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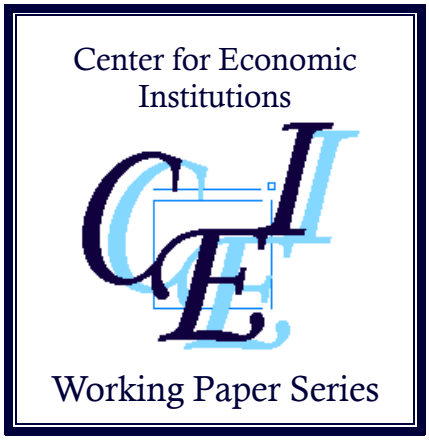

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Decline and Growth in Transition Economies: A Meta-Analysis*

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Abstract: Immediately after the collapse of socialism, the countries of Central and Eastern Europe and the former Soviet Union fell into a serious economic crisis, after which they experienced a gradual recovery. Therefore, without exception, these countries followed a J-curved growth path. However, there were marked differences among them in the length and depth of the crisis and the speed of recovery. In this paper, we perform a comparative meta-analysis of the effect size and statistical significance of structural change, transformation policy, the legacy of socialism, inflation, and regional conflict in order to elucidate the mechanism that generated the J-shaped trajectory in transition economies. The meta-synthesis, which employs 3,279 estimates drawn from 123 previous studies, revealed that while the growth-enhancing effects of structural change and transformation policy were small yet significant, inflation and regional conflict had a highly significant and strongly negative effect on output. In addition, the legacy of socialism might exacerbate the decline in production in the early stages of transition. The meta-regression analysis that simultaneously controls for various research conditions and the assessment of publication selection bias provides supporting evidence for the results obtained from the meta-synthesis.

JEL classifications: E31, O47, O57, P20, P21

Keywords: decline, growth, transition economies, meta-analysis, publication selection bias, Central and Eastern Europe, former Soviet Union

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1. Introduction

When they initially abandoned socialism with the aim of restructuring and revitalizing their national economies with market principles, the countries of Central and Eastern Europe (CEE) and the former Soviet Union (FSU) were hit by a catastrophic collapse in economic activity. Even in the least affected countries, the size of this collapse ranged from 13% to 20% of gross domestic product (GDP) in the final stages of socialism, while in those countries most seriously affected, it amounted to declines of between 64% and 87%. Moreover, this dramatic drop in production continued for as long as between six and eight years in some countries (**Table 1**). That the transition to a market economy would probably trigger social disorder and economic decline was to some extent predicted by policymakers and researchers both inside and outside the former socialist countries. At the end of the Cold War, however, hardly anyone could have foreseen that the CEE and FSU countries would experience such a serious and protracted economic crisis. Furthermore, the recovery process dashed the hopes of large numbers of people. This was because even the most developed CEE countries took between five and eight years to restore output to the levels at the end of socialism. Not only that, but even in the 25th year of the transition from socialism, some countries have yet to fully recover from the economic damage they suffered during the crisis.[1]

A sharp contraction in production at the start of the transition and the relatively gradual recovery that followed was a situation common to all the CEE and FSU countries. In other words, without exception, the former socialist transition economies have followed the so-called J-curved growth path to date. At the same time, however, and as **Table 1** shows, there were also marked differences among countries in the length and depth of the crisis as well as the growth speed during the recovery phase. Faced with an economic situation that was profoundly interesting from an academic point of view, researchers have not only made various theoretical considerations of this unique phenomenon but also performed a variety of empirical analyses to specify the background factors of it. Currently, much attention is being paid to this accumulated research, and it is by no means an overstatement to say that it has become one of the most important research fields in the economics of transition.

The results of this aggressive research have led us to share a common understanding of the determinants of macroeconomic growth in the CEE and FSU countries. Among others, not only education levels and human capital investment, which are emphasized in traditional growth theory,

[1] In fact, according to data published by the European Bank for Reconstruction and Development (EBRD, http://www.ebrd.com), output in the three CEE countries of Bosnia-Herzegovina, Montenegro, and Serbia and the two FSU countries of Moldova and Ukraine was, in 2013 and 2015, respectively, between 8% and 35% lower than that at the end of socialist period.

but even inputs such as capital and labor were not critical explanatory variables for economic growth rates during the crisis and the initial phase of recovery. Rather, the only interpretation is that various unique factors pertaining to the CEE/FSU zone and the former socialist transition economies were quite important in determining macroeconomic performance during these periods. Specifically, these unique factors are (a) structural changes in the national economy, (b) the transformation policy toward a market economy, (c) the legacy of socialism as an initial condition, (d) inflation, and (e) regional conflict. In fact, many previous studies have empirically verified that the first two factors serve to enhance economic growth while the last three factors tend to cause a downturn. Nevertheless, more than a few studies have produced results that contradict the above policy implications. Thus it cannot be said that the transition economy growth debate has reached a final conclusion. Furthermore, no comparison has been conducted on the effect size and statistical significance of the above five determinants of growth, so the question of why the CEE and FSU countries have followed not a U-shaped or V-shaped growth path but a J-shaped trajectory has not been answered by previous research. Elucidating this issue will therefore fill a big gap in the study of transition economies.

Based on the above perception of the issues, in this paper, we will attempt to shed light on the mechanism that generated the J-curved growth path in transition economies by performing a meta-analysis to compare effect size and statistical significance of structural change, transformation policy, the socialist legacy, inflation, and regional conflict. The meta-synthesis, which comprised 3,279 estimates extracted from 123 previous studies, revealed that the growth-enhancing effects of structural change and transformation policy were small, yet statistically significant, while inflation and regional conflict demonstrated a highly significant and strongly negative effect on output. The effect size and statistical significance of the socialist legacy were similar to those of structural change and transformation policy, so it is likely that this factor also contributed to the decline in production in the early stages of transition. The meta-regression analysis that simultaneously controlled for various research conditions and the assessment of publication selection bias provided supporting evidence for the policy implications obtained from the meta-synthesis. Based on these results, we conjecture that while the interaction between the above five factors led to a J-curved growth path in all of the CEE and FSU countries, differences among the countries in terms of historical preconditions, political circumstances, and reform efforts resulted in large differences in their growth trajectories.

The earliest meta-analyses on the factors of macroeconomic growth in former socialist transition countries were performed by Babecký and Campos (2011) and Babecky and Havranek (2014). In this paper, we will utilize the advantages of later research to supplement these two early studies in three ways. First, whereas the two early studies constituted meta-analyses focused on

economic reform, in this paper, we will verify the growth-enhancing effect of transformation policy in a broader sense. Second, as stated above, because this study deals simultaneously with five determinants of growth that differ in nature, the effect size and statistical significance of transformation policy are in clear contrast to the other four factors. Third, by involving an extensive examination of related studies covering almost every piece of literature targeted by these previous meta-studies, this paper provides a wider picture of the research on transition economies.[2]

The remainder of this paper is structured as follows: Section 2 gives an overview of the process of economic crisis and recovery in CEE and FSU countries during the past quarter century. Section 3 considers the factors we ought to focus to understand the mechanism of the emergence of the J-curved growth path through a comprehensive review of previous studies. Section 4 describes the procedure of literature selection and an overview of the studies selected for meta-analysis. Section 5 conducts a meta-synthesis and meta-regression analysis, and Section 6 verifies the presence and degree of publication selection bias. Section 7 summarizes major findings and concludes the paper.

2. Crisis and Recovery in Transition Economies: Looking Back on the Past Quarter Century

In this section, we will employ time-series data for real GDP growth rates to identify the characteristics of 28 CEE and FSU countries during the past quarter century. As we stated in the Introduction, in the several years immediately following the start of the systemic transformation from the planned system to a market economy, these former socialist countries were hit with a severe economic crisis that was described as a "transformational recession" (Kornai, 1994). Later, the negative growth seen at the time of the crisis was replaced by a period of slow growth, with the absolute value of positive growth rates during this period not being as high as that of negative growth rates recorded during the crisis period. In that sense, every country followed a J-shaped growth path. However, conspicuous differences between countries emerged in the length of the economic crisis, the rate of decline in output during the crisis period, and the speed of recovery from the crisis. **Figure 1** plots the path of economic crisis and recovery for all 28 CEE and FSU countries as well as for the Central European and Baltic region, the Southeast European (SEE) region, and the FSU region excluding the Baltic countries. The figure puts the starting points (t_0) for real GDP at 1989 for the CEE countries and 1991 for the FSU states. A look at the overall trend for the 28 CEE and FSU countries reveals that their economic downturn continued until the fifth year following the beginning of system transformation. However, it took 11 years from the

[2] Babecký and Campos (2011) involved a meta-analysis of 515 estimation results reported in 46 studies, while Babecky and Havranek (2014) employs 537 estimation results from 60 studies.

bottom for this drop in output to recover to the level at the end of socialism.

In other words, compared with the economic shrinkage during the transformational recession, the subsequent economic recovery took more than twice as long. However, a comparison by region reveals large differences in the patterns seen. In fact, the degree of decline in output during the economic crisis in the SEE and FSU regions was much larger than that in the Central European and Baltic region. Furthermore, the phase of recovery from the economic crisis took more time in the SEE and FSU regions than in the Central European and Baltic region. Actually, it took until 2004 for output in the FSU region to recover to the level in 1991, while it was not until 2007 that output in the SEE region returned to the 1989 level. These results contrasted sharply with the speed of economic recovery in the Central European and Baltic region.

In **Table 1**, based on analysis of variance (ANOVA) and/or Kruskal–Wallis tests, we confirm that the number of years the economic crisis lasted, the rate of decline in output during the crisis, and the average real growth rate in the first decade of recovery all exhibited significant differences between the three regions. These results also show that, in the SEE and FSU regions, the economic crisis triggered at the initial stage of transition was much more severe than that in the Central European and Baltic region. According to country-level data, in the SEE region, three countries of the former Yugoslavia, namely, Serbia, Bosnia-Herzegovina, and Montenegro, and in the FSU region, five countries, Azerbaijan, Ukraine, Georgia, Tajikistan, and Moldova, lost more than 50% of their output, as compared with that at the end of socialism, during the crisis. In the Central European and Baltic region, on the other hand, not one single country experienced a production decline on a par with those seen in the eight SEE and FSU countries.

However, from the viewpoint of the robustness of economic growth during the recovery phase, the SEE and FSU regions were not necessarily much inferior to the Central European and Baltic region. Conversely, economic growth in the FSU region was actually superior to that in the Central European and Baltic region. Nevertheless, trends like this, obtained by making comparisons among regions, are not observed for the most part at the level of the countries that comprise each region. Rather, in the background that led to this situation was the fact that several countries in the SEE and FSU regions experienced rapid economic growth as soon as the recovery period began. Furthermore, while not as clear-cut as economic growth rates in the recovery period, there were fairly large differences among countries in the SEE and FSU regions in the number of years the economic crisis lasted and the rate of decline in output during the crisis.

As the above has shown, intra-regional differences seen in the growth paths during the transition period were actually more obvious than inter-regional differences. Therefore, we performed a nonhierarchical cluster analysis, employing a *k*-means algorithm using index data, with 100 as the figure for the end of socialism, in an attempt to perform comparisons for CEE and

the FSU from a different perspective than regional differences. The number of clusters was designated as three. According to the results of the cluster analysis, the three countries from the former Yugoslavia as well as the four FSU countries, Ukraine, Georgia, Tajikistan, and Moldova, that experienced the most severe economic crises and were also the slowest to recover constitute a single cluster. This can be regarded as the group of transition economies that exhibited the worst macroeconomic performance during the past quarter century. On the other hand, a separate cluster comprises a group of countries characterized by the best macroeconomic performance. These are six countries in the Central Europe and Baltic region, Estonia, Slovakia, Slovenia, the Czech Republic, Hungary, and Poland, as well as five FSU countries in which economic administration was relatively good: Armenia, Uzbekistan, Kazakhstan, Turkmenistan, and Belarus.[3] The other cluster, which comprises the 10 remaining countries, including Romania and Russia, can be positioned as neutral, lying somewhere between these two groups of countries.

Figure 2 plots the growth paths of the above three transition-country clusters. The group of nations that exhibited the worst macroeconomic performance during the past quarter century is Cluster 1, whereas the group of best performing economies is Cluster 3. The middle group is Cluster 2. Like the growth curves for each region shown in **Figure 1**, J-shaped growth curves that go beyond the differences among clusters are also reproduced in **Figure 2**. Furthermore, it is clear that the differences between groups of countries in the shapes of the growth curves are more distinct than in **Figure 1**. This fact strongly suggests that the processes of economic crisis and recovery in the CEE and FSU countries are highly likely to have been affected by differences in the aforementioned three transition-country clusters, and more so than by regional differences. As determinants of macroeconomic growth in transition countries that cannot simply be eliminated by regional differences, what sort of factors should we be focusing on? Providing an answer to this question is the task of the next section.

[3] One may feel it odd that even among the then-new member states of the European Union (EU), six Central European and Baltic countries with especially strong reputations for promoting reform, as well as three FSU countries, Uzbekistan, Turkmenistan, and Belarus, where the pace of democratization and economic reform has been particularly low, are all included in the same cluster. However, as Iwasaki (2004) pointed out, the macroeconomic performance of these FSU countries, the governments of which dealt with national crises caused by the breakup of the Soviet Union by exercising strong leadership over industry, was not much more unfavorable in comparison with that of the Central European and Baltic countries, especially during the early phase of transition. Putting aside the evaluation of the reform strategy based on a statist, paternal industrial strategy, these facts can be seen as having a big impact on the results of the cluster analysis.

3. The Debate on Economic Crisis and Growth in Transition Economies

From the beginning of the transitional processes, various debates have occurred among policymakers and researchers concerning crisis and recovery in the CEE and FSU economies. Kornai's (1994) "transformational recession" concept, which focuses on the characteristics of socialist planned economies, and Blanchard and Kremer's (1997) "disorganization hypothesis" had a big impact on the debate at the time by offering an in-depth understanding of the economic crisis in the former socialist countries, which had become more serious than expected. Furthermore, a series of studies that appeared later, such as those from Heybey and Murrell (1999), de Melo et al. (2001), Havrylyshyn and Wolf (2001), and Falcetti et al. (2002), contended that the serious adverse impact of hyperinflation, which was triggered by the monetary overhang (excess liquidity) accumulated by the so-called economies of shortage during the socialist era, as well as the negative legacy of socialism as a historical initial condition and specific regional problems typified by civil wars, ethnic conflicts, etc., had a major and negative effect on the CEE and FSU economies. Meanwhile, a series of studies by Mitrović and Ivančev (2010), Apolte (2011), and Peev and Mueller (2012), which focused on the recovery process in the transitional economies, also endeavored to empirically verify the growth-enhancing effect not only of economic reforms but also of various other policy measures that could affect national economic activity.

In the end, the consensus reached by researchers on transition economies was as follows: Neither the long-term economic growth factors such as education level and human capital investment focused on by Mankiw et al. (1992) nor capital and labor inputs, which are essential for standard economic growth models, were important factors for determining output levels and growth rates in the CEE and FSU countries as measured in terms of GDP or GDP per citizen (or per worker). Rather, from the perspective of the depth of the economic crisis and the speed of the subsequent recovery, what led to the striking differences between these countries were the following five factors: (a) structural changes in the national economy, (b) a transformation policy aimed at establishing a market economy, (c) the legacy of socialism as an initial condition, (d) inflation, and (e) regional conflict (Havrylyshyn, 2001; Campos and Coricelli, 2002; Iwasaki, 2004).

Below, we will examine each of the five factors in turn, explore what sort of debate concerning them has existed in previous research, and use a range of variables to consider in what way the previous research attempted to empirically identify their impact on economic growth. At the end of this section, we will discuss why meta-analysis is required for the elucidation of the mechanism by which the J-shaped growth path appeared.

3.1 Structural Changes in the National Economy

Socialist countries, which positioned the quantity of labor input and intermediate goods invested as the source of value, gave priority to material production and favored heavy industry. They did not develop their financial sectors. Furthermore, to facilitate planning and management, these countries centralized the locations of production facilities and constructed enormous factories (so-called gigantism). Moreover, the social system, which included educational and research institutions, was designed and developed to support this physical-good-focused production system. In light of such characteristics of the socialist economic system, researchers have employed a variety of indicators as variables for identifying structural changes in national economies that have occurred in conjunction with system transformation. These include the private-sector share of GDP, which indicates the degree of change in the composition of a production system previously dominated by state-run companies; the degree of trade openness, which reflects the extent of freedom and diversity in external economic activity, something that had been effectively monopolized by national governments under the COMECON structure; and the degree of penetration of bank lending and depth of financing, which indicate the development of the financial system, which had been given only an extremely limited role in planned economies.

Since 2000, as state-owned businesses have been privatized, a great deal of progress has been made in the verification of the impact of the expansion of the private sector on economic growth. Fischer and Sahay (2001) used panel data covering 25 CEE and FSU countries during the period 1990–98. Their study was one of the first to identify a positive correlation between private-sector GDP share and real economic growth rates. A study by Próchniak (2011), which was released approximately a decade later, constituted a quantitative analysis of the CEE countries newly joined to the EU and reproduced empirical results similar to those of Fischer and Sahay (2001). However, a number of studies, such as those by Bennett et al. (2004, 2007) and Sukiassyan (2007), while indicating that the private-sector GDP share is positively correlated with the rate of economic growth, have reported estimation results suggesting that this correlation is statistically insignificant. Thus there are big differences among the results of empirical assessments.

A well-known example of a study that verified the cause-and-effect relationship between trade openness and the economic growth rate was that performed by Cernat and Vranceanu (2002). They studied 10 CEE countries during the 1990s and demonstrated that a close positive correlation has been established between these two variables. Capolupo and Celi (2005), meanwhile, reported that the higher the degree of trade openness in a transitional country, the higher the rate of economic growth tends to be. Other examples of previous research that has verified the relationship between trade openness and GDP growth rate are studies by Nath (2009) and Josifidis et al. (2012), and both of these studies identified a significant and positive correlation

between the two variables. Of course, studies with opposite findings, such as those by Campos and Kinoshita (2002) and Neyapti and Dincer (2005), also exist, but the number of such studies is relatively small.

Studies on the relationship between the development of the financial sector and economic growth during the transition period have also been published one after another, starting with one by Halushka (1997). Recent empirical research in this area includes studies by Akimov et al. (2009), Gaffeo and Garalova (2014), and Cojocaru et al. (2016). These studies all confirmed that the degree of bank loan penetration and financial depth have a significant and positive impact on economic growth. Kornai (1994), who put forward the notion of a "transformational recession," argued that the lack of financial system development was one of the factors behind that recession and that to overcome this problem, the establishment of private-sector commercial banks would be important. Furthermore, the results obtained by Akimov et al. (2009) provide empirical backing for that claim. Nevertheless, research in this area includes a lot of studies, such as those by Djalilov and Piesse (2011) and Dudian and Popa (2013), that have provided empirical evidence that the impact of financial-sector development on enhancing economic growth is either neutral or negative, and these empirical findings are more confusing than those concerning the effects of expansion of the private sector, trade activity, and so forth.

In light of the above discussion, let us return to **Table 1**. Panel (a) of this table demonstrates the impact of structural change in the economic system on the growth paths followed by the CEE and FSU countries. Here, based on the percentage share of the private sector in total GDP, a frequently used indicator as a proxy for structural change, the 28 transitional countries were divided into two groups: an upper group with a private-sector GDP share equal to or above 75% and a lower group with a private-sector GDP share below 75%. Then, from the perspective of the length of the economic crisis, the rate of decline in output during the crisis period, and the average rate of real economic growth during the first decade of the recovery phase, we examine whether there is a statistically significant difference between these two groups of countries. According to the results, in the case of the group of countries that have made a high degree of progress with structural change, the length of the economic crisis was, compared with the lower group, 1.3 years shorter on average, with a one-tailed 1% significance level. Furthermore, the rate of decline in output during the crisis period was also 8.8% lower at a 10% level. In other words, in countries with a relatively high degree of structural change, the results of the analysis shown in Panel (a) of **Table 1** are, in the sense that they hint at the possibility that the damage inflicted by the economic crisis was relatively minor, in line with the arguments put forward in previous research, i.e., that structural change served to suppress the economic crisis. On the other hand, a significant difference in economic growth rates between the two groups of countries was not detected, so

clear support for the contention that there was a positive correlation between structural change and economic growth was not obtained using this analytical framework.

3.2 Transformation Policy toward a Market Economy

Some of the most fundamental research questions in the economics of transition are what effect policies to promote system transformation had on market economies, how those policies were designed and implemented, and what sort of effects they had. Opinions concerning the answers to these questions in previous research, even when limited to the relationship between system transformation policy and macroeconomic growth, are extremely varied. Actually, in the debate on the growth of transitional economies, the effect of transformation policy on promoting growth has been the topic of most interest to researchers in this field, and because of that, it is no exaggeration to say that this issue has led to extremely vigorous theoretical and empirical investigations. In fact, as will be mentioned later, most of the previous studies covered by the meta-analysis performed in this paper are focused on the empirical analysis of transformation policy.

Among transformation policies, economic reform, which comprises liberalization, pricing/competition policies, corporate reform, privatization policy, financial/trade policy, etc., has always been of the most interest to researchers since the work performed by Åslund et al. (1996) and, most recently, de Rocha (2015). There are far too many studies to mention in this paper that have used either (a) the "Transition Indicators" of the European Bank for Reconstruction and Development (EBRD), which classify the extent of progress in economic reform in CEE and FSU countries by assigning each country one of five grades, or (b) the U.S. Heritage Foundation's "Index of Economic Freedom," which gives each of the world's countries an overall score based on its degree of economic freedom, or (c) variables that are the result of adjustments made to the "Transition Indicators" or the "Index of Economic Freedom" to verify the impact of economic reform on growth. An overview of previous research alone gives the impression that reform measures served, on the whole, to enhance economic growth. At the same time, however, researchers' choices about which countries/territories to cover, the period of observation, and the types of reform measures to look at can dramatically alter the empirical results, and this is characteristic of this research field.

Following economic reform, the transition policy given the next most attention by researchers has been democratization, the pillars of which include the introduction of a parliamentary system or a multi-party system. Fidrmuc (2001, 2003), Heckelman (2010), Apolte (2011), and Peev and Mueller (2012) produced research findings by tackling the relationship between democratization and economic growth head on. On the whole, these previous studies, which have employed "democracy indicators" resulting from investigations and calculations

performed by such organizations as Freedom House in the USA and the World Bank to carefully examine the interrelationship between the two phenomena, negate the minority view that democratization operates as a direct driver of economic growth. In fact, even Fidrmuc (2003), who acknowledges the economic-growth-enhancing effect of democracy, expresses a modest view, stating that democratization has, by increasing economic freedom, had a positive, yet indirect, impact on economic growth during the transition period. The estimation results of other previous studies, which have employed democratization indicators as a control variable, were mixed, and the overall trend in empirical findings has been less clear than that of economic reform.

The scope of transformation policy considered by researchers extends beyond economic reform and democratization. The rule of law and judicial reform are also important components. Most of the studies that have focused on these areas of reform have employed figures from third-party organizations, most notably Freedom House, to verify the relationship between economic growth in each country and the rule of law, the degree of the establishment of property rights, and the independence/fairness of judicial institutions, and they have identified a positive correlation between them (Grogan and Moers, 2001; Godoy and Stiglitz, 2006; Popov, 2007; Eicher and Schreiber, 2010). Other studies, albeit a much smaller number, have investigated the impact of the institutional nature of civic society, administrative reform, political reform/stability, and civic rights and the maturity of civic society on the economic crisis and the process of recovery, and these studies have found that there is a positive impact (Beck and Laeven, 2006; Eicher and Schreiber, 2010; Heckelman, 2010).

If a bold conclusion is to be drawn from the above, it would be that previous studies that have empirically examined the relationship between transformation policy and economic recovery have produced broadly similar findings, namely that measures that contribute to the transformation to a market economy either assist with economic growth or, at the very least, do not impede it, even though more than a few studies have produced contrary findings. Panel (b) of **Table 1** employs EBRD transition indicators to verify the relationship between the degree of progress in transformation policy and growth paths. Actually, similar to the case of structural change discussed earlier, the findings obtained support the aforementioned view that transformation policy served to suppress the crisis.

However, previous studies have suggested the possibility that the relationship between transformation policy and economic growth is not a monotonous or linear one. What needs to be pointed out here is that the claims of Fischer et al. (1996a, 1996b) and de Melo et al. (1997)—namely that liberalization and stabilization are two sides of the same coin but that if society does not stabilize, it will be difficult to achieve liberalization and that therefore, stabilization should be given priority—are worthy of attention from this point of view. The view that "better policy," as

advocated by Selowsky and Martin (1997), may intensify an economic crisis at least in the initial phase, leaving aside a long-term effect, also cannot be ignored.

An important issue in the transitional economic growth debate that is inseparable from and relates to the view of de Melo et al. (1997), who suggest that a non-linear relationship exists between policy and growth, is the conflicting views of radicalists and gradualists concerning the nature of the speed and policy sequence of economic transition (Iwasaki and Suzuki, 2016). From the 1990s to the early 2000s, the groups clashed, with opposing claims concerning the relationship between the speed of transformation policy (and economic reform in particular) and economic growth. In fact, while a series of studies, such as that from Roland and Verdier (2000), argue that a gradualist policy implementation effectively softened the drop in output that occurred in the initial phase of the transition, numerous others, such as that from Wyplosz (2000), claim that a policy of rapid liberalization led to a rapid escape from the transformational recession and a subsequent swift economic recovery. With the aim of bringing this debate to a conclusion, a group of researchers in the field of the economics of transition, which included Heybey and Murrell (1999), attempted to perform a unique empirical analysis by employing speed of reform as a variable for transformation policy in addition to the level of reform achieved, which had been used as such a variable in the past. Whether the difference between these two variables would lead to differences in empirical findings is an extremely interesting issue.

3.3 The Legacy of Socialism

In the context of the transitional economic growth debate, a vigorous debate also occurred concerning the impact that factors such as the number of years spent under socialism and the thoroughness of the planned economic structure had on the growth path during the transition phase. In this "socialist legacy" debate, the view existed that historical initial conditions had what could be described as a decisive impact on current and future economic activity. This view was jointly espoused by researchers in the fields of both institutional economics and evolutionary economics in the form of the concept of "path-dependency." The important point is that the longer the period spent under socialism and the deeper its impact on industrial activity or citizens' livelihoods, the more difficult it was to transform the system to a capitalist market economy, and this also served to suppress economic growth during the transition period.

From this viewpoint, Rosati (1994) expressed the opinion that the vestiges of the former system exacerbated the economic crisis during the initial phase of transition, while Stuart and Panayotopoulos (1999) expressed the view that early-stage macroeconomic imbalances were directly connected to the depth and length of the transformational recession. Furthermore, Polanec (2004) states that the negative legacy of the socialist era, which took the form of distortions in the market structure, had an extremely adverse impact on productivity during the period of

transformational recession. This shows that more than a few researchers regard the crisis that occurred during the initial phase of transition as being related to the economic situation at the tail end of socialism.

Historical initial conditions are also a key determinant not only of the economic crisis at the beginning of transition but also of the subsequent process of systemic transformation. For this reason, Denizer (1997) argued that the FSU countries, especially those in Central Asia, had more issues to resolve than did the CEE countries. Kolodko (2001) also pointed out that the longer the socialist legacy took to be eliminated, the longer it took for economic growth to return. Writing from a similar perspective, Selowsky and Martin (1997) stated that the problems faced by the FSU countries, such as distortions in industrial location, an industrial structure geared excessively toward meeting military demand, problems with private property rights, and lack of the rule of law, were more widespread and serious than those faced by the CEE countries, and thus it took the former countries longer to reallocate resources. They therefore offered an approach that added depth to the arguments put forward by such researchers as Denizer (1997) and Kolodko (2001). The view that the historical initial situation functioned to significantly restrict macroeconomic performance not only during the economic crisis but also during the recovery phase has been inherited by such researchers as Redek and Sušjan (2005) and Hodgson (2006).

Quite a few studies have used the number of years under socialism as an indicator expressing the weight of the socialist legacy, and one of the first to do so was Wolf (1999), who identified a significant negative correlation between the planned-economy period and the real economic growth rate. Since then, however, numerous studies have produced empirical results indicating that the correlation between the number of years under socialism and the economic growth rate has been weakening recently. A typical example of such a study is that of Falcetti et al. (2002). The fact that historical initial conditions recede over time has been empirically proven repeatedly in previous studies such as those by Iwasaki (2004), Cerović and Nojković (2009), and Mitrović and Ivančev (2010), who provide empirical background for the view, shared by most researchers in transitional economics, that while historical initial conditions are important, they are not necessarily insurmountable. Previous studies include several that have employed dummy variables for the former Soviet zone, the members of the Commonwealth of Independent States (CIS), etc., to measure the negative impact of the socialist legacy on economic growth in FSU countries as compared with CEE countries. The majority of studies, however, have employed, in addition to the aforementioned number of years under socialism, comprehensive indicators of initial conditions such as those developed by the EBRD (1999) and de Melo et al. (2001) or the degree of industrialization, output levels, etc., at the end of socialism to more rigorously verify the growth-suppressing effect of the socialist legacy.

As stated above, in the FSU countries, the negative legacy of the socialist planned economy probably hindered economic growth more seriously than in the CEE countries. In Panel (c) of **Table 1**, we compare the CEE countries with the FSU countries, which include the Baltic states, in order to verify the relationship between the legacy of socialism and the growth path. In doing so, we find that in the FSU countries, the rate of decline in output during the economic crisis was, on average, a statistically significant 9.4% greater than in the CEE countries. This hints at the economic-growth-suppressing effect of the socialist legacy.

3.4 Inflation

It is a well-known fact that the CEE and FSU countries experienced high inflation throughout the transition period. In fact, according to the EBRD, in 1992 Russia was hit by a more than 1,500% increase in consumer prices. Furthermore, Ukraine and Armenia recorded inflation rates of almost 5,000% in 1993 and 1994, respectively. Annual price rises of over 500% were seen in most CEE countries (Iwasaki and Uegaki, 2015). Kornai (1994) emphasized the particular importance of curbing inflation and pointed out that if the same policies implemented under socialism had been maintained, the budget constraints would not have hardened. This would have worsened inflation, which in turn would have suppressed investment and impeded economic growth. Wyplosz (2000) and Radulescu and Barlow (2002) also state that a high rate of inflation and a favorable macroeconomic structure are incompatible. Moreover, de Melo et al. (1997) present the interesting empirical finding that allowing prices to be determined freely serves to reduce prices more than maintaining price controls does. They also develop the argument that liberalization and inflation control can be pursued simultaneously and that this can also promote economic growth.

Several studies have aimed at verifying the relationship between high inflation and economic downturn during the transition period, and almost all of them have employed the consumer price index compared with the previous year or natural logarithms of that as an independent variable. One of these studies, by Brenton et al. (1997), reports that countries that succeeded in curtailing inflation were able to keep the decline in output during the crisis at a lower level. Meanwhile, Fischer et al. (1996a, 1996b) state that countries that moved quickly to deal with inflation were seen to experience a swift recovery in production. In addition, Laungani and Sheets (1997) provided analytical results showing that countries that quickly succeeded in enhancing central bank independence also succeeded in keeping their inflation rates at low levels, and this served to improve their macroeconomic conditions. Furthermore, Gillman and Harris (2010) verified that the inflation rate exerts an extremely powerful, stable, and negative impact on economic growth but also that if the inflation rate drops, its marginal effect is reduced.

The results of analysis presented in Panel (d) of **Table 1** show that for the group of countries with a higher inflation rate during the first five years of transition, the length of the economic

crisis was statistically significantly longer than that in the lower group and that the decline in output during the crisis period was more severe for the former. This finding backs up the aforementioned arguments presented in previous research concerning the economic-growth-suppressing effect of the hyperinflation that occurred in the immediate aftermath of the collapse of the socialist regime.

3.5 Regional Conflict

In the end of socialism and during the period after its collapse, regional conflicts broke out in various CEE and FSU countries. The one that is most deeply ingrained in our memories is probably the series of military conflicts that occurred in the former Yugoslavia. In this region, one war after another occurred during the 1990s: in the Croatian War, Croatia, which was striving for independence, clashed with the Federal Republic of Yugoslavia, which was trying to block these moves toward independence; the Bosnian War followed serious ethnic clashes concerning the independence of Bosnia-Herzegovina; and the Kosovo War broke out in the form of violent resistance by Albanians to their ethnic suppression by Serbia.

Conflicts also occurred frequently in the FSU region. First, armed clashes broke out between Armenia and Azerbaijan over the Nagorno-Karabakh region in 1988, during the Gorbachev administration in the Soviet Union. The war finally ended in 1994, but both countries had been left in ruins. In Tajikistan, a civil war between different ethnic groups lasted from 1992 to 1997, producing more than a million refugees. In 1992, a civil war also broke out in Moldova, after which some regions became independent of the central government. In Georgia, meanwhile, a civil war in 1991 resulted in the emergence of a number of semi-autonomous regions. The country also experienced armed clashes with Russia in 2008. Furthermore, the conflict in Ukraine, which broke out in 2014, has attracted international attention and continues to this day.

The economic impact that these regional conflicts wrought on the countries affected does not need to be emphasized. The impact was enormous. In the previous section, we reported that seven countries, Ukraine, Georgia, Tajikistan, and Moldova in the FSU and Serbia, Montenegro, and Bosnia-Herzegovina in the former Yugoslavia, formed a cluster of countries that had experienced the largest declines in production during the economic crisis and whose economies had also been slow to recover after the crisis. It is by no means coincidental that this group contains many of the countries that experienced the conflicts described above.

With the aim of measuring the impact of regional conflict on economic growth, researchers in the field of the economics of transition have expressed the occurrence of a regional conflict as a dummy variable and, for the most part, obtained statistically significant estimation results.[4]

[4] The vast majority of studies have employed a dummy variable whereby 1 denotes the year and country in which a conflict occurred. However, for countries that have experienced conflicts, a dummy

Most previous studies have treated this regional-conflict dummy variable as a control variable. However, a few studies have positioned regional conflict itself as one of the focal points of their empirical analysis. Moers (1999), for instance, pointed out that regional conflict had a more powerful impact on economic growth than systemic reform during the first half of the 1990s in 21 CEE and FSU countries. Furthermore, Hodgson (2006), who suspects that differences in ethnic composition were closely related to macroeconomic performance following the collapse of socialism, has produced empirical results that suggest a strong connection between ethnic conflict during the 1990s and economic downturns.

Our univariate comparative analysis supports the claims made by Moers (1999) and Hodgson (2006). In fact, Panel (e) of **Table 1** clearly illustrates the destructive effect of conflict, as it shows that the rate of decline in output during the crisis period in the countries that experienced regional conflicts during the 1990s was 24.6%, which is significant for a one-tailed test, higher than in the other transitional countries.

3.6 The Need for a Meta-Analysis

Regarding the five factors discussed above, it is reasonable to say that the opinions of researchers concerning the direction of their impact on economic growth in the CEE and FSU countries are mostly aligned. In other words, the structural changes in the national economy and the implementation of a transformation policy had a positive, or at least a non-negative, impact on economic growth in these countries. In contrast, the legacy of socialism, inflation, and regional conflict had a negative effect on output. As stated above, the various results of the univariate comparative analysis performed for the attributes of each group of countries reported in **Table 1** also support such a view in terms of the length of the economic crisis and the degree of decline in output during the crisis.

However, the previous literature does not provide a clear explanation of why the transition economies in the CEE and FSU regions followed a J-shaped trajectory without exception. None of the studies has explicitly discussed and empirically examined the relative differences in the degree of impact of each factor on economic growth. Only by quantitatively comparing and considering the impact of these five factors in terms of effect size and statistical significance we can answer the question of why the crisis and process of recovery in transition economies followed a J-shaped path rather than a U-shaped or V-shaped one.

Employing a meta-analysis of the empirical results of previous research to compare effect size and statistical significance is a highly effective means of achieving this objective. Furthermore, meta-analysis allows us to tackle such questions as whether a widely accepted view

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variable of 1 has been applied to the entire estimation period in some studies.

is sufficiently valid when the existence of counter-evidence is explicitly taken into account and whether the true effect size can be specified in research on transition economies as a whole. This is why, in this paper, we attempt to perform a unique and large-scale meta-analysis based on the empirical evidence of the previous literature.

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

Taking into account the issue and research objectives described above, in this section, we will describe the procedure of literature selection and give an overview of the studies selected for meta-analysis.

As a first step toward identifying relevant research that involved empirical analysis of the determinants of macroeconomic decline and growth during the transition period in the CEE and FSU countries, we used EconLit and Web of Science to search for literature published between 1989 and early 2016.[5] When using these electronic databases, we employed as search terms combinations of one of *growth*, *decline*, *output*, *performance*, *gross domestic product*, and *GDP* and one of *transition economies*, *Central Europe*, *Eastern Europe*, *former Soviet Union*, and the name of a CEE or FSU country. This generated close to 3,500 hits. Then, judging from each title, abstract, and other related information, we narrowed the list and obtained more than 250 studies.

In the second step, we closely examined the contents of these research works one by one and limited our literature list to those containing estimates that could be subjected to meta-analysis in this paper. As a result, we selected a total of 123 studies, from Åslund et al. (1996) to Cojocaru et al. (2016), listed in **Table 2**. According to this table, the selected studies had been published continuously during the period between 1996 and the beginning of 2016, but the years 2004 and 2009 saw the most publications, with 10 in each of those years. The next most productive years were 2005 and 2006, with nine papers published in each, followed by 2001 and 2003, with eight in each. By decade, 20 papers were published in the 1990s (16.3%), 73 in the 2000s (59.3%), and 30 (24.4%) in the 2010s.

All of these 123 previous works are multinational studies, covering seven or more countries (mean: 22.3; median: 25); 120 of the studies deal with new EU member states as target countries. Studies covering non-EU CEE countries numbered 104, and those covering FSU countries, excluding the Baltic states, 109. Moreover, 18 studies included research on former socialist countries outside the CEE and FSU or other emerging economies. These 123 studies cover the 33 years from 1979 to 2011 as a whole. The average period covered by each study is 9.9 years (median: 9). Eighty-one studies employ GDP as the base index of economic growth variable (i.e.,

[5] The final literature search was performed in January 2016.

dependent variable) in their empirical analysis. The number of studies using per-capita GDP and per-worker GDP is 40 and 50, respectively. On the other hand, the number of studies using structural change, transformation policy, the socialist legacy, inflation, and regional conflict as growth-determining variables (i.e., independent variables) is 34, 96, 38, 68, and 36, respectively.[6]

From these 123 studies, we extracted a total of 3,279 estimates (mean: 26.7 per study; median: 16). **Figure 3** gives a breakdown of the collected estimates by each growth-determining-variable type. As this figure shows, 1,702 extracted estimates (52%) are empirical results of the growth-enhancing effect of transformation policy, reflecting the high level of interest in this aspect among researchers. Evidence regarding the effect of inflation on growth takes the second largest share with 696 estimates. Those regarding the impacts of structural change, the socialist legacy, and regional conflict accounted for 8–10% of all the collected estimates.

5. Meta-Analysis

In this section, we will perform the meta-analysis employing the aforementioned 3,279 collected estimates. In Subsection 5.1, we will examine the distribution of the estimates and, using a traditional meta-synthesis method, perform a comparison of the effect size and statistical significance of the five growth-determining variables in question. In Subsection 5.2, we will perform a meta-regression analysis to verify whether the results of the meta-synthesis are supported even after simultaneously controlling for various research conditions. Furthermore, in Subsection 5.3, we will attempt a meta-analysis focusing solely on the structural change and transformation policy, which are of great interest in the field of the economics of transition.

5.1 Meta-Synthesis

The objects of the meta-synthesis are the partial correlation coefficient (PCC) and the t value. The PCC is a measure of the association of a dependent variable and the concerned independent variable when other variables are held constant. Here, if the t value and the degree of freedom of kth estimate (k=1, … , K) are denoted as t_k and df_k, respectively, the calculation of PCC (r_k) is performed using the following formula:

[6] Independent variables employed in previous research at frequencies similar to the above five variables are domestic investment and fiscal expenditure, but the number with empirical findings estimated to be statistically significant is much lower than that for the above five factors. The next most frequently used are education level and foreign direct investment (FDI). The empirical results of the growth-promoting effect of education are similar to those of domestic investment and fiscal expenditure, as mentioned in the Introduction. FDI is regarded as a promising factor behind growth in transition economies. However, Iwasaki and Tokunaga (2014) have already examined the impact of FDI on growth in CEE and FSU countries through a meta-analysis.

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

The standard error (*SE*) of r_k is given by $\sqrt{(1 - r_k^2)/df_k}$.

In **Table 3**, the descriptive statistics of the PCC and the *t* value and the results of the Shapiro–Wilk normality test are reported for each type of growth-determining variable. **Figure 4** presents each kernel density estimation. From these materials, we can confirm that while the distribution of the collected estimates is not distributed normally for every variable type, more of the estimates relating to the growth effects of structural change and transformation policy are distributed on the positive side, and, in contrast, those of the socialist legacy, inflation, and regional conflict are clearly biased toward the negative side. In other words, most previous studies produced findings implying that while the former two factors demonstrated a growth-enhancing effect, the latter three factors served as triggers for negative growth.

Table 4 reports the results of meta-synthesis. In this table, the PCCs are synthesized using a fixed-effect model and random-effects model. The *t* values are combined with and without a 10-point scale of the research quality level as a weight.[7] We also report the median *t* value and Rosenthal's fail-safe N (*fsN*). The latter serves as a supplemental statistic for evaluating the reliability of the combined *t* value.[8]

As reported in Panel (a) of **Table 4**, the test of homogeneity rejected the null hypothesis at a 1% significance level for all five variable types. Therefore, we adopt the coefficient of the random-effects model as a reference value of the synthesized effect size. The results indicate that the synthesized effect sizes for structural change and transformation policy both take positive values and are statistically significant. On the other hand, those for the socialist legacy, inflation, and regional conflict are significant and negative. Furthermore, regarding the combined *t* values shown in Panel (b) of the same table, even when differences in the quality level among the studies are taken into account, the overall statistical significance of the collected estimates is of an adequate level for all variable types. The sufficiently large fail-safe N also supports the results of a combination of *t* values.

According to Doucouliagos (2011), concerning assessment of the PCC in economic research,[9] the impact on economic growth of structural change, transformation policy, and the

[7] For more details on the method of evaluating the research quality, see **Appendix A** of this paper.

[8] For a more detailed explanation of the meta-synthesis method and the fail-safe N, see Section B.1 of **Appendix B** of this paper.

[9] Cohen (1988), who is frequently cited for assessing correlation coefficients, defines a coefficient of 0.3 as the threshold between a "small effect" and a "medium effect" and a coefficient of 0.5 as the

socialist legacy is regarded as a small one. On the other hand, the effect of regional conflict on output can be assessed as medium, while that of inflation can be expressed as large.[10] In other words, regional conflict and inflation hindered economic growth with effect sizes that surpass those of structural change and transformation policy by a large margin, and the legacy of socialism also contributed to output decline with an effect size similar to those of structural change and transformation policy. This finding provides a clear answer to the question of why, during the initial years of transition, the CEE and FSU countries experienced a destructive drop in output. Furthermore, the results, which indicate that the growth-enhancing effects of structural change and transformation policy are not as strong as they were assumed to be in early transition period, could provide evidence that the recovery process following the economic crisis was not V-shaped. For this reason, a comparative analysis involving a meta-synthesis with five types of growth-determining variables provides an unequivocal quantitative explanation of emergence of the J-curved growth path in transition economies.

5.2 Meta-Regression Analysis

It is difficult to say that the traditional meta-synthesis method can effectively control for possible heterogeneity between studies. Therefore, in this subsection, we perform a meta-regression analysis (MRA) to examine whether the results of meta-synthesis described in Subsection 5.1 can be reproduced after controlling for various research conditions that may have affected the empirical results in the previous literature. More concretely, we attempt to estimate the meta-regression model:

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

threshold between a "medium effect" and a "large effect." It is argued, however, that Cohen's guidelines for zero-order correlations are too restrictive when applied to economics. This prompted Doucouliagos (2011) to propose alternative criteria to those of Cohen (1988). According to his new criteria, the lower thresholds for small, medium, and large effects are set at 0.024, 0.154, and 0.245, respectively.

[10] Incidentally, and as reported in the **Supplement** to this paper, when we performed a meta-synthesis limited to estimates for the 1990s, when almost all of the CEE and FSU countries were either in the midst of crisis or in which output had still failed to recover to the levels at the end of socialism, as the estimation period, the synthesized effect size of structural change using the random-effects model shrank to 0.012, thereby becoming statistically insignificant. On the other hand, those of the socialist legacy and inflation both increased dramatically, to -0.206 and -0.413, respectively. Meanwhile, the synthesized effect size of transformation policy and regional conflict changed only slightly, to 0.170 and 0.281, respectively. These results suggest that the time-lagged effect of structural change and the time-decay effect of the socialist legacy and inflation have not been adequately captured in the earlier research.

where y_k is the k-th collected 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 eight 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 research quality level, the number of observations (N), the degree of freedom (df), or the inverse of the standard error ($1/SE$) as an analytical weight; the multilevel mixed-effects restricted maximum likelihood (RML) estimator; and the two unbalanced panel estimators consisting of a cluster-robust random-effects estimator and cluster-robust fixed-effects LSDV.[11]

We introduce the PCC or the t value into the left-hand side of the regression equation (2), while on its right-hand side, we adopt a series of meta-independent variables designed to capture not only the differences in growth-determining variables, target countries, the estimation period, and the base index of economic growth variable that we mentioned in Section 4 but also the differences in data type, estimator, benchmark index of economic growth variable, degree of freedom, and quality of the study. The names, definitions, and descriptive statistics of these meta-independent variables are listed in **Table 5**.

Table 6 provides the estimation results using all 3,279 collected estimates. Panel (a) of this table shows the estimation results of the meta-regression model with the PCC on the left-hand side, while Panel (b) gives those taking the t value as the dependent variable. Hereinafter, we will interpret the regression results under the assumption that the meta-independent variables that are statistically significant and have the same sign in at least five of eight models constitute statistically robust estimation results.

As **Table 6** shows, if structural change is taken as the default category, then regardless of differences in the dependent variables, all of the meta-independent variables that specify the estimates of the socialist legacy, inflation, and regional conflict are robustly estimated to be negative. This is in sharp contrast to the insignificant coefficient of transformation policy. Put another way, we can say that no statistically significant difference is seen for either the PCC or the t value in estimation results verifying the growth effects of structural change and transformation policy. On the other hand, the PCCs and t values for structural change and transformation policy and the three remaining growth determinants exhibit a significant difference, and the values for the latter three factors are much lower than the former two. In fact, if we refer

[11] For more details on the MRA method, see Section B.2 of **Appendix B** of this paper.

to the means of statistically significant regression coefficients, we find that compared with structural change and transformation policy, the PCCs of the socialist legacy, inflation, and regional conflict are lower, at 0.1234, 0.3504, and 0.2917, respectively, while their *t* values are also lower, at 1.2901, 4.5346, and 3.2500, respectively. The relationship expressed in the meta-independent variables of growth-determining variable types is highly consistent with the results of meta-synthesis reported in **Table 4**. Therefore, we maintain that the discussion in the previous subsection regarding the emergence of a J-shaped growth path is a universal policy implication for transition economies beyond the various differences in research conditions.

5.3 Meta-Analysis of Structural Change and Transformation Policy

Among the five growth determinants dealt with in this paper, structural change and transformation policy are of the greatest concern to international organizations and researchers of transition economies. Therefore, we will bring this section to a close by performing a meta-analysis focused on these two factors.

As mentioned in Section 3, the literature subjected to our meta-analysis employed five types of indicators for measuring structural changes in a national economy. These are (a) share of private sector in GDP, (b) trade openness, (c) bank credit to private sector, (d) market capitalization, and (e) development of the financial sector. On the other hand, the indicators that these previous studies employed for the purpose of examining the relationship between transformation policy and economic growth are more diverse, reflecting the variation in the areas of expertise of and the issues of interest to the researchers. The variable used to express the domains of transformation policy comprises a total of 16 types of indicators. These include indicators relating to economic policy in each area, such as liberalization and price/competition policy, etc., the reform of institutions/property rights, the reform of government/politics, democratization, the rule of law and legal reform, and civil rights and society.

Furthermore, as we stated in Subsection 3.2, with respect to the effect of transformation policy on growth, against the background of the heated debate on radicalism versus gradualism as alternative transition strategies (Iwasaki and Suzuki, 2016), many researchers have paid a lot of attention not only to the degree of success of the transformation policy but also to the speed of policy implementation.[12] For this reason, when we were in the process of coding the estimates of transformation policy variables, we recorded not only the domains targeted for reform but also

[12] Studies that have paid particularly close attention to the relationship between reform speed and economic growth include Heybey and Murrell (1999), referred to in Subsection 3.2, as well as Bernardes (2003), Staehr (2005), and Godoy and Stiglitz (2006). Most previous studies have employed temporal differences in the degree of reform as a proxy for reform speed. For instance, see de Macedo and Martins (2008) and Segura-Ubiergo et al. (2010).

the categories of reform level and the reform speed to serve as the benchmark index of the transformation policy variable.

Table 7 presents the results of our meta-synthesis of the estimates of structural change variables and transformation policy variables in accordance with the aforementioned sub-classifications. In addition, regarding the transformation policy variable, it also reports the meta-synthesis results for the classification of estimates according to differences in the benchmark index, namely the reform level and reform speed. As Panel (a) of the table shows, the homogeneity test strongly rejected the null hypothesis; hence, we again employed the coefficient of the random-effects model as a reference value of the synthesized effect size.

Table 7 indicates that all the variables used in previous research have not effectively or fully captured the growth-enhancing effects of structural change and transformation policy. Actually, in the case of structural change variables, the synthesized effect sizes of bank credit to private sector and market capitalization, while positive, are not statistically significant. Moreover, combined *t* values weighted by the quality level of the research have not reached a 10% significance level, not only for these two variable types, but also for the development of the financial sector. With respect to transformation policy variables, the synthesized effect sizes for five of the 16 variable types show an insignificant value. Moreover, that for democratization is significantly negative. Concerning combined *t* values that take into account the difference in research quality, 11 of the 16 variable types are insignificant. In addition, the synthesized effect sizes and weighted combined *t* values of collected estimates, which are used as a measure of the reform level, are significantly positive in both cases; yet for the reform speed, they are insignificant.

The meta-regression results reported in **Tables 8** and **9** provide evidence that supports the findings obtained from the meta-synthesis. In other words, in the case of structural change variables, if other research conditions are equal, the three variable types relating to the financial sector are, on average, significantly lower than the share of private sector in GDP in terms of the PCC. Furthermore, the *t* values of bank credit to the private sector and market capitalization are significantly lower than those for the private-sector GDP share. With respect to transformation policy variables, both the PCCs and *t* values of the six policy domains, namely comprehensive economic reform, liberalization, financial reform, trade reform, the rule of law/legal reform, and civil rights/society, are significantly higher than those of comprehensive structural reform. In addition, the PCC of political reform/stability and the *t* values of enterprise reform, government reform, and other transformation policies are significantly higher than the corresponding value of comprehensive structural reform. Moreover, compared with estimates for transformation policy variables that adopt the reform level as the benchmark index, those for the reform speed yielded

significantly lower results for both the PCCs and *t* values.[13]

As the above has shown, the fact that a fairly large proportion of the variables employed in previous research to empirically examine the growth-enhancing effect of structural change and transformation policy did not produce the expected results is probably related to the results of the meta-analysis based on all of the collected estimates that the effect size of these two factors on growth is small, as pointed out in Subsection 5.1. The question of why a significant positive correlation with economic growth in the CEE and FSU countries could not be identified from specific fields in structural change, policy scope, and reform speed is one that warrants further inquiry in the future.

6. Assessment of Publication Selection Bias

In this section, we will assess the presence and degree of publication selection bias in the literature of growth determinants in transition economies. In the discussion that follows, we examine this issue by using the funnel plot and the Galbraith plot as well as by estimating the 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 used 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 the range of ±1.96. The Galbraith plot tests whether the above relationship can be observed in the statistical significance of the collected estimates and thereby identifies the presence of type II publication selection bias.

In addition to the above two scatter plots, we also report estimates 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.

[13] However, as **Table 9** shows, when most meta-independent variables of transformation policy variable type and reform speed are controlled for between-study heterogeneity using the multilevel mixed-effects RML or the random/fixed-effects panel estimator, the statistical significance of the regression coefficient drops by a large margin. This makes it likely that some caution needs to be exercised in the interpretation of estimation results.

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:

$$t_k = \beta_0 + \beta_1(1/SE_k) + v_k, \quad (3)$$

thereby testing the null hypothesis that the intercept term β_0 is equal to zero. In Eq. (3), v_k is the error term. When the intercept term β_0 is statistically significantly different from zero, we can interpret that the distribution of the effect sizes is asymmetric. 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. (3) is replaced with the absolute *t* value:

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

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) propose examining this possibility by testing the null hypothesis that the coefficient β_1 is equal to zero in Eq. (3). The rejection of the null hypothesis implies the presence of a genuine effect. They call this test the precision-effect test (PET). Moreover, they state that an estimate of the publication-selection-bias-adjusted effect size can be obtained by estimating the following equation that has no intercept:

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

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) call this procedure the precision-effect estimate with standard error (PEESE) approach. To test the robustness of the regression coefficient, we estimate Eqs. (3) to (5) above using not only the OLS estimator but also the cluster-robust OLS estimator and the unbalanced panel estimator,[14] both of which treat possible heterogeneity among the studies.[15]

Following Babecky and Havranek (2014), **Figure 5** presents funnel plots for the PCC and degree of freedom by growth-determining variable type. For every variable type, the plot shows a roughly triangular shape and thus does not strongly indicate the presence of type I publication selection bias. We also conducted an additional univariate analysis aimed at determining whether the collected estimates are distributed evenly around the true effect. We actually tested for two

[14] To estimate Eqs. (3) and (4), we use either the cluster-robust random-effects estimator or the cluster-robust fixed-effect estimator according to the results of the Hausman test of the random-effects assumption. With regard to Eq. (5), which does not have an intercept term, we report the random-effects model estimated by the maximum likelihood method.

[15] For a more detailed discussion of methodology, see Section B.3 of **Appendix B** of this paper.

cases, the first being where the true effect is assumed to be zero and the second being where the mean of the most precise 10% of estimates is regarded as the approximate value of the true effect.[16] The results are shown in Panel (a) of **Table 10**. If the mean of the most precise 10% of estimates is assumed to equal the true effect, the null hypothesis, whereby in the case of structural change variables, the number of PCCs that are lower than the true effect is equal to the number of PCCs that are higher than the true effect, is accepted, whereas in other all cases, the null hypothesis is rejected. Accordingly, there is deemed to be a possibility that type I publication selection bias is present for all variable types.

Figure 6 shows Galbraith plots for *t* values and degrees of freedom. In these plots, the two-tail test limits of ±1.96 with a 5% significance level are shown as solid lines. From this figure, we certainly cannot say that, for every variable type, 95% of all the estimates lie between these limits. In other words, if the true effect is assumed to be close to zero, the possibility of type II publication selection bias is regarded to be high for every variable type. The results of a more rigid univariate test are reported in Panel (b) of **Table 10**. As this panel indicates, if the true effect is assumed to be zero, a goodness-of-fit test rejects the null hypothesis at a 1% significance level for all variable types. Similarly, if the mean of the most precise 10% of estimates is assumed to be the true effect, the null hypothesis that estimates where the statistic $|(k\text{th estimation result} - \text{true effect})/SE_k|$ that does not exceed the threshold of 1.96 accounts for 5% of the total is also strongly rejected in all five cases. These results lead us to infer that, irrespective of the difference in growth-determining variable type, the possibility of type II publication selection bias is extremely high in this research field.

Table 11 reports the estimation results of the meta-regression equations (3), (4), and (5). If we employ as a judgment criterion the question of whether the null hypothesis is rejected for at least two out of three models for each variable type, as Panel (a) in the table shows, the FAT results in the rejection of the null hypothesis for the two cases of transformation policy and regional conflict. On the other hand, the test for type II publication selection bias shown in Panel (b) of the same table rejects the null hypothesis for four variable types, excluding inflation. The results of the PET reported in Panel (a) reject the null hypothesis for the four cases excluding the socialist legacy. This indicates the possibility that the collected estimates contain genuine evidence beyond the publication selection bias. Actually, as shown in Panel (c) of **Table 11**, the PEESE results in a strong rejection of the null hypothesis for four variable types. Furthermore, the coefficient of the inverse standard error (1/*SE*) in Eq. (5) implies that the impact on economic growth of structural change and transformation policy is significantly positive, whereas that of

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

inflation and regional conflict is significantly negative. We can also confirm that the mutual relationship between these four factors in terms of effect size is quite consistent with the meta-analysis reported in the previous section. In this sense, the results of the meta-analysis performed in this paper can be regarded as highly reliable even when the presence of publication selection bias is taken into consideration.

7. Conclusions

After experiencing an unprecedented economic crisis in the immediate aftermath of the collapse of socialism, the CEE and FSU countries either have recovered or are in the process of recovery. The growth path followed by these nations in the past quarter century is quite interesting from a historical perspective and has therefore driven numerous researchers to endeavor to define the determinants of economic decline and growth in transition economies.

The meta-analysis in this paper, which employed 3,279 estimates collected from 123 previous studies, made the following findings concerning five factors regarded as being closely connected to emergence of a J-curved growth path in transition economies: First, structural changes in a national economy, as well as policies designed to transform the planned system into a market-oriented economy, have only delivered a small growth-enhancing impact, dashing the expectations of policymakers and researchers. Second, in contrast to these two factors, it is highly likely that the hyperinflation and regional conflicts that erupted at the beginning of transition led to a massive reduction in output. Third, the socialist legacy is also thought to have contributed to the economic crisis, with an effect size similar to those of structural changes and transformation policy. These results provide a lucid explanation for why the economic recovery that followed the crisis was characterized not by a V shape but by a slower-paced growth tempo and why marked differences occurred between countries in the rate of output decline during the crisis and the speed of recovery during the rebound. In other words, while interactions among the five factors delivered a J-curved growth path to all of the CEE and FSU countries, the differences among the nations in terms of historical preconditions, political circumstances, and reform efforts resulted in major differences in their growth trajectories.

Furthermore, in this paper, we also conducted a meta-analysis focused solely on empirical findings concerning structural change and transformation policy that are of great interest in the economics of transition. The results reported in Subsection 5.3 strongly indicate that it is far more difficult than we imagined to capture economically meaningful and statistically significant growth-enhancing effects from these two factors. In other words, we found that when we attempted to identify variables where the synthesized PCCs are significantly positive and the combined *t* values are also significant at a 10% level, only two out of five types in the case of

structural change variables and five out of 16 types of transformation policy variables meet these criteria. We also found that, while the reform level is significantly related to the economic growth rate with a positive sign, there was no significant correlation at all in the case of the speed of policy implementation. In addition to the results of meta-analysis using all of the collected estimates in Subsections 5.1 and 5.2, these results also contribute to the further understanding of macroeconomic performance in the transition period.

In this paper, we also investigated publication selection bias and the presence of genuine evidence in the existing literature through visual verification using funnel plots and Galbraith plots and estimation of meta-regression models developed specifically for this purpose. The latter results are summarized in **Table 12**. As this table shows, in this research field, the publication frequency of statistically significant empirical findings is unnaturally high. For this reason, it is highly likely that type II publication selection bias is present, though the influence of type I publication bias is not especially serious. Moreover, it is verified that genuine empirical evidence exists in the collected estimates and that the publication-selection-bias-adjusted effect size is significantly different from zero except for the legacy of socialism. In other words, previous research has, on the whole, achieved great success in specifying the true effects of the most important determinants of the growth path in the CEE and FSU countries during the transition period. We therefore wish to pay our respects to the generous efforts made by researchers of transition economies from the late 1990s until today.

APPENDIX A

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 ranking of economics journals that had been published as of November 1, 2012, by IDEAS—the largest bibliographic 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, but if at least one of the following conditions is met, each of the relevant books or chapters has 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 to be obviously high.

APPENDIX B

METHODOLOGY OF META-ANALYSIS IN THIS PAPER

In this appendix, we outline the meta-analysis to be conducted in this paper. Here, we employ the partial correlation coefficient (PCC) and the *t* value as subject of meta-analysis. The PCC is a measure of association of a dependent variable and the independent variable in question when other variables are held constant. The PCC is calculated in the following equation:

$$r_k = \frac{t_k}{\sqrt{t_k^2 + df_k}}, \quad \text{(A1)}$$

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 $\sqrt{(1 - r_k^2)/df_k}$.[17]

B.1 Meta-synthesis

The following method is applied for synthesizing PCCs. Suppose there are *K* estimates (*k*=1, 2, ..., *K*). Here, the PCC of the *k*-th estimate is labeled as r_k, and the corresponding population and standard deviation are labeled as θ_k and S_k, respectively. We assume that $\theta_1 = \theta_2 = \ldots = \theta_K = \theta$, implying that each study in a meta-analysis estimates the common underlying population effect, and that the estimates differ only by random sampling errors. An asymptotically efficient estimator of the unknown true population parameter θ is a weighted mean by the inverse variance of each estimate:

$$\bar{R} = \sum_{k=1}^{K} w_k r_k \Big/ \sum_{k=1}^{K} w_k, \quad \text{(A2)}$$

where $w_k = 1/v_k$ and $v_k = s_k^2$. The variance of the synthesized partial correlation $\bar{R}$ is given by: $1/\sum_{k=1}^{K} w_k$.

This is the meta fixed-effect model. Hereafter, we denote estimates of the meta fixed-effect model using $\overline{R_f}$. In order to utilize this method to synthesize PCCs, we need to confirm that the estimates are homogeneous. A homogeneity test uses the statistic:

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[17] A benefit of the PCC is that it makes comparing and synthesizing collected estimates easier concerning independent variables of which the definitions or units differ. On the other hand, a flaw of the PCC is that its distribution is not normal when the coefficient is close to -1 and +1 (Stanley and Doucouliagos, 2012, p. 25). Fisher's z-transformation $\left(z = \frac{1}{2}\ln\left(\frac{1+r}{1-r}\right)\right)$ is the most well-known solution to this problem. As in overall economic studies, the PCC of each estimate used for our meta-analysis is rarely observed to be close to the upper or lower limit, and thus we use the PCC as calculated in Eq. (A1). Nevertheless, we have confirmed that even if a z-transformed PCC is used, the results of meta-analysis in this paper are not greatly different.

$$Q_r = \sum_{k=1}^{K} w_k \left(r_k - \overline{R_f}\right)^2 \sim \chi^2(K-1), \quad \text{(A3)}$$

which has a Chi-square distribution with *N*-1 degrees of freedom. The null hypothesis is rejected if Q_r exceeds the critical value. In this case, we assume that heterogeneity exists among the studies and adopt a random-effects model that incorporates the sampling variation due to an underlying population of effect sizes as well as the study-level sampling error. If the deviation between estimates is expressed as δ_θ^2, the unconditional variance of the *k*-th estimate is given by $v_k^u = \left(v_k + \delta_\theta^2\right)$. In the meta random-effects model, the population θ is estimated by replacing the weight w_k with the weight $w_k^u = 1/v_k^u$ in Eq. (A2).[18] For the between-studies variance component, we use the method of moments estimator computed by the next equation using the value of the homogeneity test value Q_r obtained from Eq. (A3):

$$\hat{\delta}_\theta^2 = \frac{Q_r - (K-1)}{\sum_{k=1}^{K} w_k^u - \left(\sum_{k=1}^{K} w_k^{u^2} / \sum_{k-1}^{K} w_k^u\right)}. \quad \text{(A4)}$$

Hereafter, we denote the estimates of the meta random-effects model as $\overline{R_r}$.

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

$$\overline{T_w} = \sum_{k=1}^{K} w_k t_k \Big/ \sqrt{\sum_{k=1}^{K} w_k^2} \quad \sim \quad N(0,1). \quad \text{(A5)}$$

Here, w_k is the weight assigned to the *t* value of the *k*-th estimate. As the weight w_k in Eq. (A5), we utilize a 10-point scale to mirror the quality level of each relevant study $(1 \le w_k \le 10)$. More concretely, if the study in consideration is a journal article, the quality level is determined on the basis of the economic journal's ranking and its impact factor. For either a book or a book chapter, the quality level is determined based on the presence or absence of a peer review process and literature information, such as the publisher (see **Appendix A** for more details). 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 $\overline{T_u}$ obtained according to the following equation:

$$\overline{T_u} = \sum_{k=1}^{K} t_k \Big/ \sqrt{K} \sim N(0,1). \quad \text{(A6)}$$

By comparing these weighted and unweighted combined *t* values, we examine the relationship between the quality level and the level of statistical significance reported by each study.

As a supplemental statistic for evaluating the reliability of the above-mentioned combined *t* value, we also report Rosenthal's fail-safe N (*fsN*) as computed by the next formula:

[18] This means that the meta fixed-effect model is a special case based on the assumption that $\delta_\theta^2 = 0$.

$$fsN\ (p = 0.05) = \left(\frac{\sum_{k=1}^{K} t_k}{1.645}\right)^2 - K. \quad \text{(A7)}^{19}$$

B.2 Meta-regression Analysis

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

$$y_k = \beta_0 + \sum_{n=1}^{N} \beta_n x_{kn} + e_k\,, \quad k = 1, 2, \cdots, K, \quad \text{(A8)}$$

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).

When selecting an estimator for meta-regression models, we should pay the most attention to heterogeneity among selected studies. It is especially true in our case, where multiple estimates are to be collected from one study. Therefore, we perform an MRA using the following eight 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 (*N*), degree of freedom (*df*), 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 and cluster-robust random-effects estimator). In this way, we check the statistical robustness of coefficient β_n.

B.3 Assessment of Publication Selection Bias

Testing for publication selection bias is an important issue on par with the synthesis of estimates and meta-regression of between-study heterogeneity. In this paper, we examine this problem by using the funnel plot and the Galbraith plot as well as by estimating the meta-regression model that is designed especially for this purpose.

The funnel plot is a scatter plot with the effect size (in the case of this paper, the PCC) on the horizontal axis and the precision of the estimate (in this case, degree of freedom) on the vertical axis. In the absence of publication selection, effect sizes reported by independent studies vary randomly and symmetrically around the true effect. Moreover, according to the statistical theory,

[19] Rosenthal's fail-safe N denotes the number of studies with the average effect size equal to zero, which needs to be added in order to bring the combined probability level of all the studies to the standard significance level to determine the presence or absence of effect. The larger value of *fsN* in Eq. (A7) means the more reliable estimation of the combined *t* value. For more details, see Mullen (1989) and Stanley and Doucouliagos (2012).

the dispersion of effect sizes is negatively correlated with the precision of the estimate. Therefore, the shape of the plot must look like an inverted funnel. This means that 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 a scatter plot with the precision of the estimate (in the case of this paper, degree of freedom) on the horizontal axis and the statistical significance (in this case, the *t* value) on the vertical axis. We use this plot 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 the range of ±1.96. The Galbraith plot tests whether the above relationship can be observed in the statistical significance of the collected estimates, and thereby identifies the presence of type II publication selection bias. In addition, for the above reasons, the Galbraith plot is also used as a tool for testing the presence of a non-zero effect.[20]

In addition to the two scatter plots, we also report estimates 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:

$$t_k = \beta_0 + \beta_1(1/SE_k) + v_k, \quad \text{(A9)}$$

and thereby testing the null hypothesis that the intercept term β_0 is equal to zero.[21] In Eq. (A9), v_k is the error term. When the intercept term β_0 is statistically significantly different from zero, we can interpret that the distribution of the effect sizes is asymmetric. For this reason, this test is

[20] For more details, see Stanley (2005) and Stanley and Doucouliagos (2009).

[21] Eq. (A9) is an alternative model to the following meta-regression model that takes the effect size as the dependent variable and the standard error as the independent variable:

$$\text{effect size}_k = \beta_0 SE_k + \beta_1 + \varepsilon_k. \quad \text{(A9b)}$$

More specifically, Eq. (A9) is obtained by dividing both sides of the equation above by the standard error. The error term ε_k in Eq. (A9b) does not often satisfy the assumption of being *i.i.d.* (independent and identically distributed). In contrast, the error term in Eq. (A9), $v_k = \varepsilon_k/SE_k$, is normally distributed, and thus it can be estimated by OLS. Type I publication selection bias can also be detected by estimating Eq. (A9b) using the WLS estimator with the inverse of the squared standard error $(1/SE_k^2)$ as the analytical weight and, thereby, testing the null hypothesis of $\beta_0 = 0$ (Stanley, 2008; Stanley and Doucouliagos, 2012, pp. 60–61).

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. (A9) is replaced with the absolute *t* value:

$$|t_k| = \beta_0 + \beta_1(1/SE_k) + v_k \quad \text{(A10)}$$

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) propose examining this possibility by testing the null hypothesis that the coefficient β_1 is equal to zero in Eq. (A9). The rejection of the null hypothesis implies the presence of a genuine effect. They call this test the precision-effect test (PET). Moreover, they also state that an estimate of the publication-bias-adjusted effect size can be obtained by estimating the following equation that has no intercept:

$$t_k = \beta_0 SE_k + \beta_1(1/SE_k) + v_k, \quad \text{(A11)}$$

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 that the coefficient β_1 can be regarded as its estimate. Stanley and Doucouliagos (2012) call this procedure the precision-effect estimate with standard error (PEESE) approach.[22] To test the robustness of the regression coefficient, we estimate Eq. (A9) to (A11) above using not only the OLS estimator, but also the cluster-robust OLS estimator and the unbalanced panel estimator,[23] both of which treat possible heterogeneity among the studies.

To summarize, to test for publication selection bias and the presence of a genuine empirical effect, we take the following four steps: First, we test the type I publication selection bias by estimating Eq. (A9) to examine the FAT and the type II publication selection bias by estimating Eq. (A10). Second, regardless of the outcome of the publication selection bias tests, we conduct the PET to test the existence of a genuine effect in the collected estimates beyond possible contamination from publication bias. Third, in cases where the null hypothesis of the PET is rejected, we obtain an estimate of β_1 in Eq. (A11) using the PEESE approach. Finally, if β_1 in

[22] We can see that the coefficient β_1 in Eq. (A11) may become the estimate of the publication-bias-adjusted effect size in light of the fact that the following equation is obtained when both sides of Eq. (A11) are multiplied by the standard error:

$$\text{Effect size}_k = \beta_0 SE_k^2 + \beta_1 + \varepsilon_k. \quad \text{(A11b)}$$

When directly estimating Eq. (A11b), the WLS method, with $1/SE_k^2$ as the analytical weight, is used (Stanley and Doucouliagos, 2012, pp. 65–67).

[23] To estimate Eqs. (A9) and (A10), we use either the random-effects estimator or the fixed-effects estimator according to the results of the Hausman test of the random-effects assumption. With regard to Eq. (A11), which does not have an intercept term, we report the random-effects model estimated by the maximum likelihood method.

Eq. (A11) is statistically significantly different from zero, we report $\beta_1$as the estimate of the publication-selection-bias-adjusted effect size. In cases where the null hypothesis of PET is accepted, we judge that the literature in question fails to provide sufficient evidence to capture the genuine effect. As mentioned above, we basically follow the FAT-PET-PEESE approach advocated by Stanley and Doucouliagos (2012, pp. 78–79) as the test procedures for publication selection. However, we also include the test of type II publication selection bias using Eq. (A10) as our first step as this kind of bias is very likely in the literature of transition economies.

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Table 1. Length and depth of economic crisis, and recovery speed after the crisis period in 28 CEE and FSU countries

Region / Subregion / Country	Continuous years of the economic crisis in the beginning period of transition	Output decline during the crisis period (end of socialism = 100) [a]	Average real GDP growth rate during first 10 years of recovery after the crisis
28 CEE and FSU countries	4.0	60.2	5.7
Central Europe (CE) and the Baltic countries	3.3	73.1	4.7
Croatia	4	59.5	4.3
Czech Republic	3	86.9	2.0
Estonia	3	77.0	6.7
Hungary	4	81.9	3.7
Latvia	4	56.2	6.8
Lithuania	3	59.5	5.6
Poland	2	82.2	4.7
Slovak Republic	4	75.3	4.3
Slovenia	3	79.7	4.1
South Eastern Europe (SEE)	4.0	54.6	5.3
Albania	3	60.1	7.0
Bosnia and Herzegovina	4	13.5	18.7
Bulgaria	4	73.3	1.5
FYR Macedonia	6	70.9	2.2
Montenegro	4	48.7	3.1
Romania	3	74.9	1.5
Serbia	4	40.6	2.8
FSU excluding the Baltic countries	4.5	53.8	6.8
Armenia	2	53.1	7.5
Azerbaijan	4	42.2	10.5
Belarus	4	66.1	6.9
Georgia	3	36.5	5.9
Kazakhstan	4	69.0	6.5
Kyrgyz Republic	4	55.0	4.7
Moldova	5	44.9	3.4
Russian Federation	5	62.8	5.2
Tajikistan	5	34.1	7.3
Turkmenistan	6	54.1	14.6
Ukraine	8	44.8	4.7
Uzbekistan	4	82.5	4.4
Multiple comparison of 3 subregions [b]			
ANOVA (F)	2.50	4.40 **	0.86
Bartlett test (χ^2)	4.66 *	3.10	12.45 ***
Kruskal Wallis test (χ^2)	4.73 *	4.73 *	5.90 *
Univariate comparison of country groups [c]			
(a) Structural change [d]			
Countries in which share of private sector in GDP is 75% or more	3.3 †††	65.2 †	5.3
Countries in which share of private sector in GDP is less than 75%	4.6	56.4	6.0
(b) Transformation policy [e]			
Countries of which average EBRD reform score is 3.5 or more	3.4 †††	69.1 †††	4.3
Countries of which average EBRD reform score is less than 3.5	4.6	51.3	7.1
(c) Socialist legacy (initial conditions)			
CEE countries	3.7	65.2 †	4.6
FSU including the Baltic countries	4.3	55.8	6.7
(d) Inflation [f]			
Countries with higher inflation in the first 5 years of transition	4.4 ††	55.0 †††	6.9
Countries with lower inflation in the first 5 years of transition	3.4	71.0	4.3
(e) Regional conflict [g]			
Countries with a regional conflict(s) in 1990s	4.1	44.4 †††	6.6
Countries without regional conflict in 1990s	3.9	69.0	5.3

Notes:

[a] Reference year for CEE countries is 1989, for FSU countries 1991.

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

[c] One-sided t test. †††, ††, and † denote statistical significance at the 1%, 5%, and 10% levels, respectively.

[d] EBRD estimation in 2010.

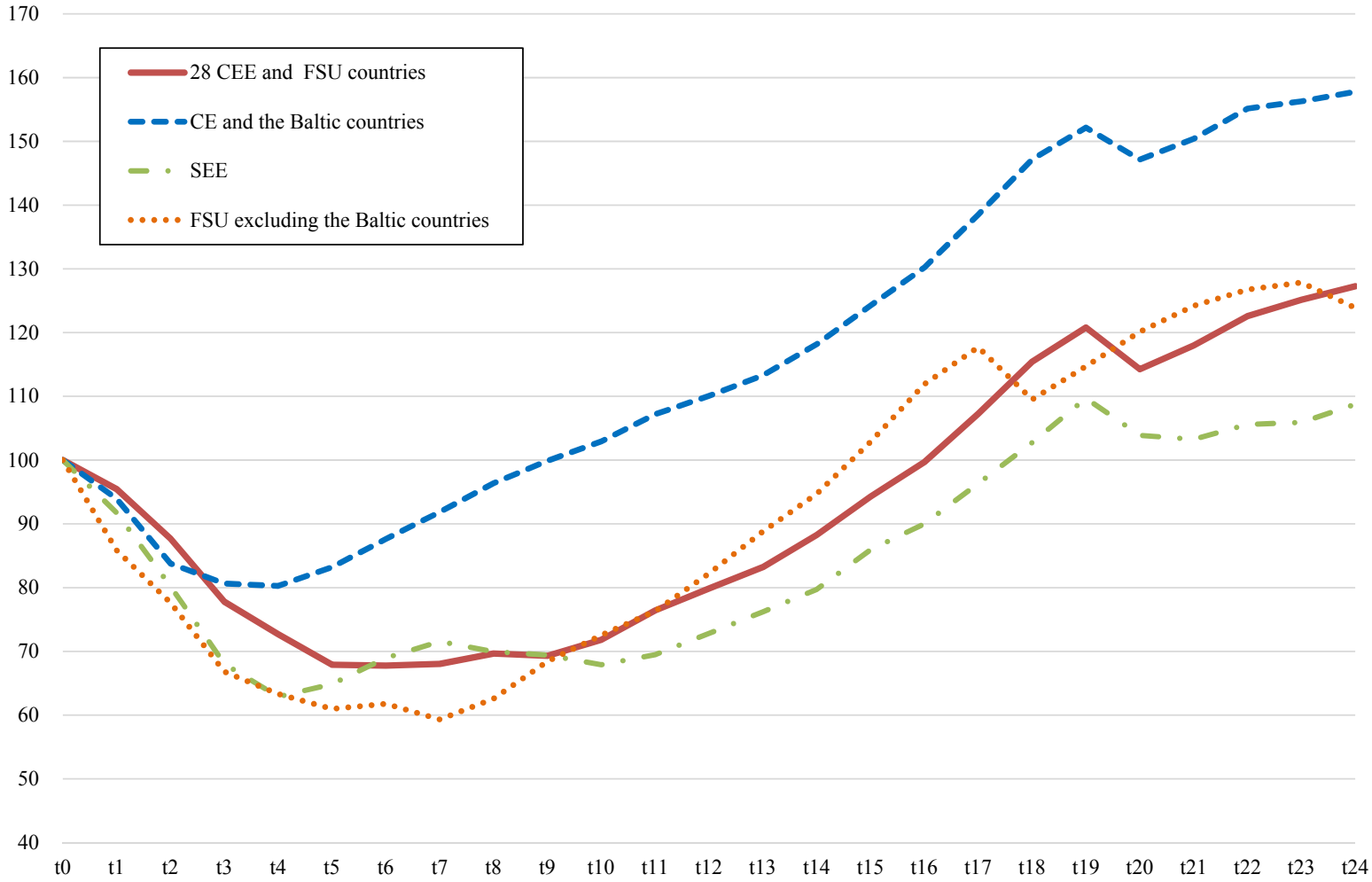
[e] In 2010. Czech Republic is included to the upper country group.

[f] Due to data limitations, Bosnia and Herzegovina, FYR Macedonia, Montenegro, and Serbia are excluded from the univariate comparison.

[g] Countries that experienced a regional conflict(s) in 1990s include the following 10 countries: Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, FYR Macedonia, Moldova, Montenegro, Serbia, and Tajikistan.

Source: Authors' estimation. The data is derived from the EBRD website (http://www.ebrd.com).

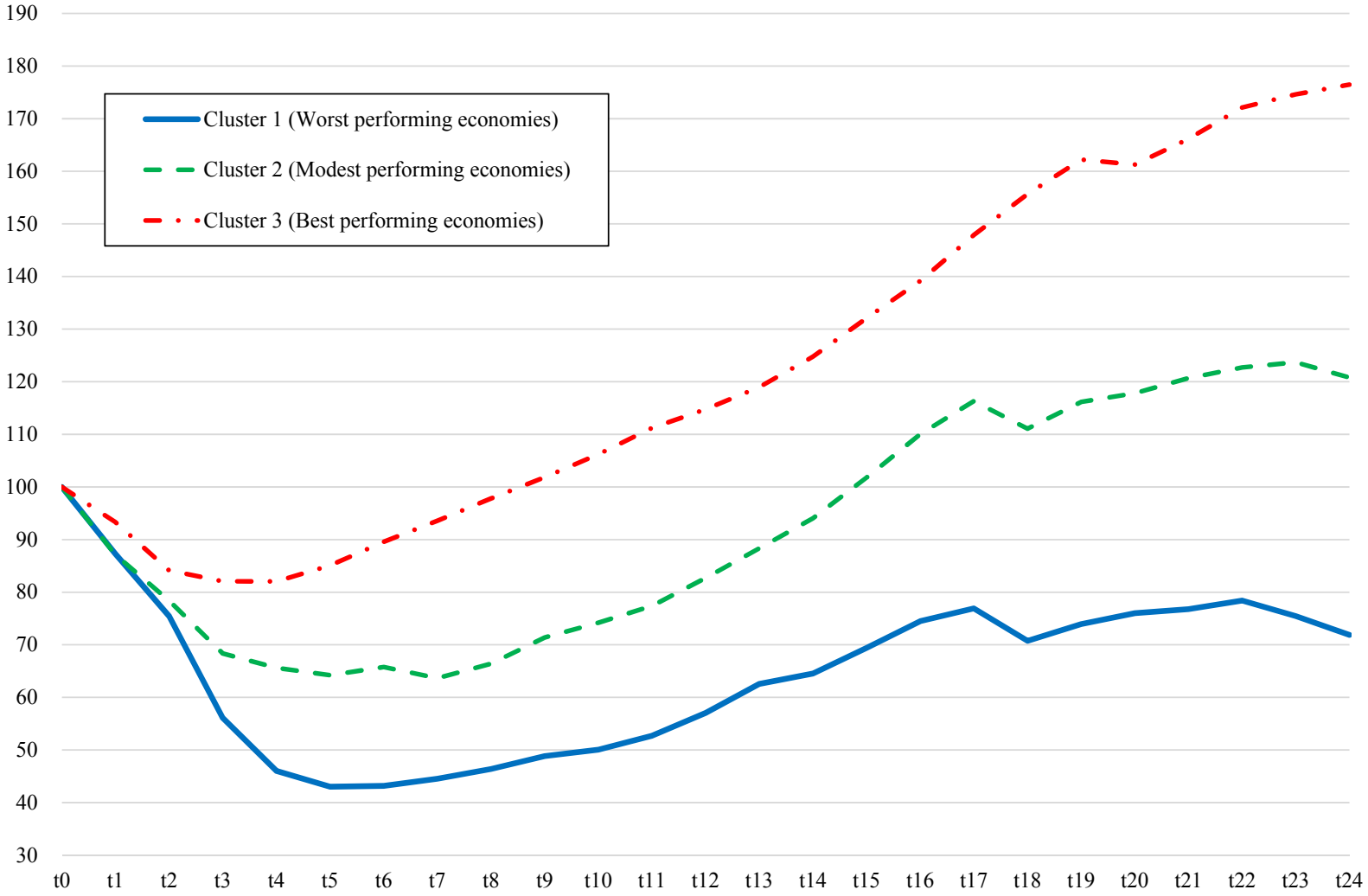
Figure 1. Economic crisis and recovery in CEE and FSU countries during 25 years of transition



Note: The real GDP level at the end of the socialist regime (t_0) is set at 100. The reference year for CEE countries is 1989, for FSU countries 1991.

Source: Authors' illustration. The data is derived from the EBRD website (http://www.ebrd.com).

Figure 2. Growth path of three clusters of transition economies



Note: The real GDP level at the end of the socialist regime (t_0) is set at 100. The reference year for CEE countries is 1989, for FSU countries 1991.

Source: Authors' illustration. The data is derived from the EBRD website (http://www.ebrd.com).

Table 2. List of selected studies on macroeconomic growth determinants in transition economies for meta-analysis

Author(s) (publication year)	Target countries					Estimation period	Economic growth variable type (dependent variable) [d]	Growth-determining variable type (independent variable)					Number of collected estimates
	Number of countries	Breakdown by country group						Structural change	Transformation policy	Socialist legacy	Inflation	Regional conflict	
		CEE EU countries [a]	Other CEE countries [b]	FSU [c]	Others								
Åslund et al. (1996)	25	10	5	10		1989-1995	A		✓	✓	✓	✓	8
Fisher et al. (1996a)	20	8		12		1992-1994	A		✓		✓		2
Fisher et al. (1996b)	25	10	2	12	1	1992-1994	A		✓				1
Sachs (1996)	25	10	3	12		1989-1995	A		✓				2
de Melo et al. (1997)	25	10	2	12	1	1989-1994	A		✓			✓	3
Denizer (1997)	27	10	4	12	1	1989-1995	A		✓	✓		✓	3
Halushka (1997)	22	7	3	12		1989-1997	A	✓			✓		51
Hernández-Catá (1997)	26	10	3	12	1	1990-1995	A		✓	✓	✓	✓	28
Loungani and Sheets (1997)	25	10	3	12		1991-1994	A		✓		✓	✓	5
Selowsky and Martin (1997)	25	10	3	12		1990-1995	A		✓			✓	12
Daniel and Reid (1998)	20	8		12		1994	B		✓				1
Fisher et al. (1998)	25	9	3	12	1	1992-1995	A		✓				5
Havrylyshyn et al. (1998)	25	10	3	12		1990-1997	A		✓	✓	✓		164
Krueger and Ciolko (1998)	21	9		12		1989-1997	A		✓	✓		✓	22
Berg et al. (1999)	26	10	3	12	1	1990-1996	A		✓				15
Heybey and Murrell (1999)	26	10	3	12	1	1990-1995	A		✓	✓			6
Moers (1999)	21	10		11		1990-1995	A		✓		✓	✓	25
Piazolo (1999)	25	10	3	12		1989-1998	A		✓				1
Stuart and Panayotopoulos (1999)	25	10	3	12		1991-1998	A	✓		✓	✓		3
Wolf (1999)	25	10	3	12		1989-1995	A		✓	✓	✓	✓	19
Abed and Davoodi (2000)	25	10	3	12		1994-1998	B		✓		✓		10
Campos (2000)	25	10	3	12		1990-1998	A			✓			8
Christoffersen and Doyle (2000)	22	10	3	9		1990-1997	B		✓		✓	✓	38
Gomulka (2000)	25	10	3	12		1992-1998	A				✓		2
Katchanovski (2000)	28	10	5	12	1	1990-1998	A		✓		✓	✓	8
Wyplosz (2000)	15	10	3	2		1989-1998	A		✓		✓		12
de Melo et al. (2001)	28	10	3	12	3	1979-1996	A		✓	✓		✓	31
Fidrmuc (2001)	25	10	3	12		1990-1998	A, B		✓			✓	29
Fisher and Sahay (2001)	25	10	3	12		1990-1998	A	✓	✓		✓	✓	10
Grogan and Mores (2001)	25	10	3	12		1990-1998	B	✓	✓	✓	✓		62
Havrylyshyn and Wolf (2001)	25	10	3	12		1990-1998	A		✓	✓	✓		80
Jaroš (2001)	25	10	3	12		1989-1999	A		✓	✓	✓		45
Merlevede (2001)	25	10	3	12		1990-1998	A		✓	✓	✓	✓	41
Warner (2001)	25	10	3	12		1990-1998	A		✓				6
Ahrens and Meurers (2002)	24	10	2	12		1992-1998	B		✓	✓	✓	✓	17
Campos and Kinoshita (2002)	25	10	3	12		1990-1998	A	✓	✓		✓	✓	40
Cernat and Vranceanu (2002)	10	10				1992-1999	A	✓			✓		6
Falcetti et al. (2002)	25	10	3	12		1989-2000	A		✓	✓			21
Güngör and Yamak (2002)	26	10	4	12		1995-1998	A		✓				9
Radulescu and Barlow (2002)	25	10	3	12		1991-1999	A		✓	✓	✓		20
Bernardes (2003)	26	10	3	12	1	1989-1999	A		✓				4
Cungu and Swinnen (2003)	20	9	1	10		1989-1997	A		✓		✓	✓	36
Dawson (2003)	13	10	3			1994-1999	A	✓					4
Fidrmuc (2003)	25	10	3	12		1990-2000	A		✓			✓	154

(continued)

Author(s) (publication year)	Target countries					Estimation period	Economic growth variable type (dependent variable) [d]	Growth determinant variable type (independent variable)					Number of collected estimates
	Number of countries	Breakdown by country group						Structural change	Transformation policy	Socialist legacy	Inflation	Regional conflict	
		CEE EU countries [a]	Other CEE countries [b]	FSU [c]	Others								
Havrylyshyn and van Rooden (2003)	25	10	3	12		1991-1998	A		✓	✓	✓		101
Iwasaki (2003)	15			15		1992-2001	A			✓	✓	✓	22
Kim and Pirttilä (2003)	14	10		4		1990-1997	A		✓		✓		8
Merlevede (2003)	25	10	3	12		1990-1999	A		✓	✓	✓		23
Bennett et al. (2004)	23	10	3	10		1991-2001	A	✓					28
Fidrnuc and Tichit (2004)	25	10	3	12		1990-2001	A		✓	✓	✓	✓	29
Fischer and Sahay (2004)	25	10	3	12		1991-2001	A		✓	✓	✓		12
Iwasaki (2004)	15			15		1992-2001	A			✓	✓	✓	25
Koivu (2004)	25	10	3	12		1993-2001	A	✓	✓		✓		18
Kronenberg (2004)	19	10	4	5		1990-1999	B		✓				1
Lawson and Wang (2004)	25	10	3	12		1991-2000	B		✓		✓		101
Loukoianova and Unigovskaya (2004)	24	10	3	11		1990-2002	A		✓			✓	42
Mercer-Blackman and Unigovskaya (2004)	21	8	3	10		1994-1997	A		✓		✓		5
Polabec (2004)	25	10	3	12		1990-2002	C		✓	✓		✓	24
Asteriou et al. (2005)	10	9		1		1990-2003	B				✓		48
Capolupo and Celi (2005)	11	10		1		1990-2000	B	✓					1
Chousa et al. (2005)	19	10		9		1993-2000	A		✓	✓			3
Funke and Ruhwedel (2005)	14	10		4		1994-2000	B		✓				2
Mickiewicz (2005a)	27	10	5	12		1989-1999	A					✓	3
Mickiewicz (2005b)	27	10	5	12		1987-2002	A		✓		✓		9
Neyapti and Dincer (2005)	23	8	3	11	1	1990-1998	A	✓	✓		✓		31
Redek and Sušjan (2005)	24	10	3	11		1995-2002	B		✓		✓		3
Staehr (2005)	25	10	3	12		1990-2001	A		✓	✓	✓	✓	166
Barlow (2006)	22	10	3	9		1993-2001	A		✓		✓	✓	80
Beck and Laeven (2006)	24	10	3	11		1992-2004	B		✓			✓	18
Berengaut and Elborgh-Woytek (2006)	25	10	3	12		1996	A			✓		✓	2
Eller et al. (2006)	10	9	1			1996-2003	C				✓		16
Eschenbach and Hoekman (2006)	24	10	3	11		1990-2004	B		✓		✓	✓	26
Falcetti et al. (2006)	25	10	3	12		1989-2003	A		✓	✓			57
Godoy and Stiglitz (2006)	23	10	3	10		1990-2001	A		✓	✓			17
Hodgson (2006)	27	10	5	12		1989-2005	B		✓				2
Neuhaus (2006)	13	10	3			1991-2002	C	✓			✓		2
Bennett et al. (2007)	23	10	3	10		1990-2003	A	✓					32
Popov (2007)	28	10	3	12	3	1989-2005	A		✓	✓	✓	✓	108
Sukiassyan (2007)	26	10	4	12		1988-2002	A	✓	✓				10
Varoudakis (2007)	25	10	3	12		1992-2004	B		✓		✓	✓	63
de Macedo and Martins (2008)	27	10	5	12		1989-2004	A		✓	✓	✓		25
Pelipas and Chubrik (2008)	26	10	4	12		1989-2005	B		✓				4
Sušjan and Redek (2008)	23	10	3	10		1995-2002	B			✓	✓		4
Akimov et al. (2009)	26	10	3	10	3	1989-2004	A	✓					16
Böwer and Turrini (2009)	10	10				1990-2008	B	✓	✓				21
Cerović and Nojković (2009)	25	10	3	12		1990-2007	A, B		✓	✓	✓		14
Fidrnuc and Tichit (2009)	25	10	3	12		1990-2007	A		✓		✓	✓	64
Iradian (2009)	26	10	4	12		1991-2006	B		✓		✓		17
Nath (2009)	13	10	3			1991-2005	B	✓	✓	✓	✓		51

(continued)

Author(s) (publication year)	Target countries					Estimation period	Economic growth variable type (dependent variable) [d]	Growth determinant variable type (independent variable)					Number of collected estimates
	Number of countries	Breakdown by country group						Structural change	Transformation policy	Socialist legacy	Inflation	Regional conflict	
		CEE EU countries [a]	Other CEE countries [b]	FSU [c]	Others								
Radziwill and Smietanka (2009)	25	10	3	12		1991-2006	A		✓	✓			3
Rapacki and Próchniak (2009)	10	10				1996-2007	A	✓	✓		✓		45
Rodríguez-Pose and Krøijer (2009)	16	10	2	4		1990-2004	B				✓		9
Vojinović et al. (2009)	10	10				1992-2006	B	✓			✓		28
Eicher and Schreiber (2010)	26	10	4	12		1991-2001	B		✓				33
Gilliman and Harris (2010)	13	10		3		1990-2003	A				✓		12
Heckelman (2010)	25	10	3	12		2000-2004	B		✓	✓			35
Mitrović and Ivančev (2010)	27	10	5	12		1999-2009	A	✓	✓		✓		12
Pääkkönen (2010)	25	10	3	12		1998-2005	C		✓				7
Sapienza (2010)	12	10	2			1999-2006	A	✓	✓				4
Segura-Ubiergo et al. (2010)	26	10	4	12		1992-2001	A		✓		✓		30
Apolte (2011)	25	10	3	11	1	1989-2008	B		✓		✓		106
Djalinov and Piesse (2011)	27	10	5	12		1992-2008	A	✓	✓			✓	10
Próchniak (2011)	10	10				1993-2009	A	✓	✓		✓		13
Raimbaev (2011)	29	10	5	12	2	1996-2009	A		✓		✓		62
Hamm et al. (2012)	25	10	3	12		1990-2000	B		✓			✓	6
Hudea and Stancu (2012)	7	7				1993-2009	B	✓					1
Josifidis et al. (2012)	15	10	5			1997-2009	A	✓	✓		✓		41
Peev and Mueller (2012)	24	10	3	11		1990-2007	B		✓				48
Tridico (2012)	28	10	6	12		2008	B		✓				3
Cieślik and Tarsalewska (2013)	24	10	2	12		1993-2006	B	✓	✓		✓		42
Dell'Anno and Villa (2013)	25	10	3	12		1990-2008	A		✓	✓	✓		107
Dudian and Popa (2013)	8	8				1996-2011	B	✓					3
Mehic et al. (2013)	7	2	5			1998-2007	B	✓			✓		2
Angelopoulou and Liargovas (2014)	18		6	12		1989-2008	A	✓					2
Gaffeo and Garalova (2014)	13	10	1	2		1995-2007	B, C	✓					18
Melnyk et al. (2014)	26	10	4	12		1998-2010	A		✓				3
Petkovaki and Kjosevski (2014)	16	10	3	3		1991-2011	A	✓	✓		✓		7
Petreski (2014a)	30	10	5	10	5	2005-2011	B	✓	✓		✓		36
Petreski (2014b)	28	10	6	12		1991-2007	B	✓	✓		✓		51
Shostya (2014)	28	10	6	12		2006-2009	A		✓	✓			4
Bjørnskov (2015)	29	10	6	12	1	1990-2009	B		✓				10
da Rocha (2015)	27	10	4	12	1	1989-1998	B		✓		✓	✓	57
Cojocaru et al. (2016)	25	10	5	10		1990-2008	B	✓					6

Notes:

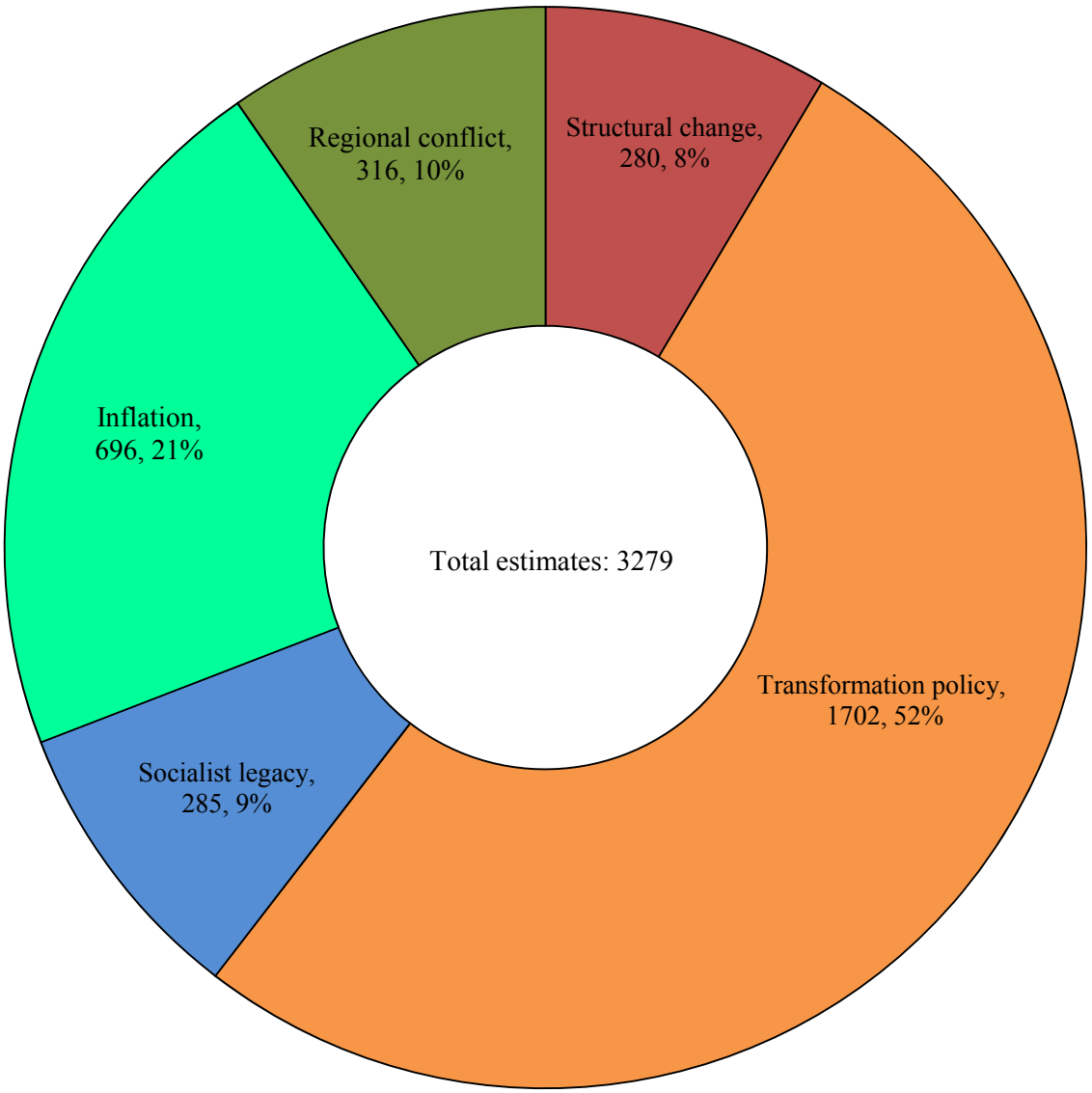
[a] CEE EU countries denote the 10 Central and Eastern European countries that joined the European Union either in 2004 or 2007.

[b] Including Albania, Bosnia and Herzegovina, Croatia, Kosovo, FYR Macedonia, Montenegro, and Serbia.

[c] Excluding the Baltic countries.

[d] A: Baseline index is GDP; B: GDP per capita; C: GDP per worker.

Figure 3. Breakdown of collected estimates by growth-determining variable type



Note: Values following the category name denote the number of estimates and the share in total collected estimates, respectively.

Source: Authors' illustration.

Table 3. Descriptive statistics of the partial correlation coefficients and the t values of collected estimates and Shapiro–Wilk normality test by growth-determining variable type

(a) PCC

	Number of collected estimates (K)	Mean	Median	S.D.	Max.	Min.	Kurtosis	Skewness	Shapiro–Wilk normality test (W)
Structural change	280	0.087	0.099	0.213	0.681	-0.873	5.582	-0.859	0.944 ***
Transformation policy	1702	0.104	0.113	0.281	0.891	-0.878	2.935	-0.058	0.998 **
Socialist legacy	285	-0.095	-0.123	0.291	0.827	-0.853	3.801	0.580	0.973 ***
Inflation	696	-0.291	-0.295	0.258	0.695	-0.911	3.060	-0.120	0.988 ***
Regional conflict	316	-0.209	-0.254	0.344	0.914	-0.878	2.637	0.580	0.947 ***

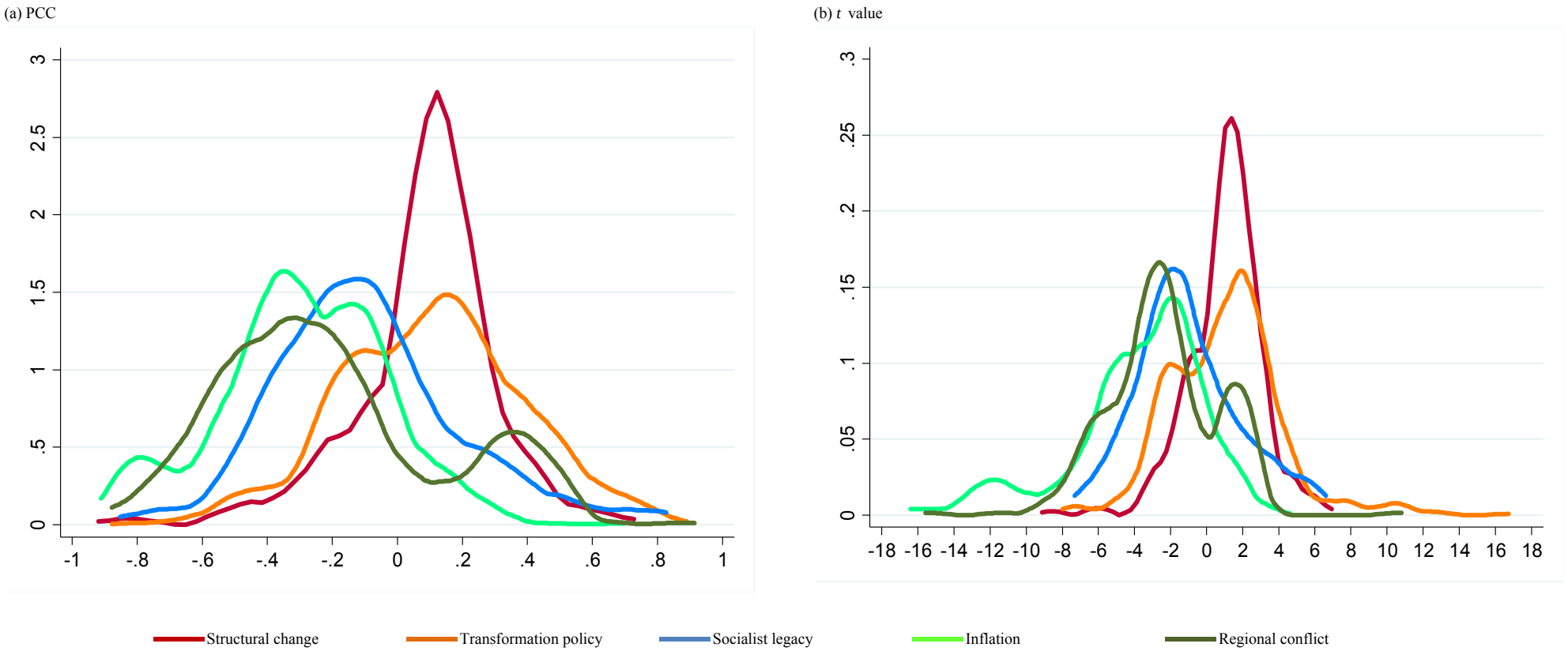
(b) t value

	Number of collected estimates (K)	Mean	Median	S.D.	Max.	Min.	Kurtosis	Skewness	Shapiro–Wilk normality test (W)
Structural change	280	1.041	1.190	1.967	6.420	-8.597	5.601	-0.703	0.957 ***
Transformation policy	1702	0.996	1.090	3.063	16.730	-8.000	5.024	0.574	0.966 ***
Socialist legacy	285	-1.029	-1.550	2.896	6.620	-7.300	3.013	0.508	0.974 ***
Inflation	696	-3.744	-3.000	3.654	4.635	-16.400	4.043	-0.996	0.935 ***
Regional conflict	316	-2.378	-2.500	3.012	10.800	-15.570	4.308	-0.052	0.968 ***

Note: ***: Null hypothesis of normal distribution is rejected at the 1% level; **: at the 5% level.

Source: Author's calculation.

Figure 4. Kernel density estimation of partial correlation coefficients and t values by growth-determining variable type



Note: Vertical axis is Kernel density. Horizontal axis is variable value.

Source: Authors' illustration.

Table 4. Synthesis of estimates by growth-determining variable type

Growth-determining variable type	Number of estimates (K)	(a) Synthesis of PCCs			(b) Combination of t values			
		Fixed-effect model (z value)[a]	Random-effects model (z value)[a]	Test of homogeneity[b]	Unweighted combination (p value)	Weighted combination (p value)	Median of t values	Failsafe N *(fsN)*
Structural change	280	0.097 *** (19.66)	0.090 *** (9.12)	996.107 ***	17.417 *** (0.00)	3.543 *** (0.00)	1.190	31109
Transformation policy	1702	0.077 *** (39.99)	0.096 *** (15.33)	16000.000 ***	41.071 *** (0.00)	6.769 *** (0.00)	1.090	1059248
Socialist legacy	285	-0.080 *** (-17.06)	-0.091 *** (-6.44)	2391.953 ***	-17.367 *** (0.00)	-2.903 *** (0.00)	-1.550	31482
Inflation	696	-0.315 *** (-107.61)	-0.295 *** (-29.95)	7455.361 ***	-98.773 *** (0.00)	-20.229 *** (0.00)	-3.000	2508612
Regional conflict	316	-0.267 *** (-50.77)	-0.232 *** (-16.04)	2067.309 ***	-42.267 *** (0.00)	-6.527 *** (0.00)	-2.500	208308

Notes:

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

[b] Null hypothesis: Effect sizes are homogeneous.

*** denotes statistical significance at the 1% level.

Source: Authors' estimation.

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

Variable name	Definition	Descriptive statistics		
		Mean	Median	S.D.
Transformation policy	1 = if growth-determining variable used for estimation belongs to the category of transformation policy, 0 = otherwise	0.519	1	0.500
Socialist legacy	1 = if growth-determining variable used for estimation belongs to the category of socialist legacy, 0 = otherwise	0.087	0	0.282
Inflation	1 = if growth-determining variable used for estimation belongs to the category of inflation, 0 = otherwise	0.212	0	0.409
Regional conflict	1 = if growth-determining variable used for estimation belongs to the category of regional conflict, 0 = otherwise	0.096	0	0.295
Trade openness [a]	1 = if trade openness is used as a proxy for structural change, 0 = otherwise	0.354	0	0.479
Bank credit to private sector [a]	1 = if bank credit to the private sector is used as a proxy for structural change, 0 = otherwise	0.143	0	0.351
Market capitalization [a]	1 = if market capitalization is used as a proxy for structural change, 0 = otherwise	0.266	0	0.442
Development of financial sector [a]	1 = if development of financial sector represents transformation policy, 0 = otherwise	0.152	0	0.359
Comprehensive economic reform [b]	1 = if comprehensive economic reform represents transformation policy, 0 = otherwise	0.266	0	0.442
Liberalization [b]	1 = if liberalization represents transformation policy, 0 = otherwise	0.152	0	0.359
Price and competition reform [b]	1 = if price and competition reform represents transformation policy, 0 = otherwise	0.067	0	0.250
Enterprise reform [b]	1 = if enterprise reform represents transformation policy, 0 = otherwise	0.028	0	0.166
Privatization [b]	1 = if privatization represents transformation policy, 0 = otherwise	0.068	0	0.251
Financial reform [b]	1 = if financial reform represents transformation policy, 0 = otherwise	0.036	0	0.186
Trade reform [b]	1 = if trade reform represents transformation policy, 0 = otherwise	0.039	0	0.193
Institutional quality [b]	1 = if institutional quality represents transformation policy, 0 = otherwise	0.014	0	0.118
Property rights reform [b]	1 = if property rights reform represents transformation policy, 0 = otherwise	0.009	0	0.097
Government reform [b]	1 = if government reform represents transformation policy, 0 = otherwise	0.018	0	0.132
Political reform/stability [b]	1 = if political reform/stability represents transformation policy, 0 = otherwise	0.018	0	0.134
Democratization [b]	1 = if democratization represents transformation policy, 0 = otherwise	0.088	0	0.283
Rule of law/legal reform [b]	1 = if rule of law/legal reform represents transformation policy, 0 = otherwise	0.055	0	0.227
Civil rights/society [b]	1 = if civil rights/society represents transformation policy, 0 = otherwise	0.023	0	0.150
Other transformation policies [b]	1 = if a policy other than comprehensive structural reform and the above policies/reforms represents transformation policy, 0 = otherwise	0.022	0	0.148
Reform speed	1 = if reform speed is adopted as the benchmark index of the transformation policy variable, 0 = otherwise	0.159	0	0.366
Proportion of other CEE countries	Proportion of non-EU CEE countries in target countries [c]	0.119	0.12	0.081
Proportion of FSU countries	Proportion of FSU countries in target countries, excluding the Baltic countries	0.435	0.48	0.194
Proportion of non-CEE and FSU countries	Proportion of non-CEE and FSU countries in target countries	0.011	0	0.029

(continued)

Variable name	Definition	Descriptive statistics		
		Mean	Median	S.D.
First year of estimation	First year of estimation period	1991.534	1990	3.210
Length of estimation	Years of estimation period	10.756	10	4.391
Cross-section data	1 = if cross-section data is employed for empirical analysis, 0 = otherwise	0.177	0	0.382
GLS	1 = if generalized least squares estimator is used for estimation, 0 = otherwise	0.049	0	0.215
FE	1 = if fixed-effect panel estimator is used for estimation, 0 = otherwise	0.402	0	0.490
RE	1 = if random-effects panel estimator is used for estimation, 0 = otherwise	0.026	0	0.158
SUR	1 = if seemingly unrelated regression estimator is used for estimation, 0 = otherwise	0.000	0	0.017
GMM	1 = if generalized method of moments estimator is used for estimation, 0 = otherwise	0.110	0	0.313
Other estimators	1 = if an estimator other than OLS and the above estimators is used for estimation, 0 = otherwise	0.002	0	0.039
IV/2SLS/3SLS	1 = if instrumental variable method or 2SLS or 3SLS is used for estimation, 0 = otherwise	0.131	0	0.338
GDP per capita	1 = if GDP per capita is used as the base index of economic growth variable, 0 = otherwise	0.306	0	0.461
GDP per worker	1 = if GDP per worker is used as the base index of economic growth variable, 0 = otherwise	0.018	0	0.132
Growth level	1 = if growth level is used as the benchmark index of economic growth variable, 0 = otherwise	0.031	0	0.174
Lagged variable	1 = if a lagged growth-determining variable is used for estimation, 0 = otherwise	0.169	0	0.374
With an interaction term(s)	1 = if estimation is carried out with an interaction term(s) of growth-determining variable, 0 = otherwise	0.036	0	0.187
$\sqrt{}$ Degree of freedom	Root of degree of freedom of the estimated model	10.935	11.662	4.617
Quality level	Ten-point scale of the quality level of the study [d]	4.992	5	2.918

Notes:

[a] Descriptive statistics are computed using the estimates of structural change variable only.

[b] Descriptive statistics are computed using the estimates of transformation policy variable only.

[c] Including Albania, Bosnia and Herzegovina, Croatia, Kosovo, FYR Macedonia, Montenegro, and Serbia.

[b] See Appendix A for more details.

Source: Authors' calculation.

Table 6. Meta-regression analysis using all collected estimates

(a) Dependent variable — PCC

Estimator (analytical weight in parentheses)	Cluster-robust OLS	Cluster-robust WLS [Quality level]	Cluster-robust WLS [N]	Cluster-robust WLS [df]	Cluster-robust WLS [$1/SE$]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS	Cluster-robust fixed-effects panel LSDV
Meta-independent variable (default) / model	[1]	[2]	[3]	[4]	[5]	[6]	[7][a]	[8][b]
Growth-determining variable type (structural change)								
Transformation policy	0.0105	0.0016	-0.0203	-0.0194	0.0047	0.0335	0.0333	0.0239
	(0.031)	(0.035)	(0.028)	(0.028)	(0.032)	(0.044)	(0.044)	(0.048)
Socialist legacy	-0.1433***	-0.1443***	-0.1198***	-0.1199***	-0.1255***	-0.1117**	-0.1113**	-0.1111**
	(0.041)	(0.049)	(0.027)	(0.027)	(0.032)	(0.045)	(0.046)	(0.049)
Inflation	-0.3664***	-0.3522***	-0.3328***	-0.3345***	-0.3747***	-0.3457***	-0.3457***	-0.3510***
	(0.033)	(0.039)	(0.026)	(0.027)	(0.035)	(0.040)	(0.040)	(0.044)
Regional conflict	-0.3004***	-0.3087***	-0.3018***	-0.3024***	-0.3097***	-0.2682***	-0.2681***	-0.2744***
	(0.042)	(0.040)	(0.034)	(0.035)	(0.036)	(0.058)	(0.059)	(0.061)
Composition of target countries (CEE EU countries)								
Proportion of other CEE countries	-0.0647	0.1363	0.0467	0.0513	-0.0114	-0.1753***	-0.1744***	-0.1600***
	(0.127)	(0.162)	(0.128)	(0.128)	(0.139)	(0.047)	(0.046)	(0.047)
Proportion of FSU countries	-0.0763	-0.0268	-0.0968*	-0.1065**	-0.0996*	-0.0552	-0.0546	-0.0582
	(0.061)	(0.060)	(0.051)	(0.049)	(0.059)	(0.036)	(0.037)	(0.040)
Proportion of non-CEE and FSU countries	-0.4829	-0.5147	-0.0317	-0.0264	-0.2710	-0.4661	-0.4829	-0.7500***
	(0.363)	(0.511)	(0.255)	(0.247)	(0.301)	(0.406)	(0.401)	(0.207)
Estimation period								
First year of estimation	0.0166***	0.0178***	0.0098***	0.0093***	0.0139***	0.0349***	0.0357***	0.0508***
	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)	(0.008)	(0.008)	(0.006)
Length of estimation	0.0023	0.0032	0.0034	0.0027	0.0037	0.0147***	0.0153***	0.0297***
	(0.003)	(0.004)	(0.003)	(0.002)	(0.003)	(0.005)	(0.005)	(0.005)
Data type (panel data)								
Cross-section data	0.0420	0.0628	0.0630	0.0690	0.0533	-0.0062	-0.0092	-0.1352
	(0.051)	(0.071)	(0.054)	(0.048)	(0.050)	(0.072)	(0.074)	(0.123)
Estimator (OLS)								
GLS	-0.1053***	-0.1287***	-0.0887***	-0.0872***	-0.1012***	-0.0666***	-0.0650***	-0.0324*
	(0.030)	(0.038)	(0.020)	(0.018)	(0.024)	(0.017)	(0.017)	(0.018)
FE	-0.0285	-0.0441	-0.0265	-0.0249	-0.0286	-0.0091	-0.0082	0.0142
	(0.024)	(0.033)	(0.016)	(0.016)	(0.018)	(0.016)	(0.016)	(0.014)
RE	-0.0343	-0.1010**	-0.0430*	-0.0266	-0.0253	-0.0342**	-0.0332**	-0.0102
	(0.041)	(0.047)	(0.025)	(0.017)	(0.024)	(0.017)	(0.017)	(0.013)
SUR	-0.2706***	-0.3226***	-0.3177***	-0.3135***	-0.2827***	-0.0305	-0.0213	0.0992***
	(0.040)	(0.043)	(0.055)	(0.053)	(0.044)	(0.034)	(0.033)	(0.000)
GMM	-0.0342	-0.0463	-0.0117	-0.0113	-0.0225	-0.0127	-0.0118	0.0114
	(0.033)	(0.039)	(0.021)	(0.020)	(0.024)	(0.017)	(0.017)	(0.014)
Other estimators	-0.1132***	-0.1113***	-0.0937***	-0.0937***	-0.0954***	-0.0357***	-0.0350***	-0.0390***
	(0.033)	(0.032)	(0.028)	(0.027)	(0.029)	(0.010)	(0.011)	(0.012)
IV/2SLS/3SLS	0.0717***	0.0781***	0.0734***	0.0742***	0.0768***	0.0232	0.0220	0.0041
	(0.019)	(0.020)	(0.020)	(0.021)	(0.020)	(0.016)	(0.016)	(0.018)
Base index of economic growth variable (GDP)								
GDP per capita	0.0343	0.0301	0.0321	0.0356	0.0345	-0.0188	-0.0201	0.1407***
	(0.027)	(0.026)	(0.025)	(0.025)	(0.025)	(0.043)	(0.044)	(0.007)
GDP per worker	-0.0623	-0.0564	-0.0164	-0.0194	-0.0594	-0.0903	-0.0945	-0.0124*
	(0.081)	(0.090)	(0.079)	(0.081)	(0.081)	(0.071)	(0.071)	(0.007)
Benchmark index of economic growth variable (growth rate)								
Growth level	-0.0251	0.0182	-0.0082	0.0151	-0.0032	-0.0932	-0.0953	-0.1848***
	(0.062)	(0.065)	(0.060)	(0.054)	(0.053)	(0.065)	(0.066)	(0.051)
Other characteristics of growth-determining variable								
Lagged variable	0.1139**	0.1020*	0.0844**	0.0843**	0.0967**	0.1613***	0.1617***	0.1646***
	(0.047)	(0.059)	(0.036)	(0.036)	(0.040)	(0.046)	(0.046)	(0.044)
With an interaction term(s)	-0.1048*	-0.0906	-0.0893**	-0.0909**	-0.1005*	-0.0242	-0.0237	-0.0214
	(0.063)	(0.059)	(0.042)	(0.042)	(0.052)	(0.037)	(0.037)	(0.035)
Degree of freedom and research quality								
$\sqrt{}$ Degree of freedom	-0.0008	-0.0003	-0.0009	-	-0.0009	0.0069	0.0070	0.0077
	(0.004)	(0.005)	(0.003)		(0.003)	(0.005)	(0.005)	(0.006)
Quality level	0.0086*	-	0.0035	0.0039	0.0062	0.0075	0.0077	dropped
	(0.005)		(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	
Intercept	-33.0555***	-35.4172***	-19.4525***	-18.3827***	-27.6109***	-69.6136***	-71.2976***	-101.5778***
	(9.629)	(9.930)	(5.630)	(5.498)	(7.333)	(15.962)	(15.913)	(11.682)
K	3279	3279	3279	3279	3279	3279	3279	3279
R^2	0.328	0.315	0.346	0.355	0.362	-	0.252	0.137

(continued)

(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 [df]	Cluster-robust WLS [$1/SE$]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS	Cluster-robust fixed-effects panel LSDV
Meta-independent variable (default) / model	[9]	[10]	[11]	[12]	[13]	[14]	[15][c]	[16][d]
Growth-determining variable type (structural change)								
Transformation policy	0.1679	0.0658	-0.2190	-0.2334	0.1502	0.5978	0.6049	0.6108
	(0.381)	(0.419)	(0.409)	(0.413)	(0.454)	(0.510)	(0.523)	(0.630)
Socialist legacy	-1.2831***	-1.3238***	-1.5540***	-1.5826***	-1.3688***	-0.9670**	-0.9516**	-0.8454
	(0.387)	(0.464)	(0.406)	(0.396)	(0.409)	(0.449)	(0.461)	(0.564)
Inflation	-4.4848***	-4.3779***	-4.8242***	-4.8957***	-5.1052***	-4.2021***	-4.1976***	-4.1893***
	(0.485)	(0.541)	(0.431)	(0.445)	(0.564)	(0.502)	(0.509)	(0.574)
Regional conflict	-3.0447***	-3.0993***	-4.1402***	-4.2383***	-3.6988***	-2.6281***	-2.6114***	-2.5394***
	(0.436)	(0.484)	(0.561)	(0.576)	(0.496)	(0.552)	(0.562)	(0.647)
Composition of target countries (CEE EU countries)								
Proportion of other CEE countries	-0.4909	1.2194	0.3116	-0.0873	-0.2465	-1.2600***	-1.2521***	-0.9512***
	(1.060)	(1.329)	(1.700)	(1.799)	(1.448)	(0.483)	(0.464)	(0.358)
Proportion of FSU countries	-1.5191**	-1.1009*	-1.5311**	-1.8398***	-1.8189***	-0.9968**	-0.9479**	-0.5196
	(0.618)	(0.650)	(0.641)	(0.664)	(0.678)	(0.418)	(0.408)	(0.376)
Proportion of non-CEE and FSU countries	-0.0396	-1.4241	2.6031	2.3465	0.8076	1.3817	1.2651	-1.7133
	(2.723)	(3.480)	(4.037)	(3.774)	(3.450)	(2.899)	(2.910)	(1.541)
Estimation period								
First year of estimation	0.1266***	0.1189***	0.1013**	0.1036***	0.1262***	0.1666***	0.1735***	0.2940***
	(0.030)	(0.031)	(0.039)	(0.038)	(0.033)	(0.036)	(0.037)	(0.053)
Length of estimation	0.0542	0.0426	0.0630	0.0418	0.0730*	0.0794**	0.0832**	0.1728***
	(0.033)	(0.038)	(0.043)	(0.036)	(0.040)	(0.033)	(0.033)	(0.050)
Data type (panel data)								
Cross-section data	0.1861	0.4201	0.1531	0.4297	0.2161	0.2049	0.1816	-0.7550
	(0.344)	(0.423)	(0.481)	(0.407)	(0.403)	(0.409)	(0.423)	(0.890)
Estimator (OLS)								
GLS	-1.2178***	-1.4180***	-1.1382***	-1.1570***	-1.2340***	-0.7776**	-0.7315**	-0.3236
	(0.348)	(0.387)	(0.276)	(0.259)	(0.309)	(0.364)	(0.344)	(0.264)
FE	-0.1931	-0.2113	-0.2985	-0.3166	-0.2621	-0.0083	-0.0026	0.0906
	(0.226)	(0.269)	(0.234)	(0.243)	(0.223)	(0.148)	(0.142)	(0.121)
RE	-0.1740	-0.7506**	-0.3919	-0.3748	-0.1634	-0.3821**	-0.3824**	-0.3318**
	(0.362)	(0.293)	(0.282)	(0.265)	(0.291)	(0.186)	(0.181)	(0.165)
SUR	-0.2935	-0.7266	0.2895	0.4913	0.1519	0.2136	0.2661	0.8561***
	(0.440)	(0.528)	(0.643)	(0.637)	(0.542)	(0.388)	(0.376)	(0.000)
GMM	0.0049	0.0160	0.0218	-0.0098	0.0067	0.0925	0.0949	0.1651
	(0.285)	(0.302)	(0.305)	(0.313)	(0.290)	(0.190)	(0.187)	(0.186)
Other estimators	-1.4001***	-1.4118***	-1.2484***	-1.2901***	-1.1753***	-1.0418***	-1.0140***	-0.8646***
	(0.358)	(0.348)	(0.426)	(0.411)	(0.400)	(0.126)	(0.120)	(0.106)
IV/2SLS/3SLS	0.6220***	0.5991***	1.0521***	1.0953***	0.9217***	0.2481	0.2206	-0.0328
	(0.219)	(0.217)	(0.315)	(0.325)	(0.287)	(0.166)	(0.167)	(0.201)
Base index of economic growth variable (GDP)								
GDP per capita	0.4274	0.4477	0.6085	0.6449	0.5643	0.2224	0.1972	0.7854***
	(0.295)	(0.289)	(0.387)	(0.392)	(0.351)	(0.286)	(0.289)	(0.080)
GDP per worker	0.1767	0.3641	0.3338	0.3171	0.2255	0.1016	0.0443	-1.1830***
	(0.805)	(0.898)	(1.183)	(1.182)	(1.002)	(0.904)	(0.919)	(0.080)
Benchmark index of economic growth variable (growth rate)								
Growth level	-0.0491	0.2152	0.0574	0.1357	-0.0918	-0.2468	-0.2680	-0.5929
	(0.601)	(0.546)	(0.831)	(0.849)	(0.673)	(0.607)	(0.613)	(0.562)
Other characteristics of growth-determining variable								
Lagged variable	1.4378***	1.1483**	1.2390**	1.2389**	1.3645**	2.0560***	2.0800***	2.2327***
	(0.501)	(0.493)	(0.503)	(0.511)	(0.529)	(0.479)	(0.482)	(0.491)
With an interaction term(s)	-1.3960**	-1.2543**	-1.4950**	-1.4975**	-1.5517**	-0.7148	-0.6734	-0.4439
	(0.663)	(0.619)	(0.588)	(0.593)	(0.651)	(0.462)	(0.449)	(0.388)
Degree of freedom and research quality								
$\sqrt{}$Degree of freedom	-0.0336	-0.0173	-0.0446	-	-0.0375	0.0279	0.0300	0.0477
	(0.038)	(0.042)	(0.041)		(0.038)	(0.036)	(0.037)	(0.047)
Quality level	0.0592	-	0.0410	0.0400	0.0483	0.0326	0.0337	dropped
	(0.043)		(0.059)	(0.059)	(0.053)	(0.043)	(0.044)	
Intercept	-251.4594***	-236.1619***	-200.6579**	-205.4785***	-250.5097***	-332.3560***	-346.0784***	-587.5625***
	(59.515)	(62.141)	(78.455)	(75.388)	(66.657)	(72.857)	(74.092)	(105.960)
K	3279	3279	3279	3279	3279	3279	3279	3279
R^2	0.345	0.327	0.344	0.348	0.368	-	0.321	0.258

Notes:

[a] Breusch–Pagan test: $\chi^2=651.50, p=0.000$

[b] Hausman test: $\chi^2=102.40, p=0.000$

[c] Breusch–Pagan test: $\chi^2=615.09, p=0.000$

[d] Hausman test: $\chi^2=58.77, p=0.000$

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' estimation. See Table 5 for definition and descriptive statistics of meta-independent variables.

Table 7. Synthesis of estimates by subcategory of structural change and transformation policy variable

Subcategory of structural change and transformation policy variable	Number of estimates (K)	(a) Synthesis of PCCs			(b) Combination of t values			
		Fixed-effect model (z value) [a]	Random-effects model (z value) [a]	Test of homogeneity [b]	Unweighted combination (p value)	Weighted combination (p value)	Median of t values	Failsafe N *(fsN)*
Structural change variable								
Share of private sector in GDP	71	0.078 *** (8.00)	0.078 *** (4.18)	209.465 ***	7.294 *** (0.00)	1.363 * (0.09)	1.000	1325
Trade openness	99	0.164 *** (18.39)	0.159 *** (12.42)	182.413 ***	16.794 *** (0.00)	3.713 *** (0.00)	1.645	10220
Bank credit to private sector	40	0.052 *** (3.71)	0.035 (1.12)	168.848 ***	2.629 *** (0.00)	0.551 (0.29)	0.224	62
Market capitalization	56	0.050 *** (4.76)	0.028 (1.06)	315.364 ***	3.317 *** (0.00)	0.700 (0.24)	0.796	172
Development of financial sector	14	0.098 *** (6.20)	0.093 *** (3.80)	29.343 ***	5.727 *** (0.00)	0.920 (0.18)	1.911	156
Transformation policy variable								
Comprehensive structural reform	167	-0.029 *** (-5.46)	-0.018 (-1.14)	1353.359 ***	-4.226 *** (0.00)	-0.914 (0.18)	-1.100	935
Comprehensive economic reform	453	0.129 *** (37.49)	0.141 *** (11.31)	5723.992 ***	37.321 *** (0.00)	6.330 *** (0.00)	2.050	232712
Liberalization	258	0.180 *** (31.65)	0.207 *** (12.65)	1826.879 ***	30.379 *** (0.00)	4.293 *** (0.00)	2.110	87733
Price and competition reform	114	-0.019 ** (-2.36)	-0.006 (-0.28)	795.697 ***	-1.363 (0.91)	-0.250 (0.60)	-0.115	-36
Enterprise reform	48	0.030 *** (2.79)	0.024 (0.93)	229.783 ***	2.225 *** (0.01)	0.540 (0.29)	0.290	40
Privatization	115	0.025 *** (3.41)	-0.003 (-0.13)	1278.319 ***	1.046 (0.15)	0.196 (0.42)	-1.500	-69
Financial reform	61	0.131 *** (13.34)	0.129 *** (4.89)	370.647 ***	11.885 *** (0.00)	1.889 ** (0.03)	1.376	3123
Trade reform	66	0.200 *** (19.47)	0.167 *** (5.18)	608.229 ***	16.609 *** (0.00)	3.030 *** (0.00)	2.245	6663
Institutional quality	24	0.111 *** (4.98)	0.222 *** (3.60)	146.350 ***	6.961 *** (0.00)	0.830 (0.20)	1.700	406
Property rights reform	16	0.017 (0.80)	0.091 * (1.85)	53.658 ***	2.668 *** (0.00)	0.407 (0.34)	0.875	26
Government reform	30	0.093 *** (4.81)	0.084 *** (3.21)	49.737 ***	4.015 *** (0.00)	0.912 (0.18)	0.220	149
Political reform/stability	31	0.051 *** (2.72)	0.130 *** (3.13)	127.441 ***	5.170 *** (0.00)	0.832 (0.20)	1.310	275
Democratization	149	-0.054 *** (-8.12)	-0.061 *** (-4.06)	550.591 ***	-7.219 *** (0.00)	-0.939 (0.17)	-0.365	2720
Rule of law/legal reform	93	0.215 *** (17.46)	0.243 *** (8.56)	406.891 ***	16.721 *** (0.00)	2.808 *** (0.00)	1.880	9516
Civil rights/society	39	-0.003 (-0.21)	0.089 *** (2.64)	226.349 ***	3.670 *** (0.00)	0.597 (0.28)	0.462	155
Other transformation policies	38	0.117 *** (9.25)	0.043 (1.07)	362.510 ***	5.722 *** (0.00)	1.240 (0.11)	-0.082	422
Reform level	1431	0.103 *** (48.11)	0.118 *** (17.12)	13000.000 ***	47.107 *** (0.00)	7.808 *** (0.00)	1.325	1172038
Reform speed	271	-0.033 *** (-7.48)	-0.018 (-1.43)	2017.457 ***	-5.320 *** (0.00)	-0.852 (0.20)	-0.380	2564

Notes:

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

[b] Null hypothesis: Effect sizes are homogeneous.

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

Source: Authors' estimation.

Table 8. Meta-regression analysis using estimates of structural change variable

(a) Dependent variable — PCC

Estimator (analytical weight in parentheses)	Cluster-robust OLS	Cluster-robust WLS [Quality level]	Cluster-robust WLS [N]	Cluster-robust WLS [df]	Cluster-robust WLS [$1/SE$]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS	Cluster-robust fixed-effects panel LSDV
Meta-independent variable (default) / model	[1]	[2]	[3]	[4]	[5]	[6]	[7] [a]	[8] [b]
Structural change variable type (share of private sector in GDP)								
Trade openness	-0.0411	-0.0281	0.0573	0.0643	0.0166	-0.0342	-0.0335	-0.1310 ***
	(0.068)	(0.058)	(0.048)	(0.048)	(0.057)	(0.064)	(0.066)	(0.045)
Bank credit to private sector	-0.1444 **	-0.1366 **	-0.0523	-0.0595	-0.0889 *	-0.1028 *	-0.0994 *	0.0355 *
	(0.059)	(0.053)	(0.036)	(0.036)	(0.046)	(0.056)	(0.058)	(0.019)
Market capitalization	-0.0698 ***	-0.0583 *	-0.0354 **	-0.0359 **	-0.0549 ***	-0.0636 ***	-0.0633 ***	-0.0515 **
	(0.024)	(0.029)	(0.014)	(0.015)	(0.020)	(0.021)	(0.022)	(0.022)
Development of financial sector	-0.1113 **	-0.0917 **	-0.0292	-0.0282	-0.0626 *	-0.0704 *	-0.0679 *	0.0135
	(0.048)	(0.042)	(0.024)	(0.022)	(0.035)	(0.036)	(0.037)	(0.016)
Composition of target countries (CEE EU countries)								
Proportion of other CEE countries	-0.0498	-0.0180	-0.0570	-0.0873	-0.0468	-0.0926	-0.0960	-0.2283 ***
	(0.106)	(0.127)	(0.116)	(0.109)	(0.104)	(0.093)	(0.096)	(0.030)
Proportion of FSU countries	-0.1469	-0.1408 *	-0.1254	-0.1025	-0.1691 *	-0.1868 **	-0.1894 **	-0.2883 ***
	(0.098)	(0.078)	(0.076)	(0.078)	(0.093)	(0.089)	(0.092)	(0.046)
Proportion of non-CEE and FSU countries	0.5439 *	0.7311 ***	0.3032	0.4971 **	0.3535	0.5237 **	0.5173 *	0.7143 ***
	(0.295)	(0.265)	(0.199)	(0.189)	(0.233)	(0.257)	(0.266)	(0.150)
Estimation period								
First year of estimation	0.0027	0.0022	0.0023	0.0027	0.0028	0.0008	0.0007	0.0049
	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.007)	(0.008)
Length of estimation	0.0060	0.0088	0.0044	0.0072	0.0047	0.0040	0.0040	0.0214 ***
	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.005)
Data type (panel data)								
Cross-section data	0.1825	0.2241	0.2674	0.2533	0.2499	0.0484	0.0417	dropped
	(0.168)	(0.142)	(0.165)	(0.153)	(0.159)	(0.197)	(0.207)	
Estimator (OLS)								
GLS	0.1423 *	0.1686 ***	0.1020	0.1201 *	0.1120	0.1240 ***	0.1226 ***	0.1781 ***
	(0.074)	(0.059)	(0.070)	(0.062)	(0.071)	(0.047)	(0.048)	(0.043)
FE	0.0808 *	0.0479	0.0361	0.0471 **	0.0487	0.0509 *	0.0496 *	0.0302
	(0.041)	(0.035)	(0.027)	(0.022)	(0.032)	(0.026)	(0.026)	(0.018)
RE	0.1510 ***	0.1265 ***	0.0689 *	0.0961 ***	0.0976 **	0.1000 ***	0.0972 ***	0.0393 *
	(0.047)	(0.039)	(0.036)	(0.026)	(0.036)	(0.028)	(0.028)	(0.023)
SUR	dropped	dropped	dropped	dropped	dropped	dropped	dropped	dropped
GMM	0.0668	0.0260	0.0266	0.0419 *	0.0348	0.0389	0.0378	0.0282 *
	(0.043)	(0.034)	(0.028)	(0.024)	(0.035)	(0.026)	(0.026)	(0.016)
Other estimators	dropped	dropped	dropped	dropped	dropped	dropped	dropped	dropped
IV/2SLS/3SLS	0.0092	-0.0336	-0.0511	-0.0546	-0.0271	0.0199	0.0199	-0.0500
	(0.084)	(0.080)	(0.050)	(0.052)	(0.060)	(0.063)	(0.064)	(0.044)
Base index of economic growth variable (GDP)								
GDP per capita	0.0780	0.0540	0.0342	0.0129	0.0527	0.0858	0.0864	0.1531 ***
	(0.060)	(0.050)	(0.045)	(0.045)	(0.052)	(0.068)	(0.072)	(0.000)
GDP per worker	-0.1362 **	-0.1367 **	-0.1316 **	-0.1304 **	-0.1453 **	-0.0833	-0.0811	dropped
	(0.067)	(0.051)	(0.056)	(0.063)	(0.061)	(0.063)	(0.067)	
Benchmark index of economic growth variable (growth rate)								
Growth level	0.0566	0.0679	0.0175	0.0052	0.0394	0.0775	0.0784	dropped
	(0.079)	(0.065)	(0.065)	(0.061)	(0.074)	(0.090)	(0.095)	
Other characteristics of structural change variable								
Lagged variable	0.0358	0.0272	0.0652	0.0715	0.0560	0.0645	0.0655	0.0740
	(0.063)	(0.033)	(0.046)	(0.046)	(0.054)	(0.058)	(0.060)	(0.064)
With an interaction term(s)	0.0106	-0.0228	0.0346	0.0083	0.0417	0.0396	0.0425	0.0389
	(0.044)	(0.036)	(0.061)	(0.047)	(0.052)	(0.057)	(0.061)	(0.034)
Degree of freedom and research quality								
√ Degree of freedom	0.0007	-0.0028	0.0065	-	0.0059	-0.0020	-0.0022	-0.0210 ***
	(0.005)	(0.005)	(0.005)		(0.005)	(0.005)	(0.006)	(0.005)
Quality level	0.0004	-	-0.0072	-0.0055	-0.0046	0.0038	0.0039	dropped
	(0.008)		(0.005)	(0.006)	(0.007)	(0.010)	(0.011)	
Intercept	-5.2755	-4.2728	-4.6825	-5.4379	-5.6263	-1.4595	-1.3032	-9.5543
	(12.146)	(10.085)	(10.679)	(11.290)	(11.651)	(12.492)	(13.044)	(15.209)
K	280	280	280	280	280	280	280	280
R^2	0.210	0.273	0.222	0.211	0.215	-	0.172	0.032

(continued)

(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 [df]	Cluster-robust WLS [$1/SE$]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS	Cluster-robust fixed-effects panel LSDV
Meta-independent variable (default) / model	[9]	[10]	[11]	[12]	[13]	[14]	[15][c]	[16][d]
Structural change variable type (share of private sector in GDP)								
Trade openness	0.1145	0.0856	1.0139 *	1.1628 *	0.5928	0.1673	0.1768	-0.9485
	(0.534)	(0.440)	(0.527)	(0.580)	(0.545)	(0.521)	(0.543)	(0.590)
Bank credit to private sector	-1.0577 **	-1.1265 **	-0.4260	-0.6239	-0.7046	-0.8819 *	-0.8517 *	0.5601 **
	(0.460)	(0.479)	(0.439)	(0.452)	(0.468)	(0.472)	(0.493)	(0.217)
Market capitalization	-0.6688 ***	-0.6196 ***	-0.4651 **	-0.4930 **	-0.5826 ***	-0.6359 ***	-0.6331 ***	-0.5095 ***
	(0.172)	(0.214)	(0.191)	(0.198)	(0.170)	(0.158)	(0.163)	(0.176)
Development of financial sector	-0.7291 *	-0.6921 *	-0.1359	-0.1242	-0.3906	-0.5886 *	-0.5670 *	0.2741
	(0.369)	(0.357)	(0.261)	(0.234)	(0.325)	(0.334)	(0.345)	(0.179)
Composition of target countries (CEE EU countries)								
Proportion of other CEE countries	-0.1861	-0.2658	-0.9677	-1.3285	-0.4340	-0.2059	-0.2204	-1.1408 ***
	(0.624)	(0.860)	(0.991)	(1.048)	(0.702)	(0.557)	(0.574)	(0.174)
Proportion of FSU countries	-1.2571 **	-1.2219 *	-1.3934 **	-0.5527	-1.5909 **	-1.2838 **	-1.2953 **	-1.9248 ***
	(0.600)	(0.641)	(0.634)	(0.936)	(0.631)	(0.536)	(0.554)	(0.302)
Proportion of non-CEE and FSU countries	6.0199 *	7.7356 ***	3.8802	9.3922 ***	4.6689	5.9978 **	5.9760 **	9.7674 ***
	(3.053)	(2.602)	(2.820)	(2.733)	(3.017)	(2.856)	(2.956)	(1.637)
Estimation period								
First year of estimation	0.0262	0.0205	0.0249	0.0345	0.0286	0.0242	0.0241	0.1032
	(0.053)	(0.049)	(0.063)	(0.077)	(0.061)	(0.054)	(0.056)	(0.080)
Length of estimation	0.0504	0.0477	0.0363	0.1175	0.0399	0.0366	0.0353	0.2127 ***
	(0.060)	(0.052)	(0.073)	(0.081)	(0.068)	(0.055)	(0.057)	(0.048)
Data type (panel data)								
Cross-section data	1.3517	1.4905 *	2.4583 *	1.8705	2.0179 *	0.7748	0.7155	dropped
	(1.080)	(0.864)	(1.288)	(1.330)	(1.148)	(1.104)	(1.159)	
Estimator (OLS)								
GLS	1.3506	1.9039 ***	1.1557	1.8452 *	1.1780	1.0301	0.9889	1.0128 ***
	(0.982)	(0.648)	(0.974)	(0.987)	(0.987)	(0.871)	(0.891)	(0.345)
FE	0.3805	0.1423	0.1749	0.6260 **	0.2199	0.1947	0.1774	0.0411
	(0.306)	(0.338)	(0.335)	(0.255)	(0.334)	(0.262)	(0.268)	(0.146)
RE	1.4863 ***	1.2013 ***	0.9280	1.8021 ***	1.1840 **	1.0088 ***	0.9542 ***	-0.0219
	(0.372)	(0.404)	(0.566)	(0.453)	(0.480)	(0.339)	(0.354)	(0.508)
SUR	dropped	dropped	dropped	dropped	dropped	dropped	dropped	dropped
GMM	0.2864	-0.0170	0.1415	0.6906 **	0.1381	0.1235	0.1110	0.0946
	(0.346)	(0.346)	(0.331)	(0.304)	(0.359)	(0.268)	(0.271)	(0.114)
Other estimators	dropped	dropped	dropped	dropped	dropped	dropped	dropped	dropped
IV/2SLS/3SLS	-0.3058	-0.8023	-0.5839	-0.7448	-0.4403	-0.1589	-0.1407	-0.3529
	(0.677)	(0.606)	(0.569)	(0.698)	(0.616)	(0.587)	(0.602)	(0.442)
Base index of economic growth variable (GDP)								
GDP per capita	0.5317	0.5952	0.3070	-0.2297	0.4111	0.5436	0.5462	1.9684 ***
	(0.458)	(0.373)	(0.516)	(0.611)	(0.513)	(0.488)	(0.515)	(0.000)
GDP per worker	-1.7074 ***	-1.4959 ***	-1.5594 **	-1.5424	-1.7353 **	-1.4940 **	-1.4730 **	dropped
	(0.626)	(0.483)	(0.669)	(0.994)	(0.672)	(0.603)	(0.635)	
Benchmark index of economic growth variable (growth rate)								
Growth level	0.5078	0.5539	0.0371	-0.2625	0.3112	0.6893	0.7110	dropped
	(0.642)	(0.505)	(0.602)	(0.593)	(0.649)	(0.733)	(0.780)	
Other characteristics of structural change variable								
Lagged variable	0.6372	0.4410	0.9940	1.1644 *	0.8487	0.8226	0.8417	1.0583
	(0.754)	(0.434)	(0.606)	(0.600)	(0.684)	(0.733)	(0.765)	(0.816)
With an interaction term(s)	0.4752	0.2472	0.5538	-0.1400	0.6577	0.5260	0.5440	-0.0481
	(0.416)	(0.281)	(0.867)	(0.497)	(0.670)	(0.375)	(0.396)	(0.327)
Degree of freedom and research quality								
√‾Degree of freedom	0.1120 **	0.0980 **	0.1882 ***	-	0.1605 ***	0.1029 **	0.1021 **	-0.0629
	(0.043)	(0.045)	(0.051)		(0.048)	(0.047)	(0.050)	(0.060)
Quality level	-0.0381	-	-0.1071 *	-0.0679	-0.0789	-0.0333	-0.0337	dropped
	(0.065)		(0.056)	(0.069)	(0.062)	(0.073)	(0.078)	
Intercept	-52.8405	-41.2869	-50.7880	-69.2502	-57.8626	-48.5769	-48.3153	-206.4832
	(106.384)	(96.721)	(125.467)	(153.256)	(122.218)	(107.500)	(112.354)	(157.845)
K	280	280	280	280	280	280	280	280
R^2	0.275	0.305	0.297	0.246	0.289	-	0.265	0.060

Notes:

[a] Breusch–Pagan test: $\chi^2=0.34$, $p=0.280$

[b] Hausman test: $\chi^2=32.45$, $p=0.019$

[c] Breusch–Pagan test: $\chi^2=1248.70$, $p=0.000$

[d] Hausman test: $\chi^2=37.21$, $p=0.005$

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' estimation. See Table 5 for definition and descriptive statistics of meta-independent variables.

Table 9. Meta-regression analysis using estimates of transformation policy variable

(a) Dependent variable — PCC

Estimator (analytical weight in parentheses)	Cluster-robust OLS	Cluster-robust WLS [Quality level]	Cluster-robust WLS [N]	Cluster-robust WLS [df]	Cluster-robust WLS [$1/SE$]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS	Cluster-robust fixed-effects panel LSDV
Meta-independent variable (default) / model	[1]	[2]	[3]	[4]	[5]	[6]	[7][a]	[8][b]
Transformation policy variable type (comprehensive structural reform)								
Comprehensive economic reform	0.1890 ***	0.2235 ***	0.1850 ***	0.1814 ***	0.1952 ***	0.0451	0.0264	-0.0413
	(0.034)	(0.036)	(0.026)	(0.024)	(0.030)	(0.064)	(0.065)	(0.072)
Liberalization	0.1719 ***	0.2605 ***	0.1526 ***	0.1425 ***	0.1623 ***	0.0519	0.0328	-0.0514
	(0.050)	(0.053)	(0.040)	(0.039)	(0.048)	(0.078)	(0.080)	(0.092)
Price and competition reform	0.0329	0.0613	0.0164	0.0263	0.0411	-0.0641	-0.0808	-0.1375
	(0.060)	(0.087)	(0.052)	(0.050)	(0.056)	(0.078)	(0.079)	(0.084)
Enterprise reform	0.0551	0.0437	0.0659 **	0.0628 **	0.0726 **	-0.0061	-0.0227	-0.0802
	(0.043)	(0.050)	(0.026)	(0.026)	(0.032)	(0.060)	(0.062)	(0.071)
Privatization	0.0471	0.0252	0.0654	0.0673	0.0699	-0.0597	-0.0760	-0.1321
	(0.061)	(0.079)	(0.062)	(0.061)	(0.062)	(0.100)	(0.103)	(0.111)
Financial reform	0.1639 ***	0.2842 ***	0.1520 ***	0.1519 ***	0.1641 ***	0.0693	0.0524	-0.0043
	(0.057)	(0.084)	(0.038)	(0.036)	(0.043)	(0.064)	(0.065)	(0.070)
Trade reform	0.1830 ***	0.2047 ***	0.1971 ***	0.1921 ***	0.2106 ***	0.1059	0.0904	0.0371
	(0.035)	(0.036)	(0.027)	(0.026)	(0.030)	(0.067)	(0.069)	(0.076)
Institutional quality	0.2175 **	0.3424 ***	0.1218	0.1019	0.1591	0.1360	0.1316	0.1243
	(0.093)	(0.083)	(0.157)	(0.164)	(0.133)	(0.124)	(0.127)	(0.139)
Property rights reform	0.1148	0.1435	0.0072	0.0029	0.0560	0.0855	0.0691	0.0053
	(0.111)	(0.107)	(0.044)	(0.043)	(0.078)	(0.107)	(0.107)	(0.105)
Government reform	0.0766	0.0927	0.1245 ***	0.1131 ***	0.1039 **	-0.0707	-0.0899	-0.1591
	(0.063)	(0.060)	(0.041)	(0.040)	(0.052)	(0.092)	(0.096)	(0.113)
Political reform/stability	0.2077 ***	0.2655 ***	0.1408 ***	0.1197 **	0.1686 ***	0.0583	0.0405	-0.0242
	(0.052)	(0.086)	(0.050)	(0.055)	(0.054)	(0.067)	(0.068)	(0.075)
Democratization	-0.0998	0.0032	-0.0528	-0.0579 *	-0.0711	-0.2488 **	-0.2663 **	-0.3423 ***
	(0.071)	(0.058)	(0.034)	(0.033)	(0.052)	(0.108)	(0.111)	(0.126)
Rule of law/legal reform	0.2170 ***	0.2766 ***	0.1916 ***	0.1878 ***	0.2192 ***	0.1140	0.0963	0.0246
	(0.069)	(0.077)	(0.052)	(0.051)	(0.060)	(0.100)	(0.101)	(0.101)
Civil rights/society	0.1297 *	0.1892 **	0.1010 **	0.1042 **	0.1220 *	0.0643	0.0514	-0.0045
	(0.073)	(0.078)	(0.047)	(0.050)	(0.065)	(0.085)	(0.085)	(0.088)
Other transformation policies	0.0969	0.2162 ***	0.1303 **	0.1351 **	0.1347 **	-0.0379	-0.0557	-0.1116
	(0.063)	(0.082)	(0.066)	(0.065)	(0.067)	(0.073)	(0.075)	(0.080)
Benchmark index of transformation policy variable (reform level)								
Reform speed	-0.1475 ***	-0.1283 ***	-0.1494 ***	-0.1535 ***	-0.1584 ***	-0.0384	-0.0346	-0.0303
	(0.035)	(0.037)	(0.026)	(0.027)	(0.028)	(0.055)	(0.056)	(0.059)
Composition of target countries (CEE EU countries)								
Proportion of other CEE countries	-0.4220 *	-0.4113	-0.4257 *	-0.3813 *	-0.4033 *	-0.3147 **	-0.2854 **	-0.1755 ***
	(0.219)	(0.284)	(0.225)	(0.209)	(0.208)	(0.140)	(0.113)	(0.030)
Proportion of FSU countries	-0.0927	-0.0507	-0.0581	-0.0495	-0.0821	-0.0998 *	-0.0939	-0.0757
	(0.067)	(0.080)	(0.065)	(0.071)	(0.062)	(0.060)	(0.062)	(0.074)
Proportion of non-CEE and FSU countries	-0.4005	-0.6192	-0.0058	-0.0158	-0.2199	-0.5864	-0.6389	-0.7403 *
	(0.515)	(0.625)	(0.407)	(0.411)	(0.448)	(0.476)	(0.474)	(0.395)
Estimation period								
First year of estimation	0.0081 *	0.0034	0.0064	0.0057	0.0077 *	0.0131	0.0154	0.0274 *
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.011)	(0.012)	(0.016)
Length of estimation	-0.0082 *	-0.0103 *	-0.0050	-0.0038	-0.0074 *	-0.0043	-0.0029	0.0082
	(0.004)	(0.006)	(0.003)	(0.003)	(0.004)	(0.008)	(0.009)	(0.014)
Data type (panel data)								
Cross-section data	0.0973	0.1194 *	0.1090 *	0.0908 *	0.0893	0.1082	0.1016	0.0012
	(0.060)	(0.067)	(0.056)	(0.055)	(0.062)	(0.088)	(0.095)	(0.147)
Estimator (OLS)								
GLS	-0.2035 ***	-0.1995 ***	-0.1810 ***	-0.1771 ***	-0.2279 ***	-0.0912 *	-0.0723	-0.0083
	(0.046)	(0.051)	(0.051)	(0.051)	(0.057)	(0.049)	(0.046)	(0.033)
FE	-0.0070	0.0113	-0.0210	-0.0193	-0.0245	0.0151	0.0201	0.0478 **
	(0.039)	(0.041)	(0.033)	(0.033)	(0.040)	(0.025)	(0.024)	(0.022)
RE	-0.0696	-0.0631	-0.0962 *	-0.0733 *	-0.0785	-0.0253	-0.0191	0.0096
	(0.060)	(0.068)	(0.052)	(0.044)	(0.054)	(0.029)	(0.027)	(0.020)
GMM	-0.0472	-0.0025	-0.0420	-0.0461	-0.0633	-0.0136	-0.0078	0.0211
	(0.049)	(0.047)	(0.040)	(0.040)	(0.051)	(0.029)	(0.027)	(0.022)
Other estimators	-0.2385 ***	-0.2564 ***	-0.2032 ***	-0.1973 ***	-0.2420 ***	-0.0198	-0.0078	0.0055
	(0.048)	(0.055)	(0.044)	(0.042)	(0.051)	(0.021)	(0.023)	(0.036)
IV/2SLS/3SLS	-0.0254	-0.0239	-0.0034	-0.0040	-0.0158	0.0023	0.0017	-0.0017
	(0.026)	(0.028)	(0.028)	(0.029)	(0.026)	(0.024)	(0.025)	(0.028)
Base index of economic growth variable (GDP)								
GDP per capita	-0.0179	-0.0098	0.0113	0.0164	-0.0064	-0.0253	-0.0238	0.2187 ***
	(0.025)	(0.031)	(0.023)	(0.023)	(0.025)	(0.058)	(0.065)	(0.031)
GDP per worker	-0.0049	-0.0360	0.0461	0.0635	0.0206	-0.0312	-0.0361	dropped
	(0.050)	(0.054)	(0.063)	(0.061)	(0.056)	(0.082)	(0.087)	
Benchmark index of economic growth variable (growth rate)								
Growth level	0.0106	0.0510	0.0974	0.1415	0.0743	-0.1492	-0.1740	dropped
	(0.131)	(0.143)	(0.104)	(0.092)	(0.117)	(0.140)	(0.147)	
Other characteristics of transformation policy variable								
Lagged variable	0.0319	0.0449	0.0645 *	0.0695 *	0.0506	0.1548 ***	0.1621 ***	0.1765 ***
	(0.044)	(0.046)	(0.038)	(0.039)	(0.044)	(0.054)	(0.055)	(0.059)
With an interaction term(s)	-0.0863 *	-0.0721	-0.1109 ***	-0.1235 ***	-0.1210 **	-0.0059	-0.0025	0.0037
	(0.051)	(0.057)	(0.042)	(0.043)	(0.047)	(0.032)	(0.032)	(0.032)
Degree of freedom and research quality								
√Degree of freedom	0.0033	0.0060	0.0031	-	0.0026	0.0077	0.0080	0.0086
	(0.005)	(0.006)	(0.003)		(0.004)	(0.008)	(0.008)	(0.009)
Quality level	0.0101 **	-	0.0088 *	0.0103 **	0.0113 **	0.0042	0.0046	dropped
	(0.005)		(0.004)	(0.004)	(0.005)	(0.008)	(0.008)	
Intercept	-16.1042	-6.6432	-12.7020	-11.1995	-15.2686 *	-26.0344	-30.6407	-54.6456 *
	(9.800)	(9.909)	(8.130)	(8.345)	(8.622)	(21.376)	(23.464)	(31.207)
K	1702	1702	1702	1702	1702	1702	1702	1702
R^2	0.226	0.251	0.239	0.247	0.238	-	0.080	0.0003

(continued)

(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 [df]	Cluster-robust WLS [$1/SE$]	Multilevel mixed-effects RML	Cluster-robust random-effects panel GLS	Cluster-robust fixed-effects panel LSDV
Meta-independent variable (default) / model	[9]	[10]	[11]	[12]	[13]	[14]	[15][c]	[16][d]
Transformation policy variable type (comprehensive structural reform)								
Comprehensive economic reform	2.5411 ***	2.8988 ***	2.7730 ***	2.6766 ***	2.8576 ***	0.6284	0.5691	-0.1787
	(0.476)	(0.493)	(0.408)	(0.377)	(0.463)	(0.532)	(0.525)	(0.475)
Liberalization	2.0723 ***	2.8215 ***	2.2832 ***	2.1523 ***	2.1962 ***	0.9886	0.9459	0.2572
	(0.613)	(0.571)	(0.595)	(0.602)	(0.679)	(0.605)	(0.600)	(0.583)
Price and competition reform	0.8220	1.3799	0.5901	0.4861	0.8971	-0.5724	-0.6272	-1.3010 *
	(0.733)	(0.944)	(0.683)	(0.675)	(0.734)	(0.728)	(0.730)	(0.734)
Enterprise reform	1.1171 **	1.0751 *	1.0416 **	0.8661 *	1.2327 ***	0.0083	-0.0435	-0.6839
	(0.479)	(0.563)	(0.424)	(0.440)	(0.472)	(0.486)	(0.483)	(0.498)
Privatization	1.3168	0.9108	1.4127 *	1.3460	1.6061 *	-0.3837	-0.4415	-1.1370
	(0.796)	(0.993)	(0.849)	(0.865)	(0.863)	(1.056)	(1.069)	(1.126)
Financial reform	2.1275 ***	3.0899 ***	2.3973 ***	2.2916 ***	2.4477 ***	1.0170 *	0.9661 *	0.3514
	(0.601)	(0.772)	(0.625)	(0.584)	(0.644)	(0.554)	(0.549)	(0.517)
Trade reform	2.8208 ***	3.1224 ***	2.9542 ***	2.7696 ***	3.3316 ***	1.5133 ***	1.4634 **	0.8405
	(0.452)	(0.427)	(0.385)	(0.376)	(0.502)	(0.575)	(0.574)	(0.568)
Institutional quality	1.9584	2.9520 ***	1.2771	0.9061	1.6254	1.6831	1.7234	2.3872
	(1.223)	(0.934)	(2.420)	(2.502)	(1.966)	(1.775)	(1.796)	(1.839)
Property rights reform	1.1968	1.3636	-0.2701	-0.4576	0.4688	0.4175	0.3727	-0.2500
	(1.017)	(1.021)	(0.627)	(0.626)	(0.912)	(1.063)	(1.072)	(1.046)
Government reform	1.4252 **	1.5640 ***	1.8585 ***	1.4475 ***	1.6781 ***	0.0725	0.0252	-0.6026
	(0.575)	(0.596)	(0.536)	(0.528)	(0.602)	(0.639)	(0.640)	(0.670)
Political reform/stability	1.8138 ***	2.1430 ***	1.7822 **	1.3662	1.8255 **	0.6947	0.6521	0.0713
	(0.608)	(0.798)	(0.758)	(0.843)	(0.786)	(0.603)	(0.601)	(0.586)
Democratization	-0.3760	0.4647	-1.0997 **	-1.2164 **	-0.7249	-1.5849 **	-1.6244 **	-2.2600 ***
	(0.599)	(0.603)	(0.540)	(0.521)	(0.608)	(0.706)	(0.707)	(0.743)
Rule of law/legal reform	2.4150 ***	2.8828 ***	2.5892 ***	2.3678 ***	2.8311 ***	1.1698	1.1254	0.4825
	(0.648)	(0.667)	(0.713)	(0.727)	(0.760)	(0.792)	(0.794)	(0.770)
Civil rights/society	1.3050 *	1.6566 **	0.9165	0.9477	1.2645 *	0.8237	0.8010	0.3600
	(0.738)	(0.775)	(0.595)	(0.620)	(0.751)	(0.723)	(0.721)	(0.694)
Other transformation policies	1.9264 **	3.3700 **	2.5068 **	2.4121 **	2.6002 **	0.2039	0.1422	-0.5453
	(0.915)	(1.321)	(1.069)	(1.104)	(1.072)	(0.731)	(0.734)	(0.727)
Benchmark index of transformation policy variable (reform level)								
Reform speed	-2.0038 ***	-1.8713 ***	-2.4132 ***	-2.4692 ***	-2.3879 ***	-0.5784	-0.5600	-0.4422
	(0.370)	(0.447)	(0.397)	(0.416)	(0.395)	(0.496)	(0.507)	(0.565)
Composition of target countries (CEE EU countries)								
Proportion of other CEE countries	-2.0175	-1.7490	-3.5088	-2.3166	-2.4893	-1.9204 **	-1.8806 **	-1.2230 ***
	(1.742)	(2.593)	(2.944)	(2.838)	(2.187)	(0.923)	(0.884)	(0.392)
Proportion of FSU countries	-0.4438	0.1709	-0.2347	0.1357	-0.4555	-1.1810	-1.1910	-1.2478
	(0.559)	(0.820)	(0.861)	(1.040)	(0.745)	(0.768)	(0.791)	(0.972)
Proportion of non-CEE and FSU countries	-0.8278	-3.7102	0.4156	-0.5175	-0.3868	-3.9733	-4.0496	-4.3383
	(3.481)	(3.315)	(5.184)	(5.678)	(4.314)	(3.725)	(3.700)	(2.664)
Estimation period								
First year of estimation	0.0678	0.0291	0.0663	0.0566	0.0761	0.1295	0.1374	0.2660 *
	(0.046)	(0.048)	(0.059)	(0.063)	(0.054)	(0.091)	(0.095)	(0.142)
Length of estimation	-0.0807 **	-0.0952 *	-0.0620	-0.0202	-0.0932 *	-0.0369	-0.0335	0.0506
	(0.040)	(0.049)	(0.048)	(0.049)	(0.051)	(0.076)	(0.081)	(0.158)
Data type (panel data)								
Cross-section data	0.0353	0.3056	0.3853	-0.2623	-0.0336	0.4042	0.4056	0.1255
	(0.566)	(0.577)	(0.623)	(0.676)	(0.701)	(0.635)	(0.651)	(0.825)
Estimator (OLS)								
GLS	-2.6919 ***	-2.6737 ***	-2.6443 ***	-2.5636 ***	-3.2603 ***	-1.3403 **	-1.2639 **	-0.4226
	(0.736)	(0.720)	(0.812)	(0.824)	(0.949)	(0.595)	(0.590)	(0.421)
FE	-0.3424	-0.2026	-0.2045	-0.1725	-0.3994	0.2185	0.2305	0.4176 **
	(0.533)	(0.495)	(0.528)	(0.528)	(0.645)	(0.232)	(0.226)	(0.179)
RE	-1.0043	-1.1644	-1.2744 *	-1.1539 *	-1.2245	-0.4246	-0.4079	-0.2078
	(0.759)	(0.804)	(0.710)	(0.688)	(0.827)	(0.383)	(0.381)	(0.337)
GMM	-0.7092	-0.3116	-0.6377	-0.6916	-0.9685	-0.1629	-0.1457	0.0894
	(0.638)	(0.581)	(0.648)	(0.651)	(0.803)	(0.363)	(0.362)	(0.321)
Other estimators	-2.8551 ***	-2.9174 ***	-2.9242 ***	-2.8286 ***	-3.2181 ***	-0.3376	-0.2800	0.1208
	(0.576)	(0.585)	(0.609)	(0.600)	(0.692)	(0.251)	(0.263)	(0.453)
IV/2SLS/3SLS	-0.1077	-0.1171	-0.0052	-0.0358	-0.1046	-0.0776	-0.0857	-0.1784
	(0.291)	(0.324)	(0.447)	(0.462)	(0.389)	(0.237)	(0.241)	(0.270)
Base index of economic growth variable (GDP)								
GDP per capita	-0.2061	-0.0040	0.2656	0.4170	-0.0729	-0.1989	-0.2052	1.2169 ***
	(0.301)	(0.353)	(0.364)	(0.373)	(0.370)	(0.553)	(0.566)	(0.389)
GDP per worker	0.7132	0.1686	0.8978	1.3073	0.7013	0.3382	0.3137	dropped
	(0.567)	(0.800)	(1.001)	(1.010)	(0.841)	(0.724)	(0.742)	
Benchmark index of economic growth variable (growth rate)								
Growth level	1.1330	1.8432	2.1204 *	2.4572 *	1.6974	-0.9638	-1.0579	dropped
	(1.558)	(1.735)	(1.232)	(1.257)	(1.495)	(1.616)	(1.647)	
Other characteristics of transformation policy variable								
Lagged variable	0.7346	0.7779	0.9535 *	1.0251 *	0.8092	2.3887 ***	2.4229 ***	2.7104 ***
	(0.557)	(0.581)	(0.540)	(0.566)	(0.612)	(0.706)	(0.719)	(0.786)
With an interaction term(s)	-1.6618 ***	-1.5255 **	-2.0137 ***	-2.1377 ***	-2.1209 ***	-0.5343 *	-0.5126	-0.3589
	(0.561)	(0.599)	(0.577)	(0.597)	(0.597)	(0.314)	(0.314)	(0.334)
Degree of freedom and research quality								
√ Degree of freedom	0.0873 **	0.1182 ***	0.0949 **	-	0.0967 **	0.0931 *	0.0930 *	0.0918
	(0.042)	(0.044)	(0.038)		(0.044)	(0.055)	(0.056)	(0.063)
Quality level	0.1107 **	-	0.1543 **	0.1666 **	0.1588 **	0.0709	0.0725	dropped
	(0.050)		(0.068)	(0.070)	(0.067)	(0.083)	(0.084)	
Intercept	-135.1758	-58.6573	-133.0673	-113.1618	-151.8193	-257.6336	-273.2752	-530.2576 *
	(91.434)	(96.168)	(117.020)	(125.330)	(107.133)	(181.406)	(188.830)	(283.128)
K	1702	1702	1702	1702	1702	1702	1702	1702
R^2	0.193	0.213	0.238	0.240	0.221	-	0.069	0.019

Notes:

[a] Breusch–Pagan test: χ^2=104.94, p=0.000

[b] Hausman test: χ^2=88.44, p=0.000

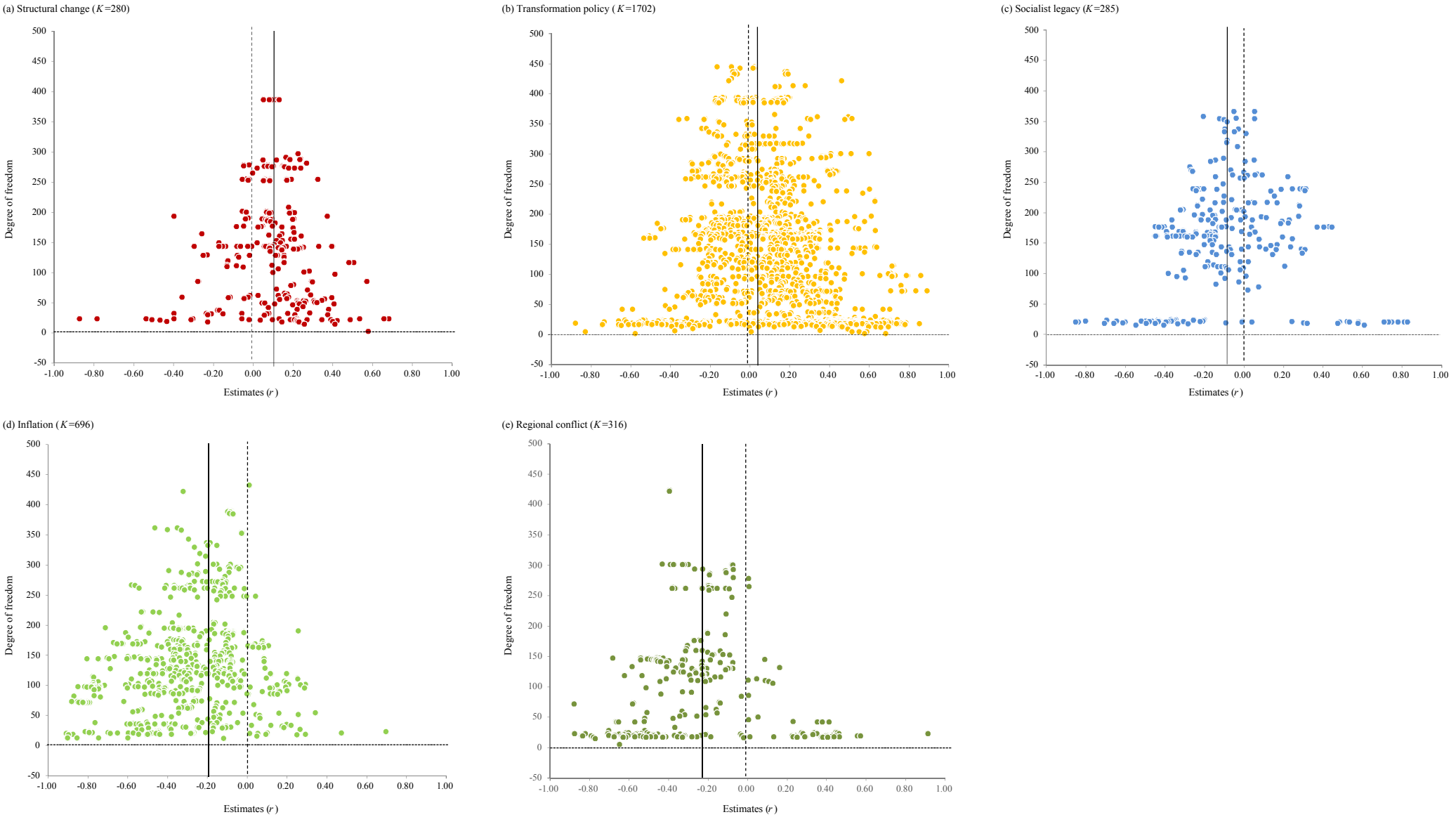
[c] Breusch–Pagan test: χ^2=132.90, p=0.000

[d] Hausman test: χ^2=51.71, p=0.015

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' estimation. See Table 5 for definition and descriptive statistics of meta-independent variables.

Figure 5. Funnel plot of estimates by growth-determining variable type



Note: Solid line indicates the mean of the top 10% most precise estimates. The values for the structural change variable, transformation policy variable, socialist legacy variable, inflation variable, and regional conflict variable are 0.120, 0.052, -0.078, -0.187, and -0.223, respectively.
Source: Authors' illustration.

Table 10. Univariate test of publication selection bias by growth-determining variable type

Growth-determining variable type	(a) Test of type I publication selection bias (funnel asymmetry test)						(b) Test of type II publication selection bias					
	Under the assumption that the truth effect size is zero			Under the assumption that the truth effect size is the mean value of the top 10 percent most precise estimates (x)			Under the assumption that the truth effect size is zero			Under the assumption that the truth effect size is the mean value of the top 10 percent most precise estimates (x)		
	Number of estimates		Goodness-of-fit test (z) [a]	Number of estimates		Goodness-of-fit test (z) [b]	Number of estimates		Goodness-of-fit test (z) [c]	Number of estimates		Goodness-of-fit test (z) [d]
	PCC_k<0	PCC_k>0		PCC_k<x	PCC_k>x		$\|t_k\|$<1.96	$\|t_k\|$>1.96		$\|(PCC_k\text{-}x)/SE_k\|$ <1.96	$\|(PCC_k\text{-}x)/SE_k\|$ >1.96	
Structural change	72	208	8.1276 *** (0.000)	151	129	-1.3148 (0.189)	182	98	23.0332 *** (0.000)	211	69	15.0812 *** (0.000)
Transformation policy	611	1091	11.6349 *** (0.000)	705	997	7.0779 *** (0.000)	766	936	94.6350 *** (0.000)	816	886	89.0742 *** (0.000)
Socialist legacy	197	88	-6.4566 *** (0.000)	167	118	-2.9025 *** (0.004)	123	162	40.1567 *** (0.000)	148	137	33.3620 *** (0.000)
Inflation	619	77	-20.5445 *** (0.000)	436	260	-6.6713 *** (0.000)	230	466	74.9941 *** (0.000)	196	500	54.8195 *** (0.000)
Regional conflict	241	75	-9.3382 *** (0.000)	175	141	-1.9126 * (0.056)	103	213	50.8999 *** (0.000)	158	158	36.7036 *** (0.000)

Notes:

[a] Null hypothesis: The ratio of the positive versus negative values is 50:50.

[b] Null hypothesis: The ratio of estimates below x versus those over x is 50:50.

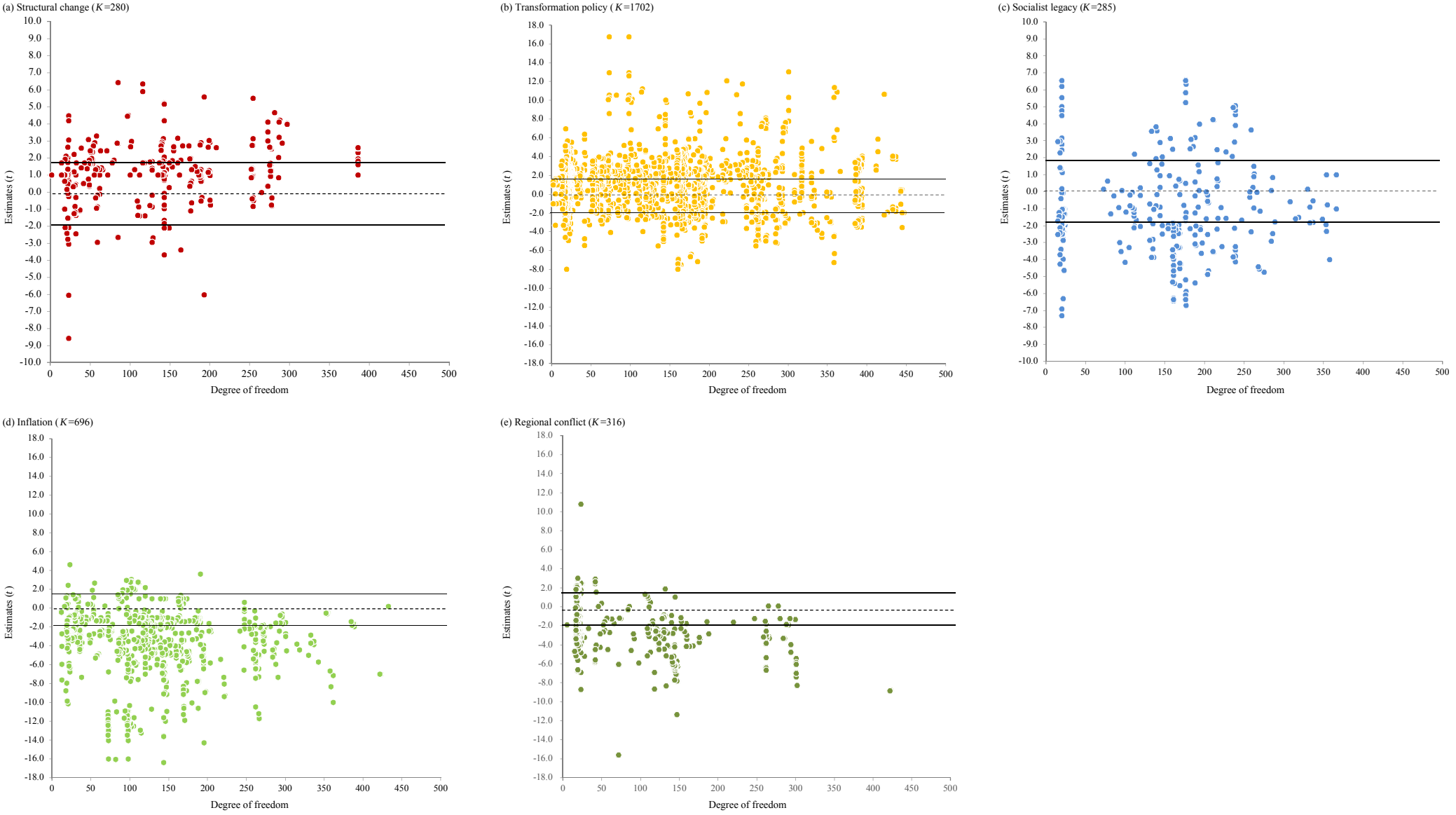
[c] Null hypothesis: Share of estimates, t value of which is within the range of ±1.96, is 95% in total estimates.

[d] Null hypothesis: Share of estimates, in which the statistics |(the k-th estimate - the true effect)/SE_k | is within the range of ±1.96, is 95% in total estimates.

Figures in parentheses are p values. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' estimation.

Figure 6. Galbraith plot of estimates by growth-determining variable type



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

Source: Authors' illustration.

Table 11. Meta-regression analysis of publication selection bias by growth-determining variable type

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

Estimates to test	Structural change			Transformation policy			Socialist legacy			Inflation			Regional conflict		
Estimator	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	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV
Model	[1]	[2]	[3] [a]	[4]	[5]	[6] [b]	[7]	[8]	[9] [c]	[10]	[11]	[12] [d]	[13]	[14]	[15] [e]
Intercept (FAT: H_0: β_0=0)	-0.3906	-0.3906	-0.0274	0.6756 ***	0.6756 *	-1.9127 **	-0.6924	-0.6924	-1.3763 *	1.5013 ***	1.5013	2.3147	1.1050 ***	1.1050 *	1.7645
	(0.268)	(0.471)	(0.603)	(0.162)	(0.362)	(0.940)	(0.455)	(1.244)	(0.754)	(0.358)	(1.161)	(2.415)	(0.309)	(0.592)	(1.128)
$1/SE$ (PET: H_0: β_1=0)	0.1265 ***	0.1265 ***	0.1079 *	0.0277 *	0.0277	0.2520 ***	-0.0280	-0.0280	0.0357	-0.4260 ***	-0.4260 ***	-0.4920 **	-0.3605 ***	-0.3605 ***	-0.4288 ***
	(0.021)	(0.032)	(0.060)	(0.016)	(0.044)	(0.081)	(0.037)	(0.096)	(0.066)	(0.033)	(0.116)	(0.196)	(0.031)	(0.070)	(0.117)
K	280	280	280	1702	1702	1702	285	285	285	696	696	696	316	316	316
R^2	0.0823	0.0823	0.0823	0.0020	0.0020	0.0020	0.0016	0.0016	0.0016	0.2122	0.2122	0.2122	0.3041	0.3041	0.3041

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

Estimates to test	Structural change			Transformation policy			Socialist legacy			Inflation			Regional conflict		
Estimator	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV	OLS	Cluster-robust OLS	Cluster-robust fixed-effects panel LSDV
Model	[16]	[17]	[18] [f]	[19]	[20]	[21] [g]	[22]	[23]	[24] [h]	[25]	[26]	[27] [i]	[28]	[29]	[30] [j]
Intercept (H_0: β_0=0)	1.2553 ***	1.2553 ***	-1.3351 *	1.0773 ***	1.0773 ***	-0.2100	2.1427 ***	2.1427 ***	-2.0592	-0.7104 **	-0.7104	-1.6168	1.0240 ***	1.0240 **	-1.2122
	(0.163)	(0.261)	(0.737)	(0.104)	(0.304)	(0.992)	(0.259)	(0.504)	(1.704)	(0.323)	(1.059)	(2.259)	(0.206)	(0.396)	(0.794)
$1/SE$	0.0493 ***	0.0493 **	0.2783 ***	0.1215 ***	0.1215 ***	0.2330 ***	0.0330	0.0330	0.3830 ***	0.3839 ***	0.3839 ***	0.4575 **	0.2239 ***	0.2239 ***	0.4554 ***
	(0.014)	(0.024)	(0.065)	(0.011)	(0.036)	(0.086)	(0.022)	(0.048)	(0.142)	(0.031)	(0.112)	(0.183)	(0.026)	(0.061)	(0.082)
K	280	280	280	1702	1702	1702	285	285	285	696	696	696	316	316	316
R^2	0.0291	0.0291	0.0291	0.0839	0.0839	0.0839	0.0062	0.0062	0.0062	0.2048	0.2048	0.2048	0.2317	0.2317	0.2317

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

Estimates to test	Structural change			Transformation policy			Socialist legacy			Inflation			Regional conflict		
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	OLS	Cluster-robust OLS	Random-effects panel ML
Model	[31]	[32]	[33]	[34]	[35]	[36]	[37]	[38]	[39]	[40]	[41]	[42]	[43]	[44]	[45]
SE	-1.2131	-1.2131	0.3044	2.6947 ***	2.6947 **	-3.6531 ***	-2.3802	-2.3802	-6.0703 **	5.5720 ***	5.5720	7.3092 ***	4.7254 ***	4.7254 **	4.8548 **
	(1.025)	(1.821)	(1.812)	(0.525)	(1.1862)	(1.372)	(1.6948)	(4.757)	(2.860)	(1.377)	(4.399)	(2.521)	(1.120)	(2.255)	(2.348)
$1/SE$ (H_0: β_1=0)	0.1049 ***	0.1049 ***	0.1046 ***	0.0602 ***	0.0602 **	0.1631 ***	-0.0648 ***	-0.0648	-0.0259	-0.3487 ***	-0.3487 ***	-0.3683 ***	-0.3084 ***	-0.3084 ***	-0.3290 ***
	(0.011)	(0.016)	(0.022)	(0.009)	(0.029)	(0.016)	(0.018)	(0.045)	(0.032)	(0.017)	(0.061)	(0.023)	(0.018)	(0.047)	(0.028)
K	280	280	280	1702	1702	1702	285	285	285	696	696	696	316	316	316
R^2	0.2820	0.2820	-	0.0976	0.0976	-	0.1124	0.1124	-	0.6132	0.6132	-	0.5736	0.5736	-

Notes:

[a] Breusch–Pagan test: χ^2=51.89, p=0.000; Hausman test: χ^2=0.60, p=0.439

[b] Breusch–Pagan test: χ^2=1621.37, p=0.000; Hausman test: χ^2=12.33, p=0.000

[c] Breusch–Pagan test: χ^2=318.12, p=0.000; Hausman test: χ^2= 1.50, p=0.220

[d] Breusch–Pagan test: χ^2=2028.26, p=0.000; Hausman test: χ^2=3.06, p=0.080

[e] Breusch–Pagan test: χ^2= 170.82, p=0.000; Hausman test: χ^2=3.56, p=0.059

[f] Breusch–Pagan test: χ^2=75.76, p=0.000; Hausman test: χ^2= 12.69, p=0.000

[g] Breusch–Pagan test: χ^2=2223.53, p=0.000; Hausman test: χ^2=8.98, p=0.003

[h] Breusch–Pagan test: χ^2= 130.66, p=0.000; Hausman test: χ^2=30.31, p=0.000

[i] Breusch–Pagan test: χ^2=2511.63, p=0.000; Hausman test: χ^2= 6.29, p=0.012

[j] Breusch–Pagan test: χ^2=290.13, p=0.000; Hausman test: χ^2=4.10, p=0.043

Figures in parentheses beneath the regression coefficients are standard errors. Except for model [33], [36], [39], [42], and [45], robust standard errors are estimated. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' estimation.

Table 12. Summary of publication selection bias test

Growth-determining variable type	Number of estimates (K)	Test results [a]			
		Funnel asymmetry test for type I PBS (FAT) (H_0: β_0 =0)	Test for type II PBS (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) [b]
Structural change	280	Accepted	Rejected	Rejected	Rejected (0.1046/0.1049)
Transformation policy	1702	Rejected	Rejected	Rejected	Rejected (0.0602/0.1631)
Socialist legacy	285	Accepted	Rejected	Accepted	Accepted
Inflation	696	Accepted	Accepted	Rejected	Rejected (-0.3683/-0.3487)
Regional conflict	316	Rejected	Rejected	Rejected	Rejected (-0.3290/-0.3084)

Notes:

[a] The null hypothesis is rejected when more than two of three models show a statistically significant estimate; otherwise, it is accepted.

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

Source: Authors' estimation.

Supplement. Synthesis of estimates limited to the estimation period of the 1990s by growth-determining variable type

Growth-determining variable type	Number of estimates (K)	(a) Synthesis of PCCs			(b) Combination of t values			
		Fixed-effect model (z value)[a]	Random-effects model (z value)[a]	Test of homogeneity[b]	Unweighted combination (p value)	Weighted combination (p value)	Median of t values	Failsafe N *(fsN)*
Structural change	68	-0.018 (-1.09)	0.012 (0.30)	384.977 ***	0.053 (0.48)	0.012 (0.50)	0.355	-68
Transformation policy	702	0.155 *** (42.51)	0.170 *** (13.60)	7571.396 ***	40.630 *** (0.00)	6.639 *** (0.00)	1.665	427545
Socialist legacy	161	-0.176 *** (-26.04)	-0.206 *** (-10.97)	1152.568 ***	-27.168 *** (0.00)	-5.067 *** (0.00)	-2.230	43755
Inflation	260	-0.474 *** (-97.45)	-0.413 *** (-23.14)	3323.719 ***	-86.224 *** (0.00)	-18.427 *** (0.00)	-4.665	714075
Regional conflict	181	-0.306 *** (-35.82)	-0.281 *** (-13.25)	986.010 ***	-31.182 *** (0.00)	-4.479 *** (0.00)	-2.560	64854

Notes:

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

[b] Null hypothesis: Effect sizes are homogeneous.

*** denotes statistical significance at the 1% level.

Source: Authors' estimation.