor's (2010). The 2012 and 2015 data are from Deloitte (2016).

Table 3. List of selected studies subject to meta-analysis and breakdown of collected estimates by target industry, estimation period, firm performance variable type, ownership variable type, and number of collected estimates

Author(s) (publication year)	Target industry	Estimation period	Firm performance variable type (dependent variable)[a]	Owernship variable type (independent variable)[b]	Number of collected estimates
Barberis et al. (1996)	Services	1992-1993	F	4, 14	24
Earle et al. (1996)	Mining and manufacturing	1994	A, E	4, 14, 15	21
Earle and Estrin (1997)	Mining and manufacturing	1994	A, B, F	4-6, 8, 9, 11-15	368
Jones (1998)	Various industries	1992-1996	A, B	1, 5, 8, 14, 15	42
Bevan et al. (2001)	Mining and manufacturing	2000	B, C, F	1, 4	10
Brown and Earle (2001)	Mining and manufacturing	1993-1999	A	12	6
Filatotchev et al. (2001)	Mining and manufacturing	1999	F	1, 4, 14	3
Kuznetsov and Muravyev (2001a)	Various industries	1995-1997	B-D	1	12
Kuznetsov and Muravyev (2001b)	Various industries	1995-1997	B-D	1, 4, 12, 13	42
Augelucchi et al. (2002)	Mining and manufacturing	2000	B, C, F	1, 4	10
Muravyev (2002)	Mining and manufacturing	1993-2000	B, C	1, 2	20
Perotti and Gelfer (2002)	Various industries	1995-1996	F	1, 8, 10	5
Guriev et al. (2003)	Mining and manufacturing	2001	F	4, 14	12
Yudaeva et al. (2003)	Mining and manufacturing	1996-1997	A	12	16
Guriev et al. (2004)	Mining and manufacturing	2001	F	4, 14	12
Guriev and Rachinsky (2004)	Mining and manufacturing	2000-2001	A-C	2, 3, 5, 12	48
Bhaumik and Estrin (2005)	Mining and manufacturing	1997-1999	A	1, 13	22
Brown et al. (2006)	Mining and manufacturing	1985-2002	A, B	12	5
Kuznetsov et al. (2006)	Mining and manufacturing	1999-2003	C, F	1, 7, 13	27
Sabirianova et al. (2006)	Mining and manufacturing	1992-2000	A	12	5
Bhaumik and Estrin (2007)	Mining and manufacturing	1997-1999	A	1, 13	5
Tytell and Yudaeva (2007)	Mining and manufacturing	1998-2002	A	12	1
Kuznetsov et al. (2008)	Mining and manufacturing	1999-2003	C, F	1, 7, 13	36
Avdasheva (2009)	Various industries	2001-2004	A, C, E, F	10, 14	18
Maury and Liljeblom (2009)	Various industries	1998-2003	D	1, 10, 12	28
Sabirianova et al. (2012)	Mining and manufacturing	1992-2000	A	12	23
Bogetic and Olusi (2013)	Mining and manufacturing	2003-2008	B	2, 3	4
Kapelyushnikov et al. (2013)	Mining and manufacturing	2009	F	1, 12, 14	24
Muravyev et al. (2014)	Various industries	1998-2009	C, D	1, 14	28

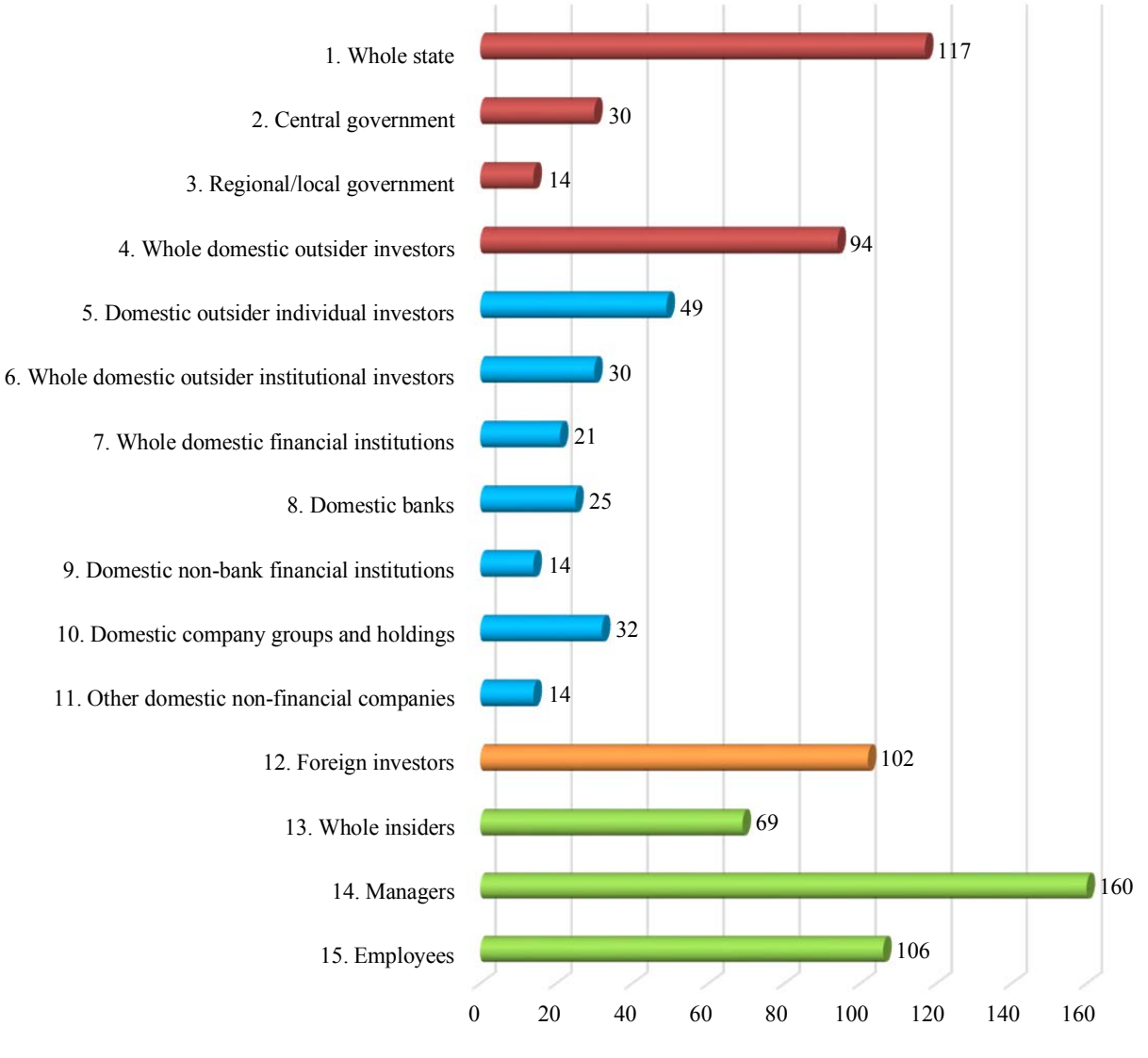
Notes:

[c] A: Sales and output; B: Efficiency; C: Productivity; D: Firm value; E: Export; F: Restructuring

[d] 1: Whole state; 2: Central government; 3: Regional/local government; 4: Whole domestic outsider investors; 5: Domestic outsider individual investors; 6: Whole domestic outsider institutional investors; 7: Whole domestic financial institutions; 8: Domestic banks; 9: Domestic non-bank financial institutions; 10: Domestic company groups and holdings; 11: Other non-financial companies; 12: Foreign investors; 13: Whole insiders; 14: Managers; 15: Employees

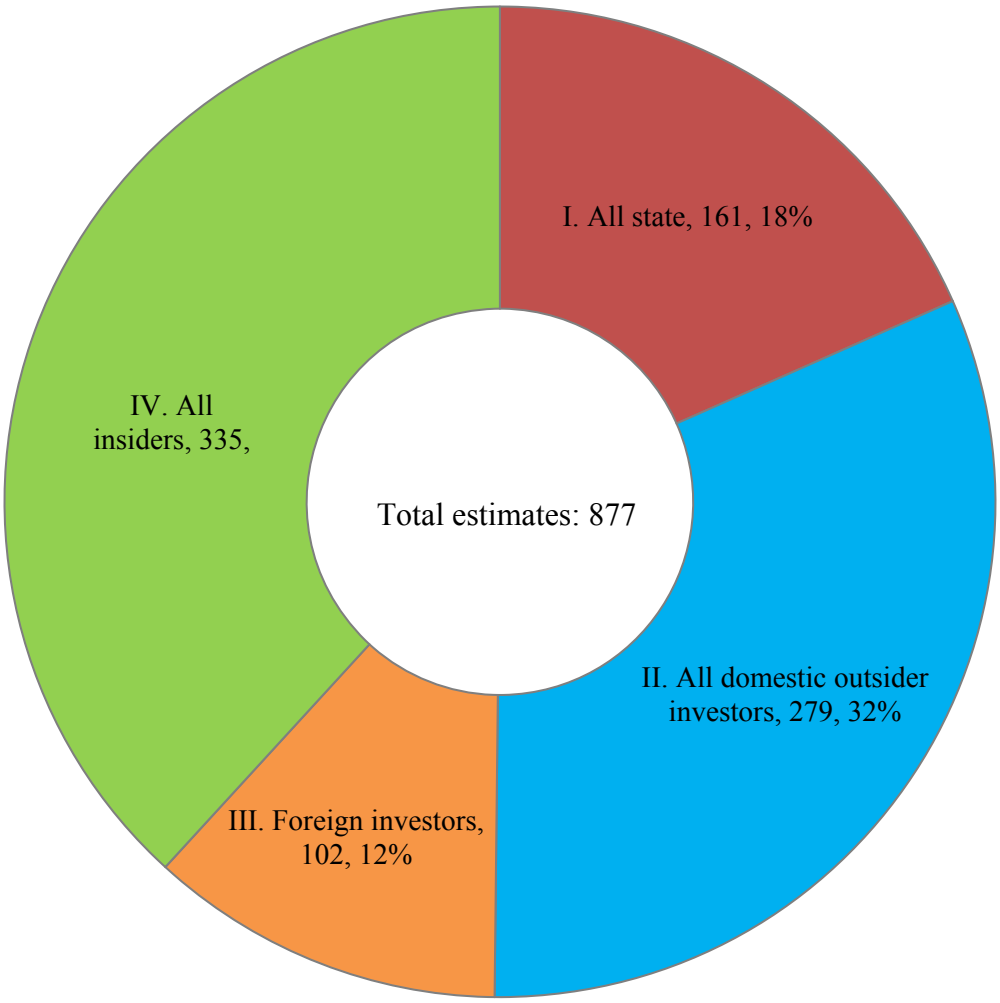
Source: Compiled by the authors

Figure 3. Breakdown of collected estimates by the basic category of ownership variable



Note: Total number of collected estimates is 877.
Source: Authors' illustration

Figure 4. Breakdown of collected estimates by aggregated category of ownership variable

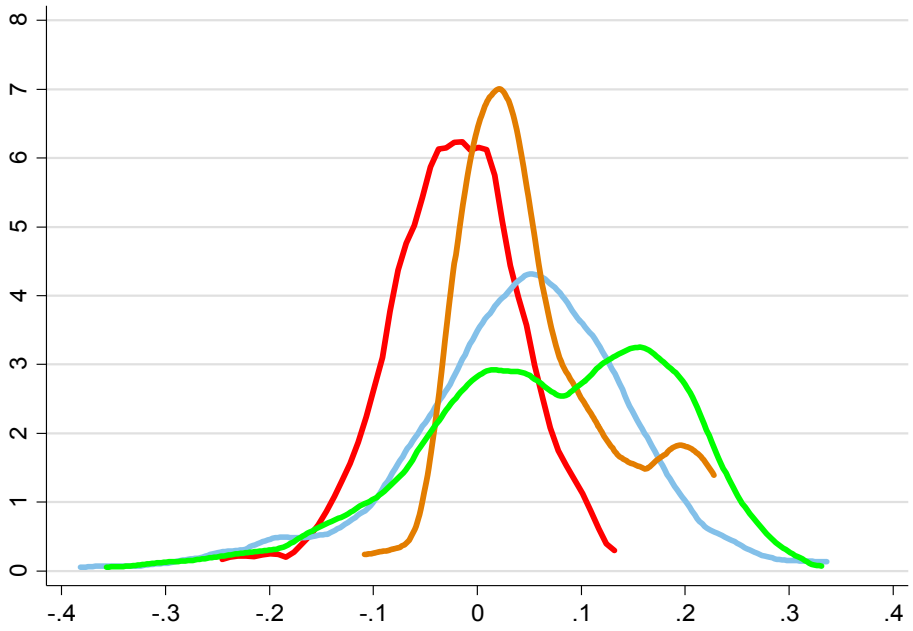


Note: Values following a category name denote the number of collected estimates and their share of total estimates.

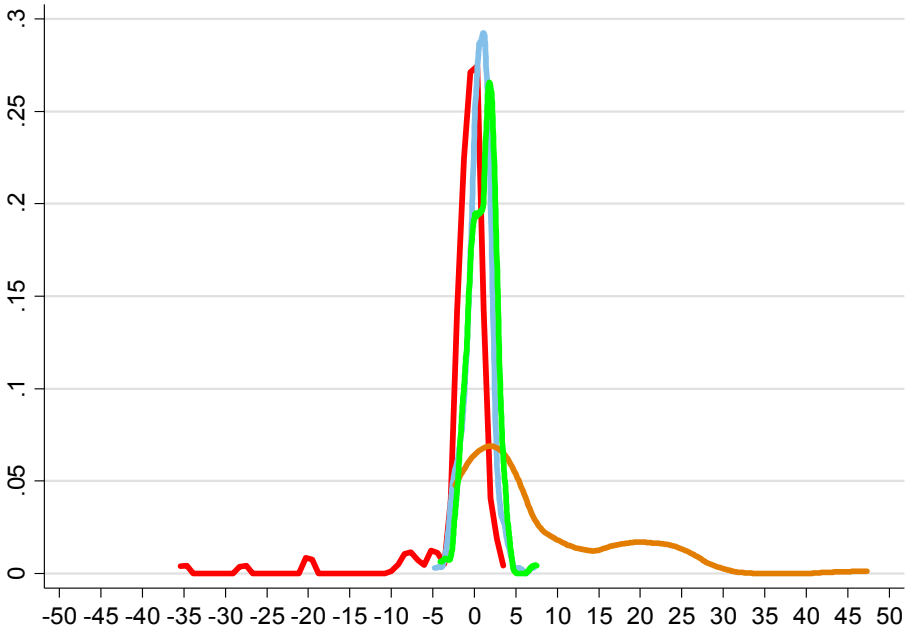
Source: Authors' illustration

Figure 5. Kernel density estimation of partial correlation coefficients and t values by the aggregated category of ownership variables

(a) PCC



(b) t value



All state (K=161)
All domestic outsider investors (K=279)
Foreign investors (K=102)
All insiders (K=335)

Note: Vertical axis is the kernel density. Horizontal axis is a variable value.
Source: Authors' illustrations

Table 4. Synthesis of estimates

Ownership variable type[a]	Number of estimates (K)	(a) Synthesis of PCCs			(b) Combination t values			
		Fixed-effect model (z value)[b]	Random-effects model (z value)[b]	Test of homogeneity[c]	Unweighted combination (p value)	Weighted combination (p value)	Median t values	Failsafe N *(fsN)*
I. All state	161	-0.057 *** (-52.34)	-0.029 *** (-7.78)	655.934 ***	-16.771 *** (0.00)	-4.581 *** (0.00)	-0.400	16573
1. Whole state	117	-0.036 *** (-9.02)	-0.018 *** (-2.79)	250.181 ***	-4.937 *** (0.00)	-1.161 (0.12)	-0.126	937
2. Central government	30	-0.046 *** (-29.94)	-0.038 *** (-7.70)	126.621 ***	-16.577 *** (0.00)	-16.577 *** (0.00)	-1.230	3016
3. Regional/local government	14	-0.074 *** (-44.07)	-0.040 *** (-4.20)	98.917 ***	-18.334 *** (0.00)	-18.334 *** (0.00)	-1.450	1725
II. All domestic outsider investors	279	0.034 *** (8.96)	0.039 *** (6.37)	648.159 ***	9.425 *** (0.00)	2.544 *** (0.01)	0.630	8879
4. Whole domestic outsider investors	94	0.050 *** (7.89)	0.055 *** (6.96)	135.664 ***	8.582 *** (0.00)	2.140 ** (0.02)	1.010	2465
5. Domestic outsider individual investors	49	-0.026 *** (-3.20)	-0.016 (-1.22)	103.264 ***	-2.015 ** (0.02)	-0.866 (0.19)	0.127	25
6. Whole domestic outsider institutional investors	30	0.002 (0.17)	0.002 (0.08)	110.221 ***	0.155 (0.44)	0.155 (0.44)	0.545	-30
7. Whole domestic financial institutions	21	0.006 (0.26)	0.006 (0.26)	6.783	0.189 (0.43)	0.041 (0.48)	0.014	-21
8. Domestic banks	25	0.013 (0.74)	0.020 (0.89)	39.256 **	1.315 * (0.09)	0.399 (0.34)	-0.234	-9
9. Domestic non-bank financial institutions	14	0.134 *** (6.79)	0.134 *** (6.79)	5.920	6.714 *** (0.00)	6.714 *** (0.00)	1.773	219
10. Domestic company groups and holdings	32	0.087 *** (9.25)	0.083 *** (4.40)	112.788 ***	8.591 *** (0.00)	1.358 * (0.09)	1.777	841
11. Other domestic non-financial companies	14	0.036 * (1.81)	0.036 * (1.81)	6.340	1.686 ** (0.05)	1.686 ** (0.05)	0.462	1
III (12). Foreign investors	102	0.031 *** (69.25)	0.064 *** (13.33)	8485.125 ***	69.288 *** (0.00)	10.123 *** (0.00)	2.581	180859
IV. All insiders	335	0.065 *** (17.87)	0.069 *** (11.63)	841.854 ***	17.895 *** (0.00)	5.190 *** (0.00)	1.250	39309
13. Whole insiders	69	0.012 (1.38)	0.010 (0.85)	121.623 ***	0.987 (0.16)	0.292 (0.39)	-0.015	-44
14. Managers	160	0.095 *** (19.68)	0.110 *** (12.85)	455.855 ***	20.793 *** (0.00)	5.001 *** (0.00)	2.032	25405
15. Employees	106	0.037 *** (5.16)	0.039 *** (4.32)	167.987 ***	5.469 *** (0.00)	2.725 *** (0.00)	0.769	1066

Notes:

[a] Ownership variable types with Arabic numerals belong to the basic category, while those with Roman numerals belong to the aggregated category.

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

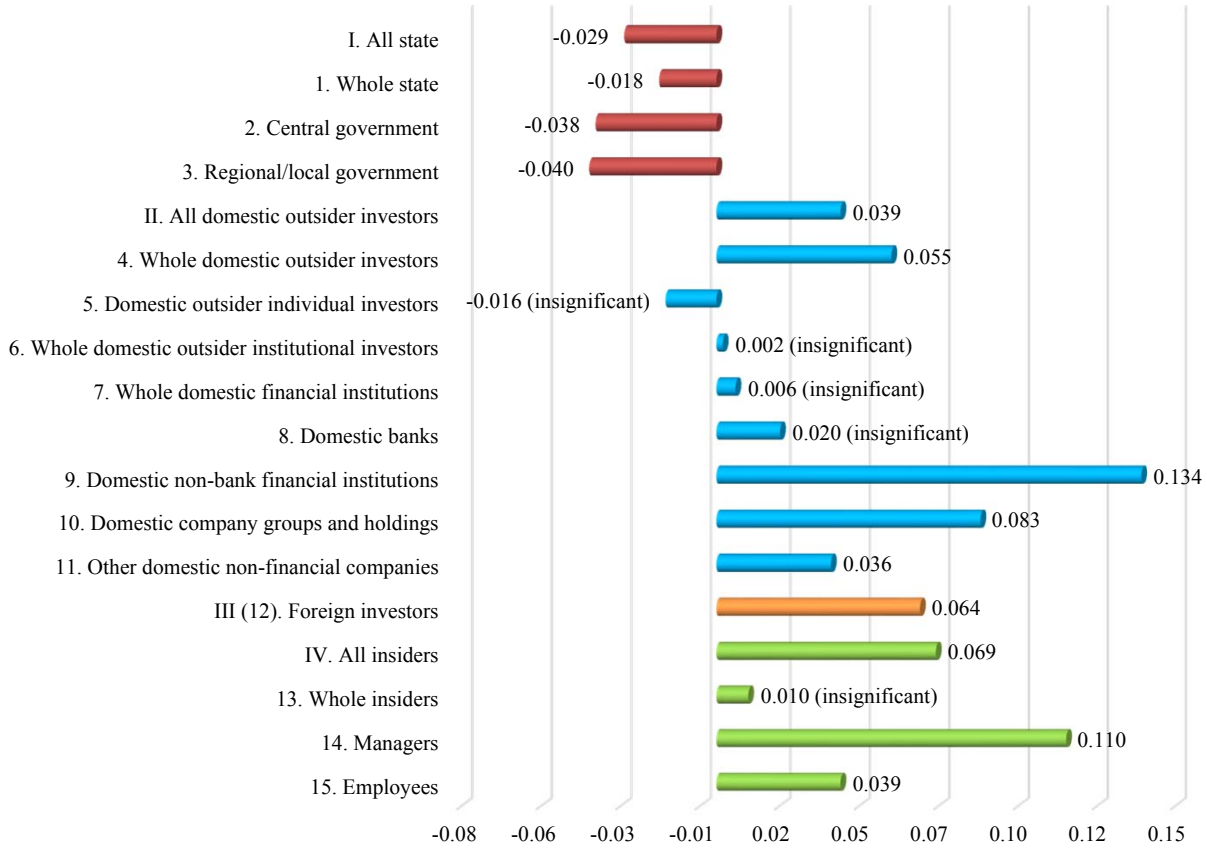
[c] Null hypothesis: Effect sizes are homogeneous.

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

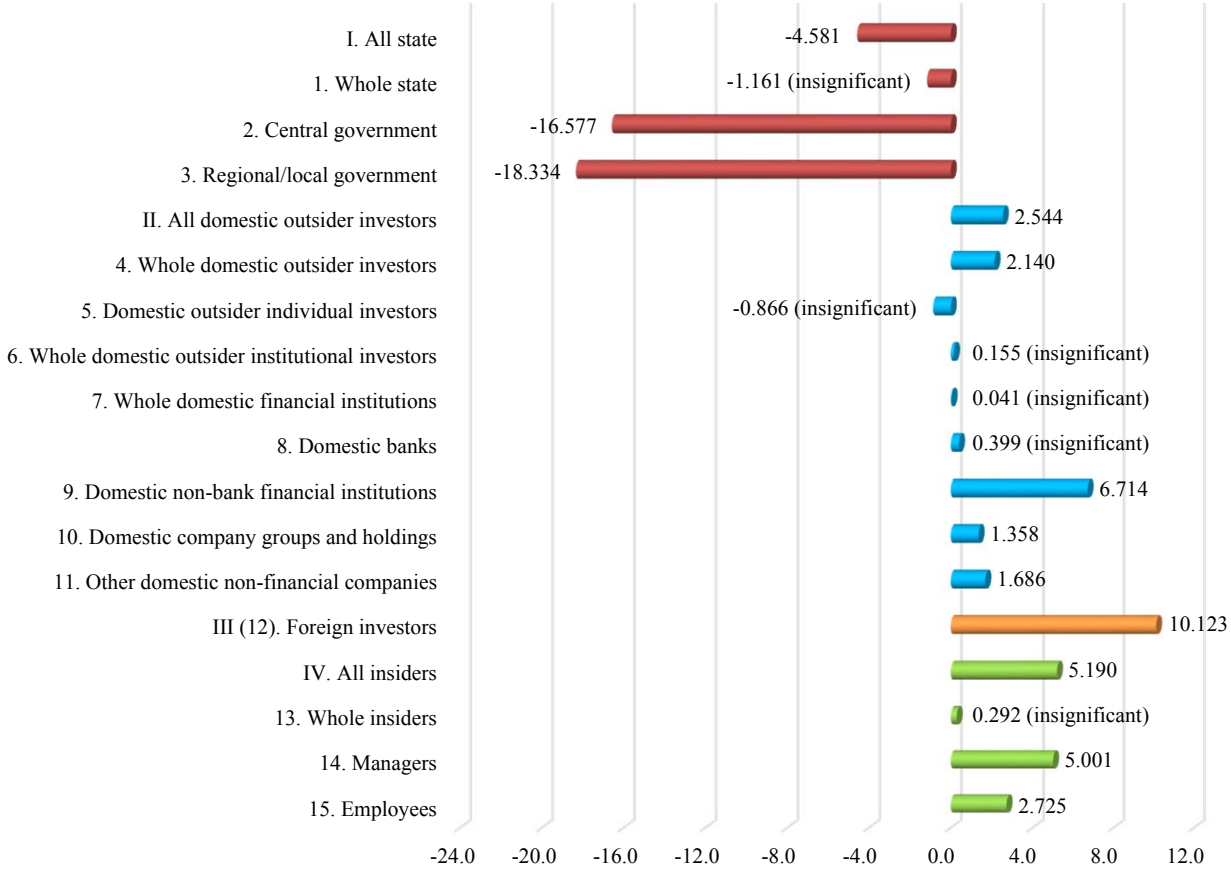
Source: Authors' estimations

Figure 6. Illustrated comparison of synthesized estimates

(a) Synthesized value of PCCs



(b) Combined t value weighted by research quality



Note: Ownership variable types with Arabic numerals belong to the basic category, while those with Roman numerals belong to the aggregated category.

Source: Authors' illustration based on Table 2

Table 5. Name, definition, and descriptive statistics of meta-independent variables

Variable name	Definition	Descriptive statistics		
		Mean	Median	S.D.
All domestic outsider investors	1 = if the ownership variable used for estimation belongs to the aggregated category of all domestic outsider investors, 0 = otherwise	0.318	0	0.466
Foreign investors	1 = if the ownership variable used for estimation belongs to the category of foreign investors, 0 = otherwise	0.116	0	0.321
All insiders	1 = if the ownership variable used for estimation belongs to the aggregated category of all insiders, 0 = otherwise	0.382	0	0.486
Central government	1 = if the ownership variable used for estimation belongs to the basic category of central government, 0 = otherwise	0.034	0	0.182
Regional/local government	1 = if the ownership variable used for estimation belongs to the basic category of regional/local government, 0 = otherwise	0.016	0	0.125
Whole domestic outsider investors	1 = if the ownership variable used for estimation belongs to the basic category of whole domestic outsider investors, 0 = otherwise	0.107	0	0.310
Domestic outsider individual investors	1 = if the ownership variable used for estimation belongs to the basic category of domestic outsider individual investors, 0 = otherwise	0.056	0	0.230
Whole domestic outsider institutional investors	1 = if the ownership variable used for estimation belongs to the basic category of whole domestic outsider institutional investors, 0 = otherwise	0.034	0	0.182
Whole domestic financial institutions	1 = if the ownership variable used for estimation belongs to the basic category of whole domestic financial institutions, 0 = otherwise	0.024	0	0.153
Domestic banks	1 = if the ownership variable used for estimation belongs to the basic category of domestic banks, 0 = otherwise	0.029	0	0.167
Domestic non-bank financial institutions	1 = if the ownership variable used for estimation belongs to the basic category of domestic non-bank financial institutions, 0 = otherwise	0.016	0	0.125
Domestic company groups and holdings	1 = if the ownership variable used for estimation belongs to the basic category of domestic company groups and holdings, 0 = otherwise	0.036	0	0.188
Other domestic non-financial companies	1 = if the ownership variable used for estimation belongs to the basic category of other domestic non-financial companies, 0 = otherwise	0.016	0	0.125
Whole insiders	1 = if the ownership variable used for estimation belongs to the basic category of whole insiders, 0 = otherwise	0.079	0	0.269
Managers	1 = if the ownership variable used for estimation belongs to the basic category of managers, 0 = otherwise	0.182	0	0.386
Emploees	1 = if the ownership variable used for estimation belongs to the basic category of employees, 0 = otherwise	0.121	0	0.326
Dummy-type variable	1 = if the ownership variable is a dummy variable, 0 = otherwise	0.528	1	0.500
Lagged variable	1 = if a lagged ownership variable is used for estimation, 0 = otherwise	0.005	0	0.067
With an interaction term(s)	1 = if estimation is carried out with an interaction term(s) of ownership variables, 0 = otherwise	0.120	0	0.325
Efficiency	1 = if efficiency is adopted as the benchmark index of firm performance variables, 0 = otherwise	0.279	0	0.449
Productivity	1 = if productivity is adopted as the benchmark index of firm performance variables, 0 = otherwise	0.100	0	0.301
Firm value	1 = if firm value is adopted as the benchmark index of firm performance variables, 0 = otherwise	0.066	0	0.249
Export	1 = if export activity is adopted as the benchmark index of firm performance variables, 0 = otherwise	0.015	0	0.121
Restructuring	1 = if restructuring intensity is adopted as the benchmark index of firm performance variables, 0 = otherwise	0.350	0	0.477
Mining and manufacturing industry	1 = if the target industry is the mining and manufacturing industry, 0 = otherwise	0.773	1	0.419
Service industry	1 = if the target industry is the service industry, 0 = otherwise	0.027	0	0.163
First year of estimation	First year of the estimation period	1995.812	1994	3.582
Length of estimation	Years of the estimation period	2.863	1	2.953
Cross-sectional data	1 = if the cross-sectional data are employed for empirical analysis, 0 = otherwise	0.753	1	0.432
Commercial database	1 = if the data employed for empirical analysis are based on a commercial database, 0 = otherwise	0.136	0	0.343
Original enterprise survey	1 = if the data employed for empirical analysis are based on an original enterprise survey, 0 = otherwise	0.778	1	0.416
FE	1 = if a fixed-effects panel estimator is used for the estimation, 0 = otherwise	0.070	0	0.255
RE	1 = if a random-effects panel estimator is used for the estimation, 0 = otherwise	0.047	0	0.211
GMM	1 = if a GMM estimator is used for the estimation, 0 = otherwise	0.001	0	0.034
Other estimators	1 = if an estimator other than OLS and the estimators above is used for the estimation, 0 = otherwise	0.083	0	0.276
IV/2SLS/3SLS	1 = if an instrumental variable method, 2SLS, or 3SLS is used for the estimation, 0 = otherwise	0.171	0	0.377
Translog model	1 = if a translog model is used for the estimation, 0 = otherwise	0.051	0	0.221
Treatment for selection bias	1 = if the estimation treats for the selection bias of privatized companies, 0 = otherwise	0.031	0	0.173
Market competition	1 = if the estimation simultaneously controls for the degree of market competition, 0 = otherwise	0.043	0	0.204
Location fixed effects	1 = if the estimation simultaneously controls for location fixed effects, 0 = otherwise	0.409	0	0.492
Industry fixed effects	1 = if the estimation simultaneously controls for industry fixed effects, 0 = otherwise	0.631	1	0.483
√‾Degree of freedom	The root of the degree of freedom of the estimated model	35.479	14.283	75.410
Quality level	The ten-point scale of the quality level of the study [a]	2.929	1	2.872

Note:

[a] See Appendix for more details.

Source: Authors' calculations

Table 6. Meta-regression analysis using an aggregated category of ownership variables

(a) Dependent variable — PCC

Estimator (Analytical weight in parentheses)	Cluster-robust OLS	Cluster-robust WLS [Quality level]	Cluster-robust WLS [N]	Cluster-robust WLS [$1/SE$]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS
Meta-independent variable (Default)/Model	[1]	[2]	[3]	[4]	[5]	[6] [a]
Ownership variable type (All state)						
All domestic outsider investors	0.0479 ***	0.0525 ***	0.0681 ***	0.0172	0.0143	0.0479 ***
	(0.013)	(0.014)	(0.017)	(0.019)	(0.010)	(0.013)
Foreign investors	0.0704 ***	0.0774 **	0.1656 ***	0.0727 ***	0.0445	0.0704 ***
	(0.024)	(0.029)	(0.031)	(0.013)	(0.031)	(0.024)
All insiders	0.0732 **	0.0337	0.1598 ***	0.0644 ***	0.0383	0.0732 **
	(0.032)	(0.029)	(0.028)	(0.020)	(0.028)	(0.032)
Other characteristics of ownership variables						
Dummy-type variable (Ownership share)	-0.0131	-0.0257	0.0057	-0.0011	0.0172 *	-0.0131
	(0.011)	(0.017)	(0.011)	(0.009)	(0.010)	(0.011)
Lagged variable	0.0192	0.0389	0.0170	0.0172	-0.0016	0.0192
	(0.043)	(0.031)	(0.036)	(0.019)	(0.016)	(0.043)
With an interaction term(s)	0.0003	-0.0187	-0.0271 ***	-0.0510	-0.0264 *	0.0003
	(0.018)	(0.021)	(0.003)	(0.032)	(0.015)	(0.018)
Firm performance variable types (Sales/output)						
Efficiency	0.0627 ***	0.0550 ***	0.0078	0.0379 ***	0.0401 ***	0.0627 ***
	(0.007)	(0.019)	(0.005)	(0.010)	(0.004)	(0.007)
Productivity	0.0512 **	0.0189	0.0111	0.0555 ***	0.0252	0.0512 **
	(0.021)	(0.033)	(0.015)	(0.018)	(0.023)	(0.021)
Firm value	0.0581 **	0.0415	-0.0003	0.0507 **	0.0033	0.0581 **
	(0.026)	(0.032)	(0.019)	(0.020)	(0.023)	(0.026)
Export	0.0048	0.0404	0.0058	0.0849	0.0317 ***	0.0048
	(0.033)	(0.030)	(0.040)	(0.050)	(0.009)	(0.033)
Restructuring	0.0337 *	0.0322	0.0265	0.0637 *	0.0029	0.0337 *
	(0.018)	(0.020)	(0.034)	(0.035)	(0.009)	(0.018)
Target industry (Various industries)						
Mining and manufacturing industry	0.0026	0.0029	-0.0330	-0.0509	-0.0558	0.0026
	(0.062)	(0.044)	(0.056)	(0.074)	(0.055)	(0.062)
Service industry	-0.0210	0.0308	-0.0495	-0.0532	0.0639	-0.0210
	(0.053)	(0.042)	(0.053)	(0.070)	(0.072)	(0.053)
	(0.006)	(0.005)	(0.003)	(0.004)	(0.006)	(0.006)
Data type (Panel data)						
Cross-sectional data	0.0344	0.0457	0.1296 ***	0.0341	0.0149	0.0344
	(0.026)	(0.038)	(0.032)	(0.066)	(0.028)	(0.026)
Data source (Official statistics)						
Commercial database	0.0187	-0.0125	0.1001 *	-0.0349	-0.0652	0.0187
	(0.075)	(0.073)	(0.052)	(0.068)	(0.060)	(0.075)
Original enterprise survey	-0.0447	-0.0885	0.0000	-0.0713	-0.0692	-0.0447
	(0.047)	(0.062)	(0.026)	(0.067)	(0.058)	(0.047)
Estimation period						
First year of estimation	-0.0063	0.0021	0.0057	-0.0052	0.0043	-0.0063
	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)	(0.005)
Length of estimation	-0.0073	0.0005	-0.0016	-0.0087 **	-0.0004	-0.0073
Estimator (OLS)						
FE	0.0290	-0.0099	-0.0361 **	0.0715 *	-0.0145	0.0290
	(0.044)	(0.033)	(0.016)	(0.041)	(0.024)	(0.044)
RE	0.0452	0.0317	-0.0075	0.0880 **	0.0174	0.0452
	(0.032)	(0.031)	(0.011)	(0.041)	(0.025)	(0.032)
GMM	0.0297	-0.0562	-0.0218 **	0.0082	-0.0173	0.0297
	(0.039)	(0.045)	(0.010)	(0.032)	(0.022)	(0.039)
Other estimators	0.0896 *	0.0507	-0.0259 **	0.0875 *	0.0477	0.0896 *
	(0.051)	(0.048)	(0.011)	(0.048)	(0.050)	(0.051)
IV/2SLS/3SLS	-0.0426 ***	-0.0194	0.0075 *	-0.0424 **	-0.0390 ***	-0.0426 ***
	(0.013)	(0.019)	(0.004)	(0.019)	(0.012)	(0.013)
Equation type (Non translog model)						
Translog model	0.0454	0.0628 *	0.0221	0.0470	0.0482	0.0454
	(0.029)	(0.037)	(0.014)	(0.033)	(0.032)	(0.029)
Treatment for selection bias of privatized firms						
Treatment for selection bias	0.0244	0.0038	0.0226	0.0262	0.0216	0.0244
	(0.023)	(0.023)	(0.017)	(0.041)	(0.026)	(0.023)
Control variable						
Market competition	-0.0742	-0.1347 *	-0.0783	-0.0877	-0.0578	-0.0742
	(0.051)	(0.069)	(0.060)	(0.064)	(0.057)	(0.051)
Location fixed effects	0.0488 *	0.0569	-0.0350 **	0.0407	0.0067	0.0488 *
	(0.027)	(0.034)	(0.017)	(0.025)	(0.021)	(0.027)
Industry fixed effects	-0.0245	-0.0221	0.0080 *	-0.0148	0.0066	-0.0245
	(0.025)	(0.035)	(0.004)	(0.019)	(0.021)	(0.025)
Degree of freedom and research quality						
$\sqrt{}$ Degree of freedom	-0.00002	-0.0001	0.0002 *	-0.00002	-0.00004	-0.00002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Quality level	0.0026	-	0.00004	0.0003	-0.0002	0.0026
	(0.003)	(-)	(0.001)	(0.004)	(0.003)	(0.003)
Intercept	12.5115	-4.1697	-11.4368	10.5158	-8.5204	12.5115
	(10.254)	(11.166)	(8.026)	(10.270)	(9.796)	(10.254)
K	877	877	877	877	877	877
R^2	0.215	0.252	0.771	0.326	-	0.215

(b) Dependent variable — t value

Estimator (Analytical weight in parentheses)	Cluster-robust OLS	Cluster-robust WLS [Quality level]	Cluster-robust WLS [N]	Cluster-robust WLS [1/SE]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS
Meta-independent variable (Default)/Model	[7]	[8]	[9]	[10]	[11]	[12] [b]
Ownership variable type (All state)						
All domestic outsider investors	1.5525 **	1.7779 **	3.5751	1.0951	0.4757	1.5525 **
	(0.645)	(0.665)	(2.432)	(1.111)	(0.292)	(0.645)
Foreign investors	3.9372 ***	3.5377 **	16.3014 ***	5.0982 **	1.2608 **	3.9372 ***
	(1.134)	(1.553)	(4.404)	(1.896)	(0.632)	(1.134)
All insiders	2.2748 **	1.9428 **	7.9690 ***	2.2645 *	1.0031 **	2.2748 ***
	(0.886)	(0.893)	(2.868)	(1.177)	(0.486)	(0.886)
Other characteristics of ownership variables						
Dummy-type variable (Ownership share)	-1.8910	-1.1343	-1.7271	-1.9784	0.1222	-1.8910
	(1.350)	(0.822)	(2.000)	(1.660)	(0.154)	(1.350)
Lagged variable	2.4435	2.5223	15.6449	0.9445	1.0357	2.4435
	(3.060)	(2.263)	(11.625)	(1.041)	(0.931)	(3.060)
With an interaction term(s)	-0.5069	-2.3890	-9.6508 ***	-2.3151	-2.7229	-0.5069
	(1.357)	(2.108)	(0.902)	(1.671)	(1.811)	(1.357)
Firm performance variable types (Sales/output)						
Efficiency	1.2995 **	-0.3085	2.3231	1.0184	0.6069 ***	1.2995 **
	(0.518)	(0.910)	(1.401)	(0.891)	(0.217)	(0.518)
Productivity	2.1950 ***	-0.1127	5.8200 *	1.8617	0.8196 *	2.1950 ***
	(0.716)	(0.829)	(3.318)	(1.363)	(0.485)	(0.716)
Firm value	1.7043	-0.1940	8.9969	0.7834	0.2439	1.7043
	(1.155)	(1.113)	(5.316)	(1.959)	(0.715)	(1.155)
Export	1.0671	1.5462	4.2494 *	5.6320 **	1.0117 *	1.0671
	(1.580)	(0.996)	(2.460)	(2.344)	(0.535)	(1.580)
Restructuring	1.4052 *	-0.0348	5.0901	4.2983 *	0.2400	1.4052 *
	(0.787)	(0.724)	(3.958)	(2.352)	(0.313)	(0.787)
Target industry (Various industries)						
Mining and manufacturing industry	-4.2664 **	-2.2735	-15.5556	-5.7688 **	-7.9939	-4.2664 **
	(1.912)	(1.428)	(9.275)	(2.688)	(5.894)	(1.912)
Service industry	-8.5901 ***	-1.1627	-22.9911 **	-9.6228 *	-6.5086	-8.5901 ***
	(3.042)	(1.671)	(9.860)	(5.047)	(6.002)	(3.042)
Estimation period						
First year of estimation	0.1920	0.5158 **	2.2208 ***	0.6898 *	0.4255	0.1920
	(0.204)	(0.237)	(0.779)	(0.380)	(0.328)	(0.204)
Length of estimation	-0.7991 **	-0.2512	-0.2106	-0.1551	0.1026	-0.7991 ***
	(0.300)	(0.299)	(0.593)	(0.334)	(0.354)	(0.300)
Data type (Panel data)						
Cross-sectional data	-0.1856	0.5345	8.0469	-11.0354 **	2.2656	-0.1856
	(1.411)	(1.376)	(5.539)	(4.793)	(2.969)	(1.411)
Data source (Official statistics)						
Commercial database	-11.0960 **	-12.9378 *	-14.8638	-23.5657 ***	-14.3845 *	-11.0960 **
	(4.637)	(6.397)	(9.284)	(5.303)	(8.088)	(4.637)
Original enterprise survey	-7.1770 **	-11.9381 *	3.8729	-7.9134	-5.3897	-7.1770 **
	(3.328)	(6.276)	(4.793)	(5.466)	(7.210)	(3.328)
Estimator (OLS)						
FE	2.1182	0.0212	-14.7512 **	-2.1387	-2.0553	2.1182
	(1.976)	(1.731)	(6.445)	(4.709)	(1.717)	(1.976)
RE	2.9466 *	3.0176 *	-4.6942	2.7436	0.5530	2.9466 *
	(1.741)	(1.640)	(4.580)	(4.996)	(1.233)	(1.741)
GMM	5.6069	0.3436	-11.3979 ***	-4.4279	-7.9680 ***	5.6069
	(5.149)	(3.631)	(3.649)	(6.681)	(0.632)	(5.149)
Other estimators	-2.9096	-2.8609	-11.3464 ***	-7.4257 *	-2.8439	-2.9096
	(2.310)	(1.969)	(4.094)	(4.117)	(2.725)	(2.310)
IV/2SLS/3SLS	-0.5696	0.9529	2.5264 ***	-0.7592	-0.2879	-0.5696
	(0.462)	(1.028)	(0.914)	(0.919)	(0.372)	(0.462)
Equation type (Non translog model)						
Translog model	5.9358 **	5.6508	4.7081 *	8.0003 **	2.3845	5.9358 **
	(2.502)	(3.460)	(2.334)	(3.684)	(2.395)	(2.502)
Treatment for selection bias of privatized firms						
Treatment for selection bias	1.3153 *	0.1890	8.1508 **	3.6501 *	0.5788	1.3153 *
	(0.729)	(1.073)	(3.191)	(2.104)	(0.702)	(0.729)
Control variable						
Market competition	-3.8089 *	-3.3367 **	-20.0669	-5.0985	-7.6894	-3.8089 *
	(2.258)	(1.521)	(11.995)	(3.328)	(7.312)	(2.258)
Location fixed effects	0.2055	-0.9143	-15.6881 ***	-1.0813	-0.7189	0.2055
	(0.934)	(1.155)	(4.869)	(1.230)	(1.334)	(0.934)
Industry fixed effects	-0.1498	0.3747	3.2386 ***	0.5853	0.7831	-0.1498
	(0.891)	(0.967)	(1.040)	(1.316)	(1.340)	(0.891)
Degree of freedom and research quality						
$\sqrt{}$ Degree of freedom	0.0052	-0.0044	0.0766 **	-0.01973	0.02032	0.0052
	(0.016)	(0.017)	(0.035)	(0.0171)	(0.0372)	(0.016)
Quality level	0.5190 **	-	-0.0030	0.3873	0.1592	0.5190 **
	(0.215)	(-)	(0.227)	(0.256)	(0.402)	(0.215)
Intercept	-372.8712	-1015.6780 **	-4428.8840 ***	-1354.2730 *	-840.1502	-372.8712
	(406.563)	(471.135)	(1558.436)	(757.841)	(654.349)	(406.563)
K	877	877	877	877	877	877
R^2	0.527	0.657	0.867	0.762	-	0.527

Notes:

[a] Breusch-Pagan test: χ^2=0.00, p=1.000; Hausman test: χ^2=2.60, p=1.000

[b] Breusch-Pagan test: χ^2=0.00, p=1.000; Hausman test: χ^2=4.17, p=1.000

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

Source: Authors' estimations. See Table 5 for definitions and descriptive statistics of meta-independent variables.

Table 7. Meta-regression analysis using basic categories of ownership variables

(a) Dependent variable—PCC

Estimator (Analytical weight in parentheses)	Cluster-robust OLS	Cluster-robust WLS [Quality level]	Cluster-robust WLS [N]	Cluster-robust WLS [1/SE]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS
Meta-independent variable (Default)/Model	[1]	[2]	[3]	[4]	[5]	[6][a]
Ownership variable type (Whole state)						
Central government	-0.0845 *	-0.1263 ***	-0.0209	-0.0890 **	-0.0249	-0.0845 **
	(0.043)	(0.032)	(0.053)	(0.034)	(0.034)	(0.043)
Regional/local government	-0.0644 *	-0.0877 ***	-0.0467	-0.0599	-0.0244	-0.0644 *
	(0.034)	(0.032)	(0.053)	(0.039)	(0.021)	(0.034)
Whole domestic outsider investors	0.0423 **	0.0529 *	0.0722 **	0.0381	0.0328 *	0.0423 **
	(0.020)	(0.027)	(0.032)	(0.030)	(0.017)	(0.020)
Domestic outsider individual investors	-0.0330	-0.0453 **	-0.0185	-0.0910 ***	-0.0264	-0.0330
	(0.028)	(0.019)	(0.037)	(0.023)	(0.018)	(0.028)
Whole domestic outsider institutional investors	-0.0229	-0.0347	0.0144	-0.0194	-0.0350 *	-0.0229
	(0.020)	(0.022)	(0.031)	(0.023)	(0.020)	(0.020)
Whole domestic financial institutions	0.0477 *	0.0461 *	0.1576 ***	0.0600	0.0452 *	0.0477 *
	(0.028)	(0.027)	(0.040)	(0.078)	(0.026)	(0.028)
Domestic banks	0.0314	0.1076	0.0227	0.0335	0.0352	0.0314
	(0.077)	(0.073)	(0.046)	(0.101)	(0.079)	(0.077)
Domestic non-bank financial institutions	0.0964 ***	0.0921 ***	0.1482 ***	0.0625 **	0.0841 ***	0.0964 ***
	(0.018)	(0.024)	(0.031)	(0.024)	(0.016)	(0.018)
Domestic company groups and holdings	0.1193 **	0.0640 **	0.0974 **	0.0353 *	0.0375	0.1193 **
	(0.050)	(0.031)	(0.043)	(0.019)	(0.029)	(0.050)
Other domestic non-financial companies	-0.0050	-0.0093	0.0510	-0.0082	-0.0173	-0.0050
	(0.018)	(0.024)	(0.031)	(0.025)	(0.016)	(0.018)
Foreign investors	0.0508 *	0.0656 **	0.1472 ***	0.0347	0.0403	0.0508 *
	(0.030)	(0.028)	(0.053)	(0.023)	(0.029)	(0.030)
Whole insiders	-0.0051	-0.0227	0.0410	-0.0417	-0.0171	-0.0051
	(0.019)	(0.022)	(0.025)	(0.029)	(0.018)	(0.019)
Managers	0.1010 **	0.0474	0.1328 ***	0.1047 ***	0.0886 **	0.1010 **
	(0.040)	(0.029)	(0.043)	(0.027)	(0.039)	(0.040)
Employees	0.0142	-0.0005	0.0519 *	0.0137	0.0005	0.0142
	(0.020)	(0.024)	(0.028)	(0.022)	(0.019)	(0.020)
K	877	877	877	877	877	877
R^2	0.338	0.321	0.796	0.472	-	0.338

(b) Dependent variable—t value

Estimator (Analytical weight in parentheses)	Cluster-robust OLS	Cluster-robust WLS [Quality level]	Cluster-robust WLS [N]	Cluster-robust WLS [1/SE]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS
Meta-independent variable (Default)/Model	[7]	[8]	[9]	[10]	[11]	[12][b]
Ownership variable type (Whole state)						
Central government	-4.0022	-9.2403 **	-6.6228	-2.7906	1.2462	-4.0022
	(2.733)	(3.760)	(6.630)	(2.875)	(1.734)	(2.733)
Regional/local government	-3.2691	-4.7658	-17.6198 **	-5.7200	-0.6038	-3.2691
	(3.523)	(3.551)	(6.792)	(5.345)	(1.291)	(3.523)
Whole domestic outsider investors	2.0972 **	2.2218 **	3.3808	2.3950 **	1.0950 **	2.0972 ***
	(0.773)	(0.894)	(3.613)	(1.049)	(0.440)	(0.773)
Domestic outsider individual investors	0.0200	0.3125	-2.5564	-1.5463	0.1855	0.0200
	(1.082)	(0.881)	(4.961)	(0.983)	(0.539)	(1.082)
Whole domestic outsider institutional investors	0.5261	0.5389	2.0883	0.7323	0.1062	0.5261
	(0.946)	(0.761)	(4.491)	(1.033)	(0.470)	(0.946)
Whole domestic financial institutions	0.0788	0.6078	14.6173 **	-10.9835 **	0.6482 ***	0.0788
	(0.768)	(0.433)	(6.788)	(4.478)	(0.250)	(0.768)
Domestic banks	0.7297	2.0211 *	-0.6065	0.6664	0.8298	0.7297
	(0.992)	(1.041)	(5.315)	(1.271)	(0.888)	(0.992)
Domestic non-bank financial institutions	2.1953 **	2.6157 ***	5.2548	1.7552	1.8376 ***	2.1953 **
	(0.869)	(0.823)	(4.511)	(1.064)	(0.461)	(0.869)
Domestic company groups and holdings	0.7912	1.0311	-11.0146	-0.7566	0.6446	0.7912
	(0.872)	(0.713)	(9.491)	(1.618)	(0.615)	(0.872)
Other domestic non-financial companies	0.8513	1.2717	3.9405	0.8598	0.4936	0.8513
	(0.869)	(0.823)	(4.511)	(1.075)	(0.461)	(0.869)
Foreign investors	2.8292 ***	2.4200 **	10.4378 *	2.9364 *	1.4554 **	2.8292 ***
	(1.028)	(0.929)	(6.209)	(1.482)	(0.678)	(1.028)
Whole insiders	0.4265	0.0843	3.8132	-0.9458	0.2471	0.4265
	(0.728)	(0.532)	(3.067)	(1.271)	(0.371)	(0.728)
Managers	2.7742 ***	2.2013 **	6.8120 *	3.1584 ***	2.0383 ***	2.7742 ***
	(0.943)	(0.908)	(4.017)	(1.095)	(0.646)	(0.943)
Employees	1.3349	1.3929	3.2103	1.5818	0.6371	1.3349
	(0.843)	(0.836)	(4.333)	(1.085)	(0.450)	(0.843)
K	877	877	877	877	877	877
R^2	0.566	0.688	0.885	0.784	-	0.566

Notes:

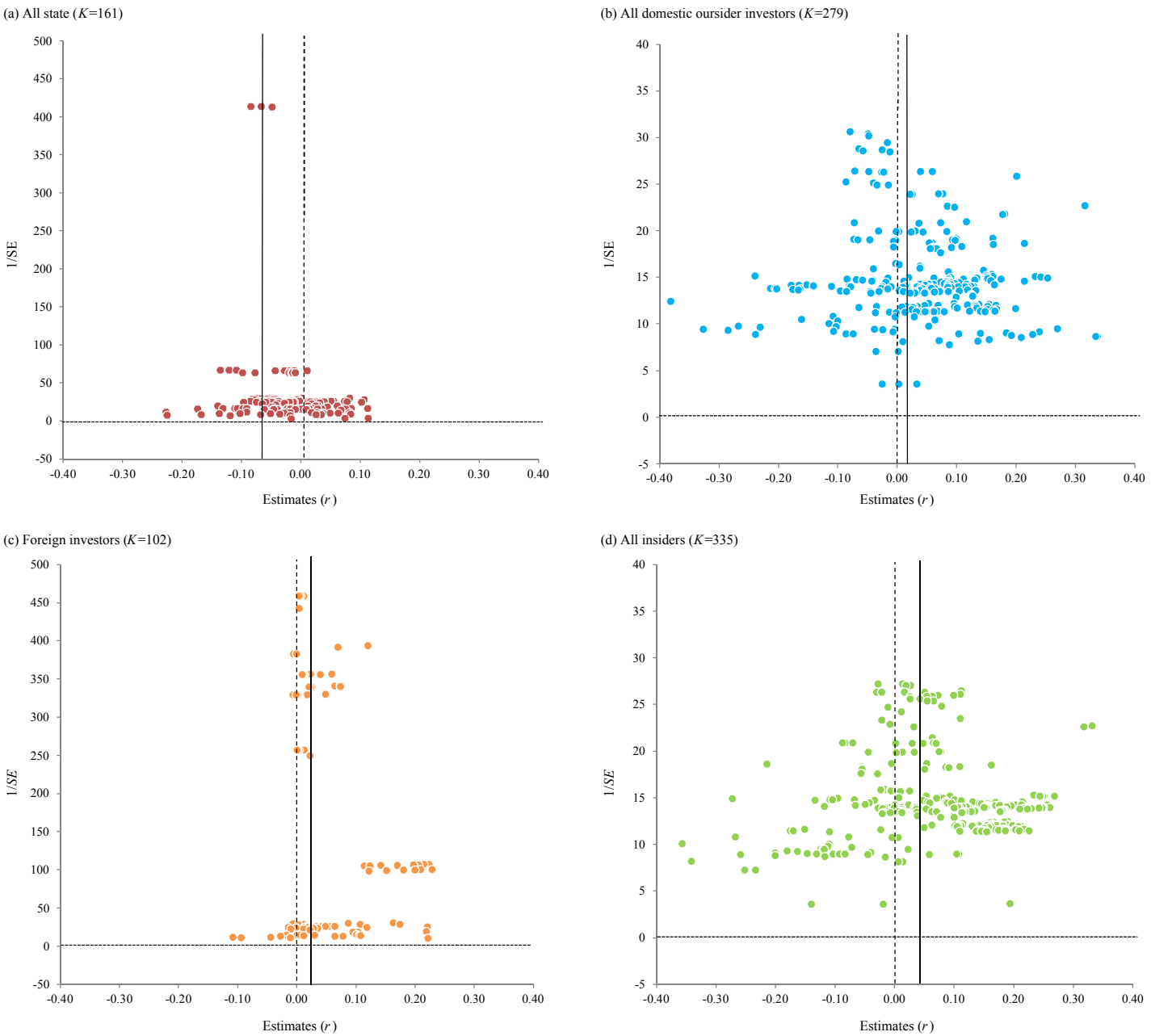
[a] Breusch-Pagan test: χ^2=0.00, p=1.000; Hausman test: χ^2=2.23, $\boldsymbol{p}$=1.000

[b] Breusch-Pagan test: χ^2=0.00, p=1.000; Hausman test: χ^2=3.99, $\boldsymbol{p}$=1.000

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

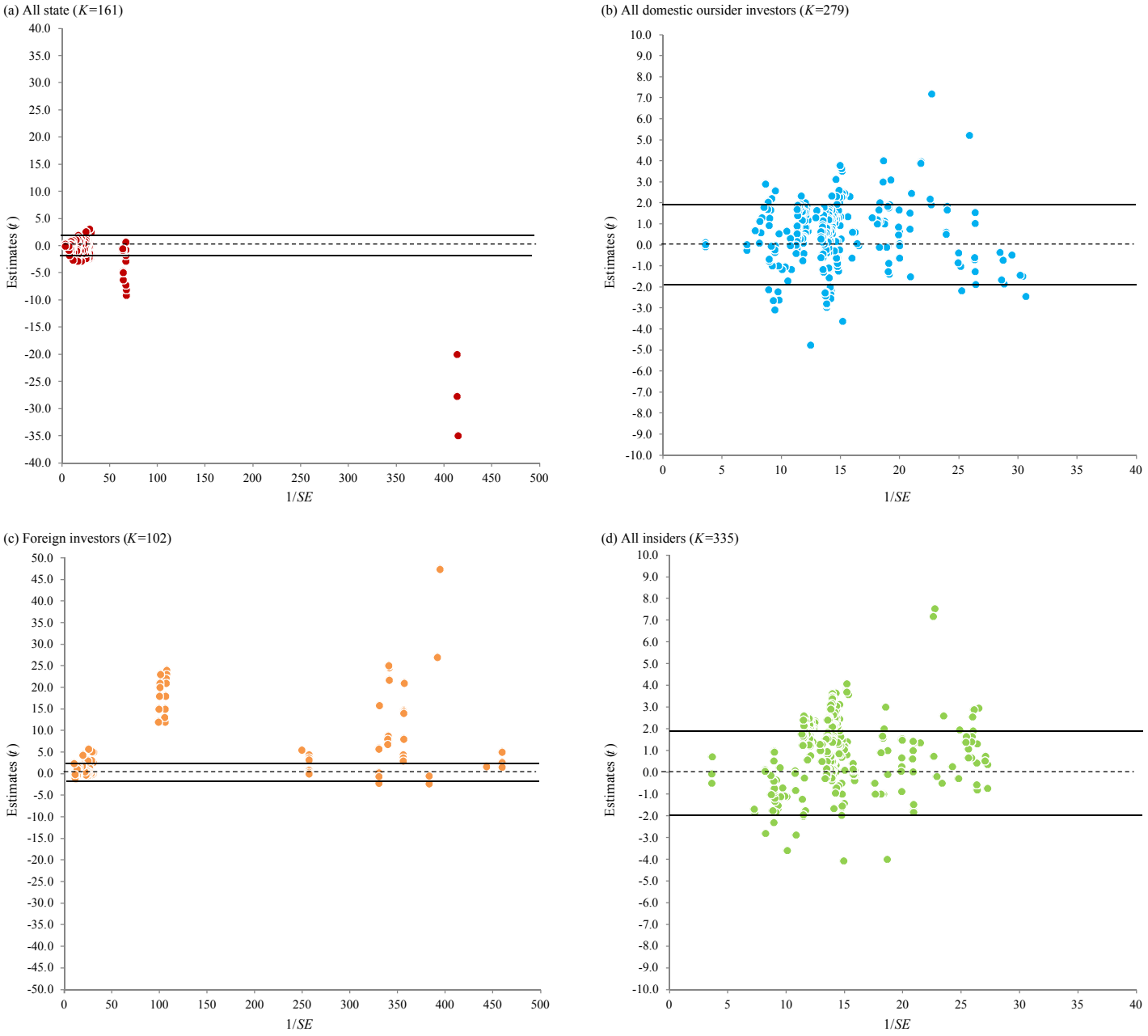
Source: Authors' estimations. Estimates of other meta-independent variables and intercepts are omitted for brevity. See Table 5 for definitions and descriptive statistics of meta-independent variables.

Figure 7. Funnel plot of estimates by aggregated category of ownership variable



Note: Solid lines indicate the mean of the top 10% most-precise estimates. The values for all state, all domestic outsider investors, foreign investors, and all insiders are -0.0631, 0.0195, 0.0267, and 0.0433, respectively.
Source: Authors' illustrations

Figure 8. Galbraith plots of estimates by aggregated category of ownership variables



Note: Solid lines indicate the thresholds of two-sided critical values at the 5% significance level ±1.96.

Source: Authors' illustrations

Table 8. Meta-regression analysis of publication selection by aggregated category of ownership variables

(a) FAT (Type I publication selection bias)-PET test (Equation: $t=\beta_0+\beta_1(1/SE)+v$)

Estimates to test	I. All state			II. All domestic oursider investors			III. Foreign investors			IV. All insiders		
Estimator	OLS	Cluster-robust OLS	Cluster-robust random-effects panel GLS	OLS	Cluster-robust OLS	Cluster-robust random-effects panel GLS	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV	OLS	Cluster-robust OLS	Cluster-robust random-effects panel GLS
Model	[1]	[2]	[3] [a]	[4]	[5]	[6] [b]	[7]	[8]	[9] [c]	[10]	[11]	[12] [d]
切片(FAT: H_0: β_0=0)	0.9636 ***	0.9636 ***	0.9546 ***	0.5581 *	0.5581	0.2091	3.9909 ***	3.9909	-20.6668	0.5150 *	0.5150	-0.3733
	(0.225)	(0.176)	(0.177)	(0.319)	(0.703)	(0.517)	(0.940)	(3.375)	(18.174)	(0.312)	(1.152)	(1.631)
$1/SE$ (PET: H_0: β_1=0)	-0.0640 ***	-0.0640 ***	-0.0640 ***	0.0004	0.0004	0.0098	0.0177 ***	0.0177	0.1702	0.0319	0.0319	0.0465
	(0.008)	(0.001)	(0.001)	(0.022)	(0.055)	(0.028)	(0.006)	(0.011)	(0.112)	(0.021)	(0.058)	(0.103)
K	161	161	161	279	279	279	102	102	102	335	335	335
R^2	0.826	0.826	0.826	0.001	0.001	0.001	0.091	0.091	0.091	0.008	0.008	0.008

(b) Test of type II publication selection bias (Equation: $|t|=\beta_0+\beta_1(1/SE)+v$)

Estimates to test	I. All state			II. All domestic outsider investors			III. Foreign investors			IV. All insiders		
Estimator	OLS	Cluster-robust OLS	Cluster-robust random-effects panel GLS	OLS	Cluster-robust OLS	Cluster-robust random-effects panel GLS	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV
Model	[13]	[14]	[15] [e]	[16]	[17]	[18] [f]	[19]	[20]	[21] [g]	[22]	[23]	[24] [h]
切片(H_0: β_0=0)	-0.3470 *	-0.3470 ***	-0.3470 ***	0.7500 ***	0.7500 **	0.6081	4.1415 ***	4.1415	-21.7986	1.5465 ***	1.5465 ***	-0.6808
	(0.210)	(0.113)	(0.113)	(0.194)	(0.342)	(0.520)	(0.924)	(3.311)	(17.512)	(0.212)	(0.438)	(1.948)
$1/SE$	0.0621 ***	0.0621 ***	0.0621	0.0356 ***	0.0356	0.0457 *	0.0181 ***	0.0181	0.1785	-0.0021	-0.0021	0.1515
	(0.008)	(0.001)	(0.001)	(0.014)	(0.024)	(0.026)	(0.006)	(0.011)	(0.108)	(0.015)	(0.026)	(0.134)
K	161	161	161	279	279	279	102	102	102	335	335	335
R^2	0.858	0.858	0.858	0.031	0.031	0.031	0.098	0.098	0.098	0.0001	0.0001	0.0001

(c) PEESE approach (Equation: $t=\beta_0 SE+\beta_1(1/SE)+v$)

Estimates to test	I. All state			II. All domestic outsider investors			III. Foreign investors			IV. All insiders		
Estimator	OLS	Cluster-robust OLS	Random-effects panel ML	OLS	Cluster-robust OLS	Random-effects panel ML	OLS	Cluster-robust OLS	Random-effects panel ML	OLS	Cluster-robust OLS	Random-effects panel ML
Model	[25]	[26]	[27]	[28]	[29]	[30]	[31]	[32]	[33]	[34]	[35]	[36]
SE	8.0121 ***	8.0121 **	5.8798 *	2.2319	2.2319	1.2653	20.0880 ***	20.0880	5.8895	1.0734	1.0734	0.0132 ***
	(2.210)	(3.221)	(3.125)	(1.782)	(3.708)	(2.925)	(6.272)	(19.761)	(53.929)	(1.845)	(6.806)	(3.135)
$1/SE$ (H_0: β_1=0)	-0.0589 ***	-0.0589 ***	-0.0602 ***	0.0252 **	0.0252	0.0190	0.0302 ***	0.0302 ***	0.0314 ***	0.0598 ***	0.0598 **	0.0286 *
	(0.007)	(0.003)	(0.003)	(0.011)	(0.028)	(0.017)	(0.005)	(0.009)	(0.010)	(0.011)	(0.022)	(0.017)
K	161	161	161	279	279	279	102	102	102	335	335	335
R^2	0.820	0.820	-	0.115	0.115	-	0.366	0.366	-	0.276	0.276	-

Notes:

[a] Breusch-Pagan test: χ^2=0.05, p=0.4145; Hausman test: χ^2=0.20, p=0.6531

[b] Breusch-Pagan test: χ^2=6.40, p=0.0057; Hausman test: χ^2=0.02, p=0.8956

[c] Breusch-Pagan test: χ^2=169.28, p=0.0000; Hausman test: χ^2=6.98, p=0.0083

[d] Breusch-Pagan test: χ^2=423.97, p=0.0000; Hausman test: χ^2=0.72, p=0.3948

[e] Breusch-Pagan test: χ^2=0.00, p=1.0000; Hausman test: χ^2=0.71, p=0.3982

[f] Breusch-Pagan test: χ^2=4.30, p=0.0191; Hausman test: χ^2=0.56, p=0.4541

[g] Breusch-Pagan test: χ^2=173.43, p=0.0000; Hausman test: χ^2= 8.52, p=0.0035

[h] Breusch-Pagan test: χ^2=43.26, p=0.0000; Hausman test: χ^2=8.73, p=0.0031

Figures in parentheses beneath the regression coefficients are standard errors. Except for Model [27], [30], [33], and [36], robust standard errors are estimated. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' estimations.

Table 9. Summary of publication selection bias testing

Ownership variable type[a]	Number of estimates (K)	Test results[b]			
		Funnel asymmetry test for type I publication selection bias (FAT) (H_0: β_0=0)	Test for type II publication selection bias (H_0: β_0=0)	Precision-effect test (PET) (H_0: β_1=0)	Precision-effect estimate with standard error (PEESE) (H_0: β_1=0)[c]
I. All state	161	Rejected	Rejected	Rejected	Rejected (-0.0602/-0.0589)
1. Whole state	117	Rejected	Accepted	Rejected	Rejected (-0.0584/-0.0445)
2. Central government	30	Accepted	Accepted	Rejected	Rejected (-0.0472)
3. Regional/local government	14	Rejected	Rejected	Rejected	Rejected (-0.0760)
II. All domestic outsider investors	279	Accepted	Rejected	Accepted	Accepted
4. Whole domestic outsider investors	94	Rejected	Rejected	Accepted	Accepted
5. Domestic outsider individual investors	49	Accepted	Rejected	Accepted	Accepted
6. Whole domestic outsider institutional investors	30	Accepted	Rejected	Accepted	Accepted
7. Whole domestic financial institutions	21	Accepted	Accepted	Accepted	Accepted
8. Domestic banks	25	Rejected	Rejected	Rejected	Rejected (-0.1071)
9. Domestic non-bank financial institutions	14	Accepted	Accepted	Accepted	Rejected (0.1753)
10. Domestic company groups and holdings	32	Accepted	Accepted	Rejected	Rejected (0.0813/0.0912)
11. Other domestic non-financial companies	14	Rejected	Rejected	Rejected	Rejected (0.1680)
III (12). Foreign investors	102	Accepted	Accepted	Accepted	Rejected (0.0302/0.0314)
IV. All insiders	335	Accepted	Rejected	Accepted	Rejected (0.0286/0.0598)
13. Whole insiders	69	Accepted	Rejected	Accepted	Accepted
14. Managers	160	Accepted	Rejected	Accepted	Rejected (0.0556/0.1321)
15. Employees	106	Accepted	Accepted	Accepted	Accepted

Notes:

[a] Ownership variable types with Arabic numerals belong to the basic category, while those with Roman numerals belong to the aggregated category.

[b] The null hypothesis is rejected when more than 2 of 3 models show a statistically siginificent estimate. Otherwise accepted.

[c] Figures in parentheses are publication selection bias-adjusted estimates. If two estimates are reported, the left and right figures denote a mininum and maxinum estimate, respectively.

Source: Authors' estimations.