Inter-municipal cooperation and tax enforcement capabilities

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JEL Classification: H71, H77, H83
Keywords: Inter-municipal cooperation, Tax enforcement, Tax compliance

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Inter-municipal cooperation and
tax enforcement capabilities *

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1 Introduction

The tax gap, defined as the difference between the actual taxes collected by governments from companies and households and the legally mandated taxes, is directly related to government revenue, fiscal soundness, and the healthy functioning of societies (IRS 2006; IMF 2015; De Neve, Imbert, Spinnewijn, Tsankova, and Luts 2021).[1] Therefore, closing this gap by increasing tax collection is a key objective for governments in both developed and developing countries worldwide (HMRC 2018; De Neve et al. 2021; Basri, Felix, Hanna, and Olken 2021; Garriga and Tortarolo 2024).[2] To close this gap, governments can take two main approaches. One approach is to facilitate taxpayer compliance. (Slemrod 2019; Martinez-Vazquez, Sanz-Arcega, and Tránchez-Martín 2022).[3] The other approach is to enhance the tax enforcement capabilities of the administration (IRS 2006; Pomeranz and Vila-Belda 2019; Bethencourt and Perera-Tallo 2024). This latter approach indicates enforcement of tax collection through reforms on the administrative side, which is distinct from governmental intervention to facilitate taxpayer compliance.

One of the simplest ways to enhance tax enforcement capabilities is by increasing the number of tax officials, equipment, and other resources. While this straightforward approach can improve tax collection, it may require additional costs, which in turn limit research from the perspective of administrative tax enforcement. For example, deploying police officers on every street corner to completely prevent robberies and red light infractions is not optimal; similarly, providing an excessive number of tax collection officials to achieve complete tax enforcement is inefficient and impractical (Slemrod 2019).[4] Therefore, while improving tax enforcement capabilities may be effective in closing the tax gap, allocating more officials and resources is not always a rational and realistic governmental reform. Therefore, the efficacy of reforms aimed at improving tax enforcement capabilities remains unclear.

This paper focuses on Inter-municipal Cooperation (IMC) to shed light on the effectiveness of enhancing tax enforcement capabilities. IMC refers to collaborative tax collection among

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[1]The tax gap is a measure related to the revenue side and is not directly associated with administrative costs. However, efforts to close the tax gap often require additional expenditures.

[2]From the perspectives of increasing tax revenue and promoting fairness, closing tax gaps has been a subject of considerable discussion in developed countries, including the United States and the United Kingdom (HMRC 2018; IMF 2015; IRS 2006). The amount of unpaid tax exceeds 3 billion pounds in the UK and 30 billion dollars in the US per year (HMRC 2018; IMF 2015). In developing countries, concerns have been raised over weaknesses in tax enforcement, such as auditing, taxpayer services, and legal frameworks, which have made addressing tax gaps a critical issue for ensuring fiscal sustainability and strengthening state capacity (IMF 2015). In Japan, total unpaid taxes exceeded 2 trillion yen as of 2000. Therefore, improving the collection of unpaid taxes, thereby narrowing the tax gap, is essential for securing additional revenue and enhancing tax fairness. For further details on unpaid taxes in Japan, please see subsection 2.2.1.

[3]Many studies have examined tax compliance by focusing on interventions on the taxpayer side, such as digitalization, third-party reporting, and procedural changes. See Slemrod (2019); De Neve et al. (2021); Bellon, Dabla-Norris, Khalid, and Lima (2022); Okunogbe and Pouliquen (2022); Garriga and Tortarolo (2024) for the findings on tax compliance.

[4]Slemrod (2019) employed this analogy to argue that completely eradicating tax evasion is not optimal.

different municipalities, establishing new jurisdictions for collective operations. Its collaborative approach is expected to improve tax enforcement at both the inter-municipal organization and local tax official levels. First, collaborative collection efforts at the IMC organization can improve tax enforcement through an augmented deployment of tax collection officials on a per-case basis. In addition, such increasing collection activities allow for more division of labor into more specialized functions within the organization, leading to more effective tax enforcement. Second, IMC provides tax officials with opportunities for training in professional development and exposure to more sophisticated tax collection practices through interactions between officials from participating municipalities. This training and interaction within IMC can lead to more effective tax enforcement for each official.[5] Therefore, IMC has the potential to enhance tax enforcement at both the inter-municipal organization and local municipal official levels.[6]

To investigate the evidence, we exploit the setting of implementing IMC in Japan and data on tax enforcement. First, we exploit the timing variation of implementing IMC in Japan. This IMC refers to collaborative tax collection efforts among multiple municipalities without establishing an independent fiscal authority, such as creating new tax rights. Thus, we can examine the effects of IMC on tax enforcement without confounding the existence of other institutional tax changes that can influence tax enforcement.[7]

Second, we can use the unpaid tax collection rate to examine the effects of IMC on the tax gap. The unpaid tax collection rate is the percentage of unpaid taxes that have been successfully collected. That is, this rate denotes the gap in which local governments can collect actual unpaid taxes from companies and households relative to the total unpaid taxes that should be collected. In particular, IMC covers tax collection on unpaid taxes only. Therefore, IMC may increase unpaid tax collection rates by improving tax enforcement. In addition, the unpaid tax collection rate is comparable between municipalities that have introduced IMC and those that have not, as it is measured at the municipality units rather than at the IMC units.[8]

To examine the effects of IMC on unpaid tax collection rates, we use a difference-in-differences (DID) approach and an event study specification, exploiting the timing of IMC implementation across municipalities. For the unpaid tax collection rate, our analysis focuses on

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[5]Some literature points out the importance of the relationship between learning and experience and human capital interaction (Acemoglu and Angrist 2000; Henderson 2007; De la Roca and Puga 2017). In particular, there is evidence that the existence of highly productive or skilled workers leads to more productivity gains through worker interaction and training (Mas and Moretti 2009; De Grip and Sauermann 2012; Bentsen, Munch, and Schaur 2019)

[6]See Section 2.1 for more information on the relationship between IMC and tax enforcement.

[7]For example, IMC in France involves the transfer of competencies and tax powers, enabling the setting of tax rates.

[8]When administrative data are measured in IMC units in areas that have adopted IMC, they are not comparable to data from non-IMC areas, where measurements are taken at each municipality level. Similarly, in cases of municipal consolidation, comparing data between preconsolidation municipalities and postconsolidation entities becomes challenging because administrative data are collected at the level of the newly consolidated municipalities after consolidation.

two tax categories—inhabitant taxes and property taxes. We find that IMC increases unpaid tax collection rates for inhabitants and property taxes by approximately 17 percent and 28 percent, respectively. In the event study analysis, we confirm that there are no differences in the pre-trends of the outcomes before IMC implementation. However, the preimplementation financial condition of the municipalities may pose a potential confounding factor, given the anticipation of increased tax revenue through IMC participation. To consider this concern, we conduct a robustness check using financial data and reveal that the main results are robust. Furthermore, we perform a placebo test using a placebo outcome variable, which further supports the robustness of our findings.

We also show the heterogeneous effects of IMC on the basis of whether municipalities send their officials. There are two types of IMC participation: (1) municipalities that participate by sending their officials, and (2) those that participate without sending officials. In the first case, tax officials involved in the IMC return to their own municipalities in the future. In contrast, in the second case, no such return occurs, as municipal officials are not directly involved in the IMC activities. To focus on those differences, we show the heterogeneous effects of IMC, using the variation in whether participating municipalities send their officials. Our findings indicate that municipalities sending tax officials to IMC achieve higher unpaid tax collection rates for resident taxes compared to those that do not send officials. These results suggest that training and interaction within the IMC enhance tax collection efficiency at the local municipal level.

While the main purpose of this study is to show the effects of enhanced tax enforcement by IMC, it is also true that additional tax collections may be costly. Therefore, we also focus on tax administrative costs, which are the comprehensive costs associated with tax collection. We show that tax collection through IMC does not lead to increased tax administrative costs. These results suggest that IMC could be a rational governmental reform compared to a simple reform such as an increase in tax collection resources.

This study is related to the work of Jia, Ding, and Liu (2020) in its focus on the relationship between government reform and local tax revenue. However, our research diverges from several perspectives. While the above studies focused on the amount of tax revenue, we focused on the tax gap as a local tax outcome. Furthermore, the greatest distinction between our study and the work of Jia et al. (2020) is that they are interested in the effects of fiscal decentralization, whereas we focus on enhancing tax enforcement through municipal cooperation.

More generally, this paper contributes to the broad literature on policy responses to non-compliance. A growing body of research focuses on initiatives designed to encourage tax compliance, including the introduction of third-party reporting, tax audits, and digital technologies (Slemrod 2019; Alm 2019; Bellon et al. 2022; Okunogbe and Pouliquen 2022). De Neve et al. (2021) investigate the simplification of communications, focusing on the probability of

payment to letters sent.[9] While most of these studies examined services and policy interventions that facilitate behavioral change on the taxpayer side, our study focuses on enhancing tax enforcement capabilities on the administrative side.

This paper also contributes to the extensive body of research on IMC. Existing empirical studies have examined the impact of IMC on local government costs (Bel and Warner 2015; Allers and de Greef 2018; Ferraresi, Migali, and Rizzo 2018). Almost all studies on IMC have focused on the cost aspect of local governments, targeting capital-intensive services such as sewage and waste disposal (Bel, Fageda, and Mur 2012). Meanwhile, only a limited number of studies have explored aspects other than local government costs. For instance, Tricaud (2024) demonstrated that in France, IMC leads to more construction and fewer public services, whereas Banaszewska, Bischoff, Bode, and Chodakowska (2022) finds that IMC in Poland reduces local unemployment rates. This paper complements this stream of literature by investigating the impact of IMC on revenue.

Additionally, Breuillé, Duran-Vigneron, and Samson (2018) examined the effects of establishments of IMC (EIMC) in France on local tax rates. This paper substantially differs from their work on tax rates in focusing on local tax enforcement. Furthermore, the framework of IMC in Japan, which has no independent fiscal authority, differs in its purpose and nature from that of EIMC, as EIMC involves transferred competencies and tax powers from participating municipalities. Therefore, Japan's IMC setting allows us to estimate the effect of improving the tax enforcement capacity of the administrative side without confounding the influence of complex institutional tax changes that can affect tax enforcement.

The remainder of the paper is organized as follows. In Section 2, we present an overview of IMC and local taxation. Section 3 describes the data used in the analysis. Section 4 outlines the empirical strategy, while Section 5 presents the heterogeneity results. Section 6 concludes the paper.

2 Institutional Background

2.1 Local Taxation

In Japan, both central and local governments collect taxes. While local government revenue is approximately half that of the central government, the total exceeds 40 trillion yen (approximately 300 billion U.S. dollars). The tax base of the central government consists primarily of income taxes, corporate income taxes, and consumption taxes. Local governments also have corporate income taxes and consumption taxes. In local governments, the tax base differs between prefectures and municipalities. In particular, at the municipal level, inhabitant and property

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[9]These authors use the number of tax collections as a measure of the tax gap, whereas our study uses the amount of revenue from tax collections.

taxes constitute the majority of total revenue. Inhabitant taxes are levied on all residents within a municipality and consist of two components: a "per income levy", which is proportional to an individual's income amount, and a "per capita levy", which is a fixed amount regardless of income amount. Property taxes are assessed on land, buildings, and depreciable assets such as factory machinery and equipment. Inhabitant taxes accounted for 37 percent and property taxes accounted for 41 percent of total municipal tax revenues in 2021. [10] IMC handles these two tax items and does not cover the remaining taxes, including corporate taxes.

Figure A.1 shows the inhabitant and property tax revenue per taxpayer, indicating that property tax revenue per taxpayer is more than double the inhabitant taxes per taxpayer. The collection of inhabitant taxes is distributed among municipalities and prefectures, leading to comparatively modest amounts per case. [11] Therefore, since IMC prioritizes high-value tax cases, IMC is more likely to focus on property taxes, the most expensive tax category per taxpayer among municipal tax revenues, than on inhabitant taxes. [12]

Tax collection can be divided into present and unpaid tax collection. The present tax collection refers to taxes newly collected during the fiscal year, whereas unpaid tax collection is the sum of past taxes that have not been collected. Figure 1 presents the unpaid tax amount from 2000 to 2018, where the blue and red lines represent the unpaid inhabitant and property taxes, respectively. The green line denotes unpaid ordinary taxes, which indicate the comprehensive tax category including inhabitant, property, and corporate taxes. [13] In all tax categories, unpaid taxes are approximately 400 billion yen or higher (approximately 26 billion U.S. dollars). Furthermore, the sum of unpaid inhabitant taxes and unpaid property taxes accounts for more than 70 percent of unpaid ordinary taxes.

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[10] The third largest share, corporate income taxes, accounted for approximately 9 percent.

[11] The inhabitant taxes in municipalities are generally set at 6 percent of an individual's income.

[12] For more information about IMC, see Section 2.2.1.

[13] Ordinary taxes account for over 90 percent of total municipal tax revenue in Japan.

Figure 1: Reform of unpaid tax collection

Note: Trends in the total amount of unpaid tax collection in Japan from 2000 to 2018. The green line shows the unpaid tax collection amount for ordinary taxes, the red line shows the unpaid tax collection amount for the inhabitant tax, and the blue line shows the unpaid tax collection amount for the property tax. The monetary unit is a billion yen.

2.2 Inter-municipal cooperation

2.2.1 Inter-municipal cooperation in Japan

IMC is formed beyond municipal boundaries to enhance the efficiency of public service delivery by leveraging scale merits. Unlike municipal mergers, IMC involves the collaborative provision of selected public services or the shared administration of specific functions such as tax collection, and it has been adopted in various countries (Bel and Warner 2015).

Japan's local government structure consists of two levels—47 prefectures and 1,718 municipalities. While IMC is not embedded within these two layers of government, IMC establishes an additional level of jurisdiction for specific tasks and has the responsibility of performing the work instead of each municipality itself. Additionally, in Japan, such collaborations are employed across various services, including joint waste management, firefighting, and healthcare to enhance public service provision quality.

Among the various forms of IMC that target specific public services, IMC for the collection

of unpaid taxes also exists as a means to improve the efficiency of tax administration. This form of IMC specializes in the collection of unpaid taxes and is intended to collect more unpaid taxes. In paticular, participating municipalities aim to improve the tax collection of officials through the accumulation of know-how and to increase the deployment of tax collection officials on a per-case basis (Isozaki 2006; Kashiwagi 2009; Tezuka 2012).[14] By 2022, 43 IMCs focused on collaborative tax collection had been established, involving over 750 municipalities.[15] These IMCs primarily target unpaid inhabitant and property taxes and do not involve independent fiscal authority, such as the creation of taxation rights. Instead, they are responsible for conducting specific collection-related tasks on behalf of member municipalities. The operation of unpaid tax collection includes several complicated tasks, such as notification, property investigation, seizure, public auction, and deficiency disposition. Notification is a notice of demand to the taxpayer who has failed to pay the tax. Owing to the high number of delinquent taxpayers relative to the number of local officials, the volume of notifications is correspondingly large (Tezuka 2012). [16] When there is no response to such a notification, property investigations, seizures, and public auctions are executed. In particular, the task of property investigation includes inquiries to the national tax office, legal affairs bureau, other public offices, and relevant financial institutions to ascertain the actual status of income and real estate ownership and to obtain a list of bank accounts and the number of deposits. Additionally, carrying out seizures and public auctions is essential to knowledge of tax law and negotiation skills. These tasks of information investigation, seizures, and public auctions are considered highly specialized techniques (Tezuka 2012.)

IMC may play a larger role in property tax collection in terms of information investigation. As noted in Section 2.1, although the inhabitant tax shares a common tax base with the national taxes, the property taxes are a revenue source unique to municipalities. From this perspective, although information on inhabitant taxes is relatively accessible through national government channels, information on property taxes must be independently collected by local governments, which may make it more challenging to obtain. Thus, IMC activities could contribute more effectively to property tax collection.

IMC is implemented voluntarily among neighboring municipalities. Until 2000, the number of IMCs on tax collection remained limited to only three. However, from the late 2000s onward, their number increased substantially. Figure A.2 illustrates the trend in the number of municipalities implementing IMC. This upward trend has been attributed to Japan's severe fiscal conditions during the 2000s, as well as to the expansion of local government tax bases

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[14]For details on the expected effects of IMC, please refer to Subsection 2.2.2.

[15]This type of IMC can be organized in the form of a "multitask extended association," "single-task extended association," or "voluntary organization." Multitask and single-task extended associations are types of IMC that constitute legal entities. In contrast, voluntary organizations have no legal authority. However, any type of organization is still a form of municipal cooperation on tax collection.

[16]Although precise data on the number of delinquents and notifications are unavailable owing to data limitations, estimates from 2006 indicate that at least approximately 5 million of the 25 million households were behind on their national health insurance premium payments to municipalities.

([Ministry of Internal Affairs and Communications 2009](#)). Particularly, in 2007, a portion of the national income tax was transferred to the local resident tax, expanding the local tax base. This shift likely increased the administrative burden associated with tax collection and required more efficient tax administration for municipalities. As a result, many municipalities may proceed to introduce IMC to improve the efficiency of tax collection. However, this institutional change did not alter the tax burden on residents and had no direct effect on taxpayer compliance.

Furthermore, in some cases, IMCs are established at the initiative of the prefectural government ([Kashiwagi 2009](#)). As illustrated in Figure [A.3](#), there is a notable concentration of municipalities participating in IMCs within specific prefectures. Additionally, IMCs are primarily implemented among neighboring municipalities, resulting in regional clustering. These factors related to promotion and coordination may be one of explainion the variation in IMC adoption across municipalities. Furthermore, previous research has also suggested that the factors influencing a municipality's decision to introduce this cooperative approach may include municipality size, geographical, sociodemographic, fiscal revenue, and spatial characteristics ([Brasington 2003](#); [Carr, Gerber, and Lupher 2007](#); [Feiock 2007](#); [LeRoux and Carr 2007](#); [Di Porto, Merlin, and Paty 2013](#); [Di Porto, Parenti, Paty, and Abidi 2016](#); [Ferraresi et al. 2018](#)). For a discussion of these factors in the analysis, please see Subsection 3.2.

Almost all IMCs are composed of municipal officials from the participating municipalities, which means that the participating municipalities send their municipal officials to IMC. However, some IMCs, including those involving 46 municipalities in three prefectures, operate as exceptions and are formed without the dispatch of municipal officials. These IMCs are composed of prefectural officials and external personnel who do not belong to municipalities. That is, municipalities that fall under this exceptional IMC could participate in IMC without sending their municipal officials.

IMCs also prioritize high-value tax cases. Over 70 percent of IMCs set the conditions for collaborative tax collection based on large amounts of unpaid taxes and difficult-to-process cases. Therefore, while IMC targets both inhabitant and property taxes, they may focus more on property taxes, which represent the higher value per taxpayer relative to inhabitant taxes.

Furthermore, IMC does not necessarily collect all unpaid taxes. That is, IMC does not jointly collect all unpaid taxes among participating municipalities, and individual municipalities also continue to collect unpaid taxes themselves including inhabitant and property taxes.

The cost burden within IMC is determined by the population share, the amount of unpaid taxes, and the percentage of tax revenues within IMC. For example, the Kyoto Regional Tax Organization has a uniform 5 percent share of the total operating burden for IMC, and the remaining share is determined by the population percentage, the tax revenue percentage, and the amount of unpaid tax for each municipality.

2.2.2 Potential channels of Inter-municipal cooperation on tax collection

IMC is expected to enhance tax enforcement through two potential channels, as shown in Figure 2. First, tax enforcement can be improved through the collaborative efforts of IMC organizations. For example, collaborative tax collection in IMC organizations can increase the deployment of tax collection officials on a per-case basis through cooperation between municipalities. In particular, the recent trend in Japan of a declining number of officials in the local governments has led to a shortage of human capital for tax collection services (Murakami 2012). Consolidating local tax officials through IMC can substantially increase the number of available tax officials, thereby compensating for these gaps. Furthermore, these increases by the organization may allow for more division of labor into more specialized functions (Blom-Hansen, Houlberg, and Serritzlew 2014). Establishing specialized departments, on the basis of the unpaid tax collection process, can result in more efficient collection operations (Tezuka 2012). However, such a division of labor requires a larger workforce and scale. Therefore, the scale increase by IMC enables more division of labor into more specialized labor and may lead to enhanced tax enforcement.

Additionally, the tax administration could conduct tax collection at lower costs by leveraging economies of scale through IMC. Therefore, within a limited budget, IMC may increase resources for tax collection, including human resources, and may compensate for the lack of services for tax collection.

As discussed in Section 2.2.1, the collection of unpaid taxes involves numerous and complex tasks. In particular, property investigations require a wide range of activities, including conducting inquiries, reconstructing deposit records, and negotiating with delinquent taxpayers to assess their financial situations. Given these demands, increasing the number of available tax officials and promoting a more efficient division of labor through IMC may enhance the effectiveness of municipalities in collecting unpaid taxes.

Second, training and interaction within IMC may improve the tax enforcement of each tax official. IMC not only takes over the work of the municipality but also provides local tax officials with opportunities for training and exposure to more sophisticated tax collection practices. For example, the Mie Outstanding Tax Recovery Authority, an IMC, provides training and conferences to improve the tax enforcement skills of local tax officials participating in IMC. Furthermore, IMC establishes teams of knowledgeable and novice tax officials to provide the latter an opportunity to be exposed to more sophisticated tax collection practices (Murakami 2012). Such training and worker interactions can lead to increased productivity (De Grip and Sauermann 2012). In particular, it is difficult to accumulate expertise on the unpaid tax collection process at the municipal level where officials are transferred every few years and do not specialize in tax collection compared with the national level in Japan (Hayashi 2009). Therefore, local tax officials may become more effective in tax collection through training and interaction within IMC, thus enhancing tax enforcement.

As stated in Section 2.2.1, the collection of unpaid taxes, such as the implementation of seizures and auctions, requires knowledge of tax law and appropriate negotiation skills, but there is a shortage of such expertise. Enhancing the collection skills of local tax officials within IMC may lead to improving the collection of unpaid taxes.

This training and interaction within IMC enhance tax collection at the municipal level, which in turn may improve tax enforcement. IMC does not handle all of the local tax collection, and individual municipalities also continue to collect unpaid taxes. Therefore, local tax officials who have acquired collection skills within IMC carry out tax collections and apply these skills in their own municipalities. This spread of knowledge and expertise from the IMC could improve tax enforcement within individual municipalities. In the case of the Mie Outstanding Tax Recovery Authority, the officials who had experience in tax collection work at the IMC returned to their municipality and played a central role in tax collection administration, which led to an improvement in the tax collection capabilities (Murakami 2012).[17]

Additionally, since IMCs tend to prioritize high-value property tax cases over inhabitant taxes, improving tax collection at the municipal level through redknowledge spread from the IMC level may bring greater benefits to resident taxes, where municipalities have more room to intervene. We discuss those potential effects in Section 6, focusing on the IMC composition.

Figure 2: Relationship between IMC and local tax enforcement
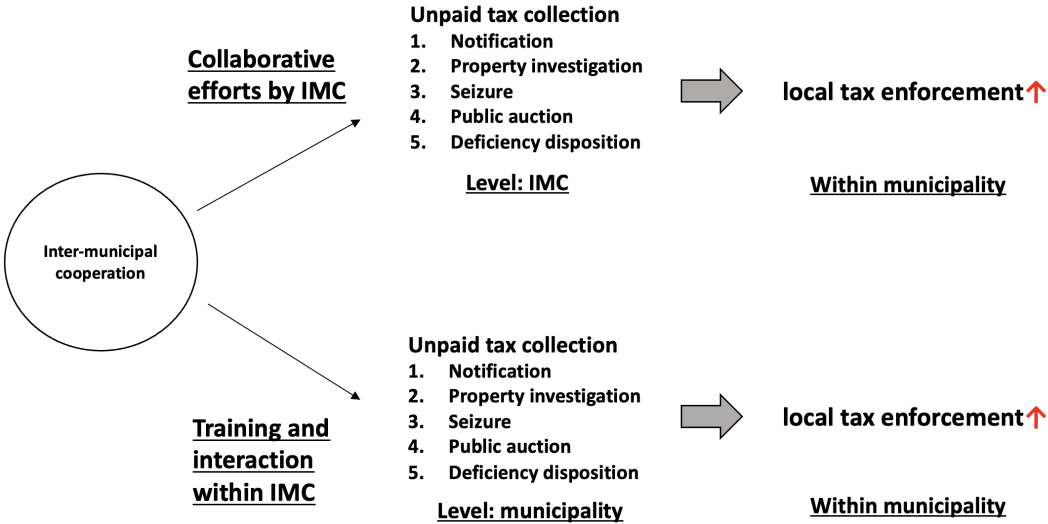
Note: This figure shows the workflow of IMC intervention.

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[17]In addition, municipalities participating in this IMC typically dispatched their officials for two years, after which the officials returned to their respective municipalities.

3 Data

Our analysis uses an exhaustive administrative panel of Japanese municipalities and covers the fiscal period from 2000 to 2018. In Japan, a devastating earthquake called the Great East Japan Earthquake occurred in 2011, causing extensive damage to the administration and residents in the affected areas, particularly in the Iwate, Miyagi, and Fukushima Prefectures. Therefore, we exclude these three prefectures from our panel.[18] In addition, excluding the 23 wards of Tokyo and amalgamated municipalities, we create a balanced panel dataset.[19] All data except for treatment variables on the timing of IMC introduction are available from the Survey on Local Public Finance Situations[20], the Survey on the Basic Register of Residents[21], the Final Accounts of Municipal Governments[22], and the Survey on Local Government Capacity Management Relations.[23] Table A.1 shows summary statistics of the main variables.

3.1 Outcome Variables

We use the unpaid tax collection rate as a measure of the tax gap. This measure indicates the degree to which the local government could have collected unpaid tax. The unpaid tax collection rate in municipality i in year y is as follows:

$$Unpaid\ tax\ collection\ rate_y = \frac{Unpaid\ tax\ collection_y}{Total\ unpaid\ tax_y}$$

where *Unpaid tax collection$_y$* is the unpaid tax collected by municipality i in year y. *Total unpaid tax$_y$* is the total unpaid tax remaining until year y. In other words, the denominator captures the total tax with that has not been collected, whereas the numerator reflects the actual amount collected within the denominator.[24] Therefore, enhanced tax enforcement on unpaid taxpayers leads to a narrower gap between these two figures (i.e., an increase in the unpaid tax collection rate).

The unpaid tax collection rate is also captured in a municipal unit, even in municipalities

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[18]For example, residents in the areas affected by the earthquake took special measures, such as extended deadlines and exemptions from local tax payments, during the crisis.

[19]The 23 wards of Tokyo have a fiscal base in which revenues exceed expenditures and property taxes are collected at the prefectural level, which is very different from the financial status of other municipalities.

[20]We use this survey to collect outcome variables related to tax collection and costs. In Japanese, Chiho Zaisei Jyokyo Chousa.

[21]We use this survey to collect variables related to the population. In Japanese, Jyumin Kihon Daichou Chosa.

[22]We use this survey to collect variables related to the industry share. In Japanese, Chiho Kokyo Dantai Tein Kanri Kankei.

[23]We use this survey to collect variables related to the number of tax officials. In Japanese, Shi Chou Son Kessan Jyokyo Shirabe.

[24]We also examine the effects of IMC on the tax gap using the unpaid tax collection rate where the denominator is the fixed total amount of unpaid taxes as of 2000 which is the first sample period. Even when the denominator is fixed at such a base year, the findings remain consistent with the main results. For further details, please refer to Section 4.3.2.

that have introduced IMC, and is the comparable measure between municipalities that have introduced IMC and those that have not.

3.2   Treatment Variables

Our analysis uses treatment variables that exploit the timing of implementation of IMC across municipalities. To establish these treatment variables, we obtain data from the Ministry of Internal Affairs and Communications in Japan.

A potential concern about the timings of IMC introduction is the possibility of the municipality's decision to participate in IMC being confounded by other specific features. As discussed in Section 2.2.1, several general factors in the decision may exist, such as, geographical, sociodemographic, and fiscal characteristics, along with circumstances specific to Japan. Furthermore, Figure A.3 shows the distribution of municipalities participating in IMC, and its distribution is concentrated in certain regions because IMC is implemented within neighboring municipalities, Nevertheless, prior to IMC implementation, there were no disparities in unpaid tax collection rates. In Figure 3, the red and blue lines compare the average rates of unpaid tax collection between the not-yet-treated group and the never-treated group for inhabitant taxes (left panel) and property taxes (right panel), respectively. The not-yet-treated group includes municipalities that eventually adopt IMC but have not done so at the time of observation, whereas the never-treated group comprises municipalities that never adopt IMC and serves as the control group. A comparison between the two groups reveals minimal variation in unpaid tax collection rates over time. In other words, in the absence of treatment, there appears to be no difference in unpaid tax collection between the treatment and control groups. This suggests that there is almost no bias due to the confounding factor of municipal characteristics. Therefore, the observed increase in unpaid tax collection rates following IMC implementation is likely to be driven by the treatment effects of IMC.

In addition, we conduct DID analysis incorporating municipal fixed effects and prefecture-by-time fixed effects, which ensures appropriate comparisons between the treatment and control groups within the prefecture. In the event study specification, the findings suggest that the treatment effects are not driven by the pretreatment periods. In further verification, we show that the results are robust for sample periods that account for the timing of the increase in the introduction of IMC in Japan, as well as for datasets that account for geographical and fiscal factors.

Figure 3: Comparison of not-yet-treated and never-treated groups
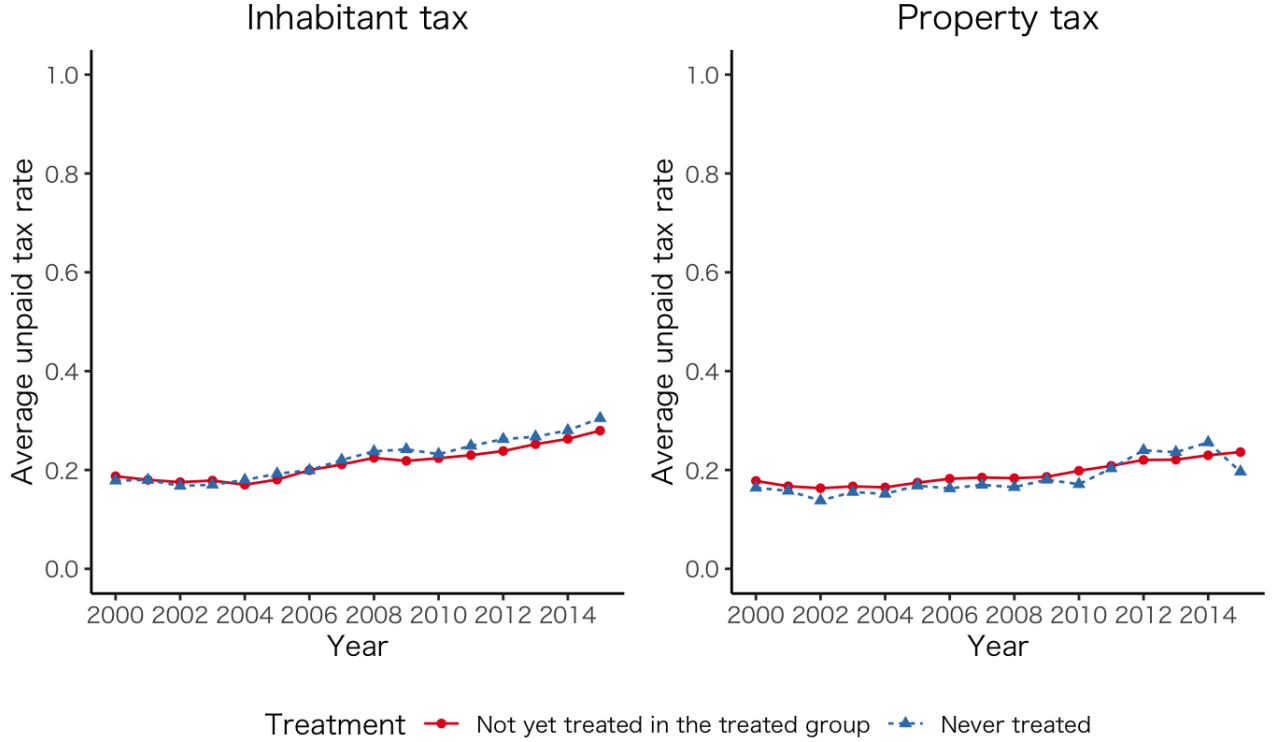
Note: Trends in the average unpaid tax collection rate from 2000 to 2015. The red line shows the average unpaid tax collection rate in the not-yet-treated group within the treatment group (i.e., the treatment group before IMC implementation), and the blue line shows the average unpaid tax collection rate in the control group, which is never treated.

4 Empirical Strategy and Results

4.1 DID Specification

Collaborative tax collection enhances tax enforcement capabilities at both the inter-municipal and local municipal levels, which in turn is expected to improve the tax gap. To examine this, we present a strategy for estimating the effect of IMC on the tax collection rate. By exploiting different timings of IMC introduction, we estimate the following:

$$ln(Y_{i,p,t}) = \beta IMC_{i,p,t} + \mu_i + \rho_{p,t} + \varepsilon_{i,p,t} \qquad (1)$$

where $Y_{i,p,t}$ is the unpaid collection rate for each tax type, indicating tax enforcement in municipality i of prefecture p in year t. This unpaid tax collection rate is converted into its

logarithmic form. $IMC_{i,p,t}$ is a binary dummy variable that equals 1 if IMC is adopted in municipality i within prefecture p during year t and 0 otherwise. The parameter of interest is β. If the introduction of IMC improves the tax gap, then the sign of β should be positive. μ_i and ρ_{py} are municipality- and prefecture-by-time fixed effects, respectively, and ε_{ipy} is the error term. By including these fixed effects, we control for the characteristics specific to the municipalities but that remain constant over time, as well as macro shocks at the national level, and address the issue of omitted variable bias. In addition, by including prefecture-by-time fixed effects, the comparison between the treatment and control groups becomes a comparison within a prefecture over time. Therefore, regional differences in the introduction of IMCs across prefectures, as shown in Figure A.3, can be controlled.

In the main specification, we do not include any covariates, as the DID estimator with fixed effects and time-varying covariates requires an additional identification assumption of DID on the covariates (Sant'Anna and Zhao 2020). Therefore, in Section 4.3.2 on the robustness check, we present the estimation results with additional covariates.

4.2 Event Study Specification

We demonstrate the dynamic effects of IMC on tax enforcement using event study analysis, which offers two advantages. First, such analysis enables us to indirectly test the parallel trend assumption, which is the identifying assumption for the DID specification. The parallel trend assumption requires that the outcome variables of the treatment and control groups follow similar trends in the absence of treatment. By examining the trends in outcome variables between the treatment and control groups during the pretreatment period through event study analysis, we can check the validity of the parallel trend assumption. In addition, this analysis allows us to examine the effect of IMC appearance and how the effect of IMC persists following IMC implementation.

In the analysis, we use normalized time t', which represents the difference between the calendar year t and the year when the municipality i first participated in IMC.

$$ln(Y_{i,p,t}) = \sum_{-8,\tau \neq -1}^{8} \beta_\tau IMC_{i,p,t'}^\tau \ + \ \mu_i \ + \ \rho_{p,t} \ + \ \varepsilon_{i,p,t} \qquad (2)$$

$IMC_{ipt'}^\tau$ denotes the lead and lag indicators that take a value of 1 if t' is equal to τ, greater than or equal to 8, or less than or equal to -8.[25] β_τ represents the dynamic treatment effects for the 8 periods before and the 9 periods after the introduction of the IMC. To satisfy the parallel trend assumption, the treatment effect should not be observed in the periods before the treatment.

[25] τ = -1 is excluded from the equation as the reference period.

4.3 Main Results

4.3.1 DID and Event Study Results

Table 1: DID estimate: Impact of IMC on the unpaid tax collection rate

	(1)	(2)
	Inhabitant tax	Property tax
TaxIMC	0.168***	0.279***
	[0.048]	[0.076]
Observations	22135	22264
R-squared	0.567	0.550
Municipality FE	Yes	Yes
Pref*Year Yes	Yes	Yes

Note: The table shows the results in Equation (1). Columns (1) and (2) represent the effects of IMC on the unpaid collection rate on inhabitant tax and property tax. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at the levels of 1%, 5%, and 10%, respectively.

Columns (1) and (2) of Table 1 show the effects of IMC on the unpaid tax collection rate for inhabitant and property taxes. We estimate approximately 17 percent and 28 percent increases in the probability of the unpaid tax collection rate for inhabitant and property taxes, respectively, by IMC implementation. In all the estimation results, we observe positive effects of IMC that are significant at the 1 percent level. Column (3) of Table 1 illustrates the effects of IMC on the unpaid tax collection rate of corporation taxes. Corporate taxes are not subject to collection under IMC. In fact, the coefficient in Column (3) is close to zero, indicating no observable effects of IMC on the unpaid tax collection rate for corporate taxes. This result is consistent with the fact that IMC covers resident and property taxes but does not cover corporation taxes.[26]

Figure 4 presents the event study results of Equation (2) with the 95 percent confidence intervals, in which the top and bottom panels indicate the results for inhabitant and property taxes, respectively. In all the panels of Figure 4, the coefficients are positive and significant after the introduction of IMC, which is consistent with the DID results. Moreover, prior to the introduction of IMC, the estimated coefficients are close to zero and almost nonsignificant. These results suggest the absence of pretreatment differences in IMC in terms of trends between the treated and control groups.

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[26]As mentioned in Section 2.2.1, the number of IMCs increased from the late 2000s, and one reason for this upward trend can be attributed to the expansion of local government tax bases in 2007. Although this expansion did not affect taxpayer behavior due to an unchanged tax burden, it may have placed additional pressure on tax administration. We analyze Equation (1) using two datasets, dividing the sample periods into before and after 2007. Panel A and Panel B in Table A.2 present the results of Equation (1) before and after 2007, respectively, which are consistent with the findings in Table 1. Thus, we do not observe heterogeneous effects of IMC based on the 2007 benchmark and these results suggest that the expansion of tax bases had no impact on the main results.

These findings indicate that improved tax collection by IMC results in more effective tax enforcement. Additionally, IMC enhances unpaid tax collection measures on property taxes more substantially than those on inhabitant taxes. This may be attributed to property taxes being more likely to be subject to collaborative collection at the inter-municipal, owing to their higher unpaid tax amount per taxpayer.

Figure 4: Event study plots: The unpaid tax collection rate
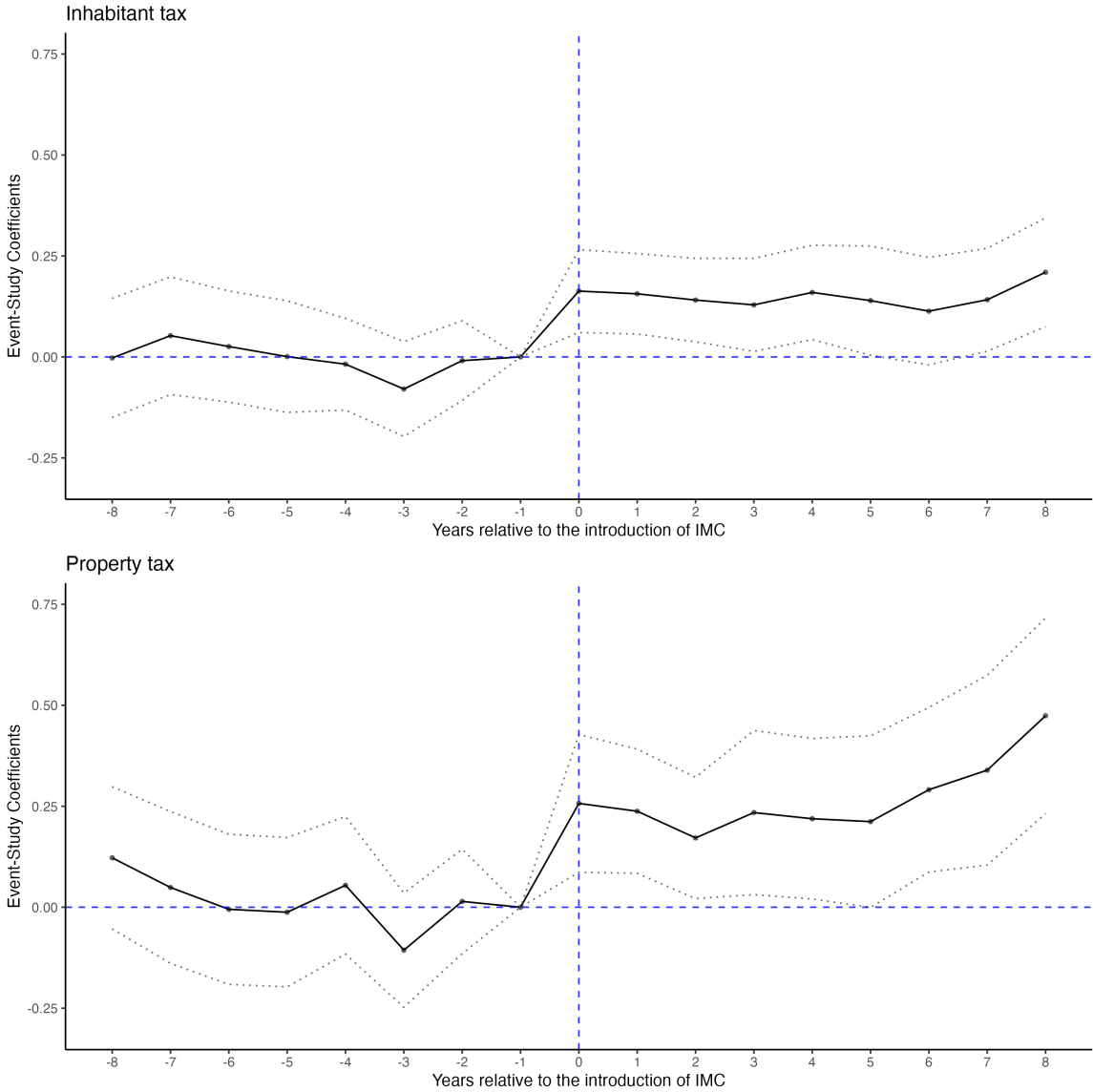
Note: This figure shows the estimation results of the event study analysis and 95% confidence intervals (dotted lines). The horizontal axis indicates years relative to the introduction of IMC. The model controls for municipality fixed effects and prefecture-by-year fixed effects. Standard errors are clustered at the municipality level.

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4.3.2 Robustness

Control variables When the timing of the introduction of IMC is confounded by the geographic and financial features of the municipality, the estimation results may be biased. For example, if IMC adoption is biased toward municipalities with certain geographic factors, then this bias can lead to the timing of IMC implementation, which would affect the outcome variables. In particular, the financial factor of the municipality may be a confounder in terms of tax collection via IMC. Therefore, we use i) the population size, the share of the population younger than 15 years old, the share of the population older than 65 years old, the share of secondary industrial workers among total workers, and the share of tertiary industrial workers among total workers as covariates of basic geographic characteristics and ii) the financial capability indicator, local government debts, taxable income, the amount of corporate tax, the number of municipal officials and the number of workers as covariates of local public finance and administration. Columns (1) and (4) of Table A.3 present the results of the specification in Equation (1), controlling for basic geographic characteristic covariates. Columns (2) and (5) of Table A.3 show the results of the specification in Equation (1), controlling for both basic geographic characteristics and local public finance covariates. The estimated coefficients are almost consistent with the results of the baseline analysis without covariates in Table 1. Furthermore, Figure A.4 is the result of the specification in Equation (2), controlling for covariates, and similarly shows results consistent with those in Figure 4, thus suggesting that the timing of the introduction of IMC is not confounded by any covariates.[27]

Furthermore, data on the number of tax officials since 2004 are available. Therefore, Columns (3) and (6) of Table A.3 show the results controlling for the number of tax officials in a limited sample period, and the results remain consistent.

Furthermore, we estimate the propensity score using those covariates of 2000 before the IMC introduction and logit models, and construct a dataset that corresponds one-to-one to the treatment unit based on the propensity score. Table A.4 shows the results of Equation (1) using this matched sample, which are also consistent with the baseline results.

Expense item The financial status of municipalities can also be a potential confounding factor in IMC implementation. For example, a municipality facing increasing expenditures may adopt IMC to enhance its tax revenue generation. To rule out this possibility of confounders, we examine the impact of IMC on total expenditures by character. The total expenditures by character are local government expenditures categorized into personnel, supplies and services, maintenance, and social assistance costs. Figure A.6 shows the impact of IMC on expenditures by characteristic using Equation (2). All point estimates are close to zero, and the results do not indicate any specific trend prior to the adoption of IMC. These findings reinforce the conclusion that the implementation of IMC is not driven by pre-existing fiscal conditions. Following the

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[27]In addition, Figure A.5 presents a test of covariate balances.

treatment, a slight increase is observed in certain expenditure categories. This growth may be attributed to increased revenue resulting from improvements in the collection rate of unpaid taxes. However, revenue from unpaid taxes constitutes less than 1 percent of total tax revenue, suggesting that improvements in the collection rate are unlikely to have a substantial impact on specific expenditure categories.[28]

Other collection measure An increase in the amount of unpaid tax collected through IMC may reduce the total unpaid taxes of the next year, suggesting that improvements in unpaid tax collection rates in one year could mechanically influence the unpaid tax rates in subsequent years, regardless of the introduction of IMC. Therefore, we examine the effects of IMC on unpaid tax collection in each year, relative to a fixed total amount of unpaid taxes as of 2000. Table A.5 shows the impact of IMC on unpaid tax collection in a given year, standardized by the 2000 unpaid tax amount using Equation (1). The results demonstrate that IMC substantially increases the unpaid tax collection rate, standardized by 2000. These findings are consistent with the baseline results and suggest that the baseline results reflect changes in the numerator of the unpaid tax collection rate driven by IMC.

Other DID estimators While two-way fixed effects DID with staggered treatment adoption, such as in Equations (1) and (2), has been widely accepted across numerous studies, recent studies have highlighted the need for strict assumptions, which include homogeneous treatment effects (de Chaisemartin and D'Haultfoeuille 2020; Callaway and Sant'Anna 2021; Goodman-Bacon 2021; Sun and Abraham 2021; Borusyak, Jaravel, and Spiess 2024). For staggered DID settings, Sun and Abraham (2021) proposes a methodology that combines relative period indicators with cohort indicators and estimates the full set of cohort-time-specific treatment effects. Following their technique, we examine the robustness of the event study results. Figure A.7 shows the event study results obtained using the Sun and Abraham (2021) estimator, which is consistent with the results in Figure 4, suggesting the robustness of the main analysis.

5 Placebo Outcome

As a placebo test, we estimate Equation (1) using an alternative measure of tax collection that is not directly related to IMC's operations. Specifically, we examine the current tax collection rate. The current tax collection rate is the percentage of taxes that have been successfully collected within the tax amount that should be newly collected in a given year. Since IMC activities are limited to the collection of unpaid taxes, they are not expected to affect the present tax collection rate.

Columns (1) and (2) of Table 2 show the effects of IMC on the present tax collection rates for

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[28]In 2000, the total revenue of all Japanese municipalities was approximately 60 trillion yen, while the revenue from unpaid taxes was approximately 200 billion yen.

inhabitant and property taxes, respectively. The results show no significant impact on property tax collection, and only a slight decrease in the case of inhabitant taxes. However, the estimated coefficient is close to zero, which is small relative to the main results. Additionally, Figure A.8 presents the results from the robust estimator discussed in Section 4.3.2, which also shows no decreasing trend.

Table 2: DID estimate: Impact of IMC on the present tax collection rate

	(1)	(2)
	Inhabitant tax	Property tax
TaxIMC	-0.002***	0.001
	[0.001]	[0.002]
Observations	22135	22264
R-squared	0.562	0.724
Municipality FE	Yes	Yes
Pref*Year Yes	Yes	Yes

Note: The table shows the results in Equation (1). Columns (1) and (2) represent the effects of IMC on the present collection rate on inhabitant tax and property tax. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at the levels of 1%, 5%, and 10%, respectively.

Furthermore, we estimate Equation (1) using the unpaid tax collection rate for corporate taxes. Corporate taxes account for a substantial portion of unpaid taxes, following inhabitant and property taxes. However, since IMC's operations are limited to inhabitant and property taxes, no effect on corporate tax collection is expected. Table 3 presents the estimated effect of IMC on the unpaid tax collection rate for corporate taxes. The coefficient is close to zero, indicating no observable impact.[29]

Table 3: DID estimate: Impact of IMC on the unpaid tax collection rate

	(1)
	Corporation tax
TaxIMC	0.021
	[0.092]
Observations	17038
R-squared	0.439
Municipality FE	Yes
Pref*Year	Yes

Note: The table shows the results in Equation (1), which represent the effects of IMC on the unpaid collection rate on corporation tax. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at the levels of 1%, 5%, and 10%, respectively.

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[29]Figure A.9 displays the results using the estimation method proposed by Sun and Abraham (2021).

6   Heterogeneity

In this section, we examine the heterogeneous effects of IMC on tax enforcement by focusing on whether municipalities send their officials to the IMC. Our aim is to provide evidence that informs how municipalities can engage with IMC. We categorize IMC participation into two types: (1) municipalities that send their officials, and (2) those that do not.[30]

In the first type of participation, where municipalities send their officials, a potential factor contributing to positive heterogeneous effects could be the benefits from the spread of knowledge. For instance, tax officials involved in IMC return to their own municipalities with knowledge benefits from the learning and interaction within the IMC, potentially improving their municipalities' tax administration.

Conversely, the second type of participation involves IMC officials who are primarily external personnel not belonging to the municipalities. Consequently, these municipalities may not anticipate benefits from the spread of knowledge, as their municipal officials are not directly involved in the IMC activities. We estimate the heterogeneous effects of IMC on tax enforcement based on its participation types as follows:

$$ln(Y_{i,p,t+2}) = \beta_1 IMC_{i,p,t,c} + \beta_2 IMC_{i,p,t} \times Officials_i + \mu_i + \sigma_t + \varepsilon_{i,p,t,c} \qquad (3)$$

where $Officila_i$ is an indicator variable that equals 1 if municipality i's official participates in IMC and 0 otherwise. β_2 shows the differential impact of IMC on tax enforcement between the municipalities that send their officials to IMC and the municipality without sending their officials. In municipalities that participate in IMC by sending their officials, the tax officials return to their municipalities in the future. In municipalities that participate in IMC without sending their officials, there is no such situation. Therefore, β_2 reflects the differences in tax enforcement outcomes attributable to the return of officials.

We also use the tax collection rate with a two-period lead $Y_{i,p,y+2,c}$, considering the periods that it takes for municipal officials who benefit from the IMC to return to their municipality. For example, n the Mie Outstanding Tax Recovery, an IMC, participating municipalities dispatch their officials for two years, after which the officials return to their respective municipalities. Following this, each municipality dispatches new officials. Owing to the limited variation between the treatment and control groups within prefectures, we include year fixed effects σ_t instead of prefecture-by-year fixed effects.[31] The parameter β_1 is the impact of IMC when

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[30]This type refers to cases where IMC is composed of prefectural officials and external personnel. For details on the composition of IMC, see Section 2.1.1.

[31]As mentioned in Section 2.2, IMCs formed without dispatching municipal officials are concentrated in only three prefectures, and there are almost no variations between treatment and control groups within prefectures. Consequently, we cannot compare the treatment and control groups within prefectures. For the baseline analysis,

no municipal officials are sent. However, this parameter is unrelated to taking the lead in the outcome and is just an indicator providing no interpretation.

Table 4: DID estimate: Heterogeneous effects by IMC composition

	(1)	(2)
	Inhabitant tax	Property tax
TaxIMC × Officials	0.118**	0.139
	[0.062]	[0.102]
R-squared	0.567	0.555
Observations	18580	18714
Municipality FE	Yes	Yes
Year FE	Yes	Yes

Note: The table shows the results in Equation (3). The outcome variables in Columns (1) and (2) are the unpaid collection rate on inhabitant and property taxes, respectively. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at levels of 1%, 5%, and 10%, respectively.

The estimates of Equation (3) for IMC composition are shown in Table 4.[32] The coefficients in Column (1) of Table 4 are positive and statistically significant, which pertains to the inhabitant tax. In contrast, the coefficients of the interaction on property taxes in Column (2) are null. This result indicates that for the inhabitant taxes, the impacts of IMC are greater in municipalities that send officers than in those that do not send officers.

The heterogeneous effects observed for inhabitant taxes show the possibility that the tax collection of inhabitant taxes of each municipality benefits from the learning and interaction within IMC, resulting in improved tax enforcement. As discussed in Section 2.1.2, in municipalities that dispatch officials to IMC, the enhancement of tax collection skills acquired within IMC may spread into the municipality' own operations once the officials return. In contrast, in municipalities that participate in IMC without dispatching officials, no such return occurs, and consequently, there is no opportunity for knowledge and expertise to spread from the IMC.

These findings are also consistent with the fact that IMC plays a larger role in property tax collection than in inhabitant tax collection. IMC prioritizes property tax collection over inhabitant tax collection, as it tends to focus on large tax amounts, and property tax involves higher amounts per case than inhabitant taxes do.[33] In addition, property taxes are a unique municipal tax base, and information gathering for their collection is more complex than that for inhabitant taxes. To obtain information, IMC may be utilized more in the area of property

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Table A.6 presents the baseline effects estimated using Equation (1), which include year fixed effects.

[32]Table A.7 shows the estimates of Equation (3) for a variable representing IMC composition, which equals 1 for all municipalities participating in the IMC if one or more municipal officials from those municipalities participate in the IMC.

[33]For details, please refer to Section 2.2.1.

taxes.[34] As a result, there is more room for inhabitant tax collection by individual municipalities, and individual municipalities may process more inhabitant taxes than property taxes, leading to an increase in the unpaid collection rate of inhabitant taxes. Therefore, the knowledge benefits from IMC to the municipality may be more effective for tax categories where there is room for individual municipalities to intervene. While these results do not directly evaluate knowledge benefits from the learning and interaction, the findings suggest the potential channel for the impacts of IMC.

7 Impact on tax collection costs

In this section, we examine whether IMC affects the costs of tax collection. While the purpose of this study is to show the effects of enhanced tax enforcement by IMC, it is also true that the collection of additional taxes may be costly. In general, collection activities incur tax administrative costs, including comprehensive costs associated with tax collection (Sanford 1978; Notsu 2024). In the context of Japan, personnel costs account for more than 70 percent of tax administrative costs, followed by supplies and services costs. In addition, these costs include subsidy costs, which reflect payments to other municipalities and local public enterprises and account for the cost of the burden each municipality places on operating the IMC.[35]

To explore the relationship between the introduction of IMC and costs, we show the effects of IMC on tax administrative costs.[36] Table A.8 presents the estimation results corresponding to Equation (1), where Columns (1), (2), (3), and (4) present the impacts of IMC on total tax administrative costs, personnel costs of tax administration, supplies and services costs of tax administration, and subsidy costs of tax administration, respectively.[37] In Columns (1), (2), and (3), all coefficient estimates are statistically insignificant and have small magnitudes, suggesting that IMC is not a reform that increases costs in tax collection at least. In contrast, Column (4) shows a significant increase in subsidy costs, indicating that IMC operations incurs additional costs for participating municipalities. However, the proportion of subsidy costs relative to total tax administrative costs is very small and does not substantially affect the overall tax collection costs.[38]

Furthermore, as discussed in subsection 4.3.2, there is no observed increase in costs for other expense items due to IMC. These results suggest that IMC could be a rational governmental

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[34]For details on the relationship between IMC activities and the tax base, please see Section 2.2.1.

[35]These subsidy costs typically also include personnel costs related to the operation of the IMC (Kashiwagi 2009).

[36]Tax administrative costs are captured at each municipality level, not at the IMC level, similar to the tax collection rate.

[37]Figure A.10 presents the results from the estimation proposed by Sun and Abraham (2021).

[38]Furthermore, in 2000, the unpaid tax amount exceeded 6 billion dollars, whereas the subsidy costs for tax administration were approximately 500 million dollars. Thus, the proportion of subsidies relative to the unpaid tax amount is also small.

reform for enhancing tax enforcement.

8 Conclusions

This study examines the effects of enhancing administrative tax enforcement on the tax gap, using the timing variation in IMC creation across municipalities and unpaid tax collection rates. The results of the DID analysis reveal that IMC increases unpaid tax collection rates for inhabitant and property taxes by approximately 17 and 28 percent, respectively. Furthermore, we examine the heterogeneity effects of IMC based on whether participating municipalities send their officials. The results reveal that municipalities sending tax officials to IMC achieve higher unpaid tax collection rates for inhabitant taxes than those that do not. This finding suggests that training and interaction within IMC enhance the tax collection skills at the local municipal level. We also estimate the effect of IMC on tax administrative costs and find no evidence of increased costs resulting from IMC participation. These findings suggest that IMC reform, which enhances tax enforcement capabilities, could serve as a more rational governmental reform than a simple reform, such as an increase in tax collection resources.

This study has policy implications aimed at increasing revenue. Given limited resources, improving the tax enforcement capacity of the administration remains challenging. Meanwhile, we demonstrate that IMC, which integrates and scales with tax collection among local governments, can substantially close the tax gap through enhanced tax enforcement. Moreover, we found no disadvantages of IMC, even from a cost perspective. Therefore, these results suggest that it is crucial to consider the restructuring of the local government framework not only from a cost perspective but also in terms of revenue.

References

Acemoglu, D., and J. Angrist. 2000. "How Large Are Human-Capital Externalities? Evidence from Compulsory Schooling Laws." *NBER Macroeconomics Annual* 15 9–59. https://doi.org/10.1086/654403.

Allers, M. A., and J. A. de Greef. 2018. "Intermunicipal cooperation, public spending and service levels." *Local Government Studies* 44 (1): 127–150. https://doi.org/10.1080/03003930.2017.1380630.

Alm, J. 2019. "What motivates tax compliance?" *Journal of Economic Surveys* 33 (2): 353–388. https://doi.org/10.1111/joes.12272.

Banaszewska, M., I. Bischoff, E. Bode, and A. Chodakowska. 2022. "Does inter-municipal cooperation help improve local economic performance? – Evidence from Poland." *Regional Science and Urban Economics* 92 103748. https://doi.org/10.1016/j.regsciurbeco.2021.103748.

Basri, M. C., M. Felix, R. Hanna, and B. A. Olken. 2021. "Tax administration versus tax rates: evidence from corporate taxation in Indonesia." *American Economic Review* 111 (12): 3827–3871. 10.1257/aer.20201237.

Bel, G., X. Fageda, and M. Mur. 2012. "Does cooperation reduce service delivery costs? Evidence from residential solid waste services." *Journal of Public Administration Research and Theory* 24 (1): 85–107. https://doi.org/10.1093/jopart/mus059.

Bel, G., and M. E. Warner. 2015. "Inter-municipal cooperation and costs: Expectations and evidence." *Public Administration* 93 (1): 52–67. https://doi.org/10.1111/padm.12104.

Bellon, M., E. Dabla-Norris, S. Khalid, and F. Lima. 2022. "Digitalization to improve tax compliance: Evidence from VAT e-Invoicing in Peru." *Journal of Public Economics* 210 104661. https://doi.org/10.1016/j.jpubeco.2022.104661.

Bentsen, K. H., J. R. Munch, and G. Schaur. 2019. "The Effect of Highly Educated Workers on Productivity: Evidence from Employer-Employee Matched Data." *IZA Discussion Paper* (12054): .

Bethencourt, C., and F. Perera-Tallo. 2024. "Public sector and human capital: on the mechanics of economic development." *Journal of Economics*. https://doi.org/10.1007/s00712-024-00868-9.

Blom-Hansen, J., K. Houlberg, and S. Serritzlew. 2014. "Size, Democracy, and the Economic Costs of Running the Political System." *American Journal of Political Science* 58 (4): 790–803. https://doi.org/10.1111/ajps.12096.

Borusyak, K., X. Jaravel, and J. Spiess. 2024. "Revisiting event study designs: Robust and efficient estimation." *The Review of Economic Studies*. https://doi.org/10.1093/restud/rdae007.

Brasington, D. M. 2003. "Size and School District Consolidation: Do Opposites Attract?" *Economica* 70 (280): 673–690. https://doi.org/10.1111/1468-0335.00291.

Breuillé, M. L., P. Duran-Vigneron, and A. L. Samson. 2018. "Inter-municipal cooperation and local taxation." *Journal of Urban Economics* 107 47–64. https://doi.org/10.1016/j.jue.2018.08.001.

Callaway, B., and P. H. C. Sant'Anna. 2021. "Difference-in-Differences with multiple time periods." *Journal of Econometrics* 225 (2): 200–230. https://doi.org/10.1016/j.jeconom.2020.12.001.

Carr, J. B., E. R. Gerber, and E. W. Lupher. 2007. "Explaining Horizontal and Vertical Cooperation on Public Services in Michigan: The Role of Local Fiscal Capacity." *Chapter in Metropolitan Affairs in Michigan, Michigan State University Press* 34. https://digitalcommons.wayne.edu/interlocal_coop/34.

de Chaisemartin, C., and X. D'Haultfoeuille. 2020. "Two-way fixed effects estimators with heterogeneous treatment effects." *American Economic Review* 110 (9): 2964–96. https://doi.org/10.1257/aer.20181169.

De Grip, A., and J. Sauermann. 2012. "The Effects of Training on Own and Co-worker Productivity: Evidence from a Field Experiment." *The Economic Journal* 122 (560): 376–399. 10.1111/j.1468-0297.2012.02500.x.

De Neve, J. E., C. Imbert, J. Spinnewijn, T. Tsankova, and M. Luts. 2021. "How to improve tax compliance? Evidence from population-wide experiments in Belgium." *Journal of Political Economy* 129 (5): 1425–1463. https://doi.org/10.1086/713096.

Di Porto, E., V. Merlin, and S. Paty. 2013. "Cooperation among local governments to deliver public services: a "structural" bivariate response model with fixed effects and endogenous covariate." *GATE Groupe d'Analyse et de Théorie Economique Lyon-St Etienne. Working Paper* 1304. https://ssrn.com/abstract=2215670.

Di Porto, E., A. Parenti, S. Paty, and Z. Abidi. 2016. "Local government cooperation at work: a control function approach." *Journal of Economic Geography* 17 (2): 435–464. https://doi.org/10.1093/jeg/lbw008.

Feiock, R. C. 2007. "Rational Choice and Regional Governance." *Journal of Urban Affairs* 29 (1): 47–63. https://doi.org/10.1111/j.1467-9906.2007.00322.x.

Ferraresi, M., G. Migali, and L. Rizzo. 2018. "Does intermunicipal cooperation promote efficiency gains? Evidence from Italian municipal unions." *Journal of Regional Science* 58 (5): 1017–1044. https://doi.org/10.1111/jors.12388.

Garriga, P., and D. Tortarolo. 2024. "Firms as tax collectors." *Journal of Public Economics* 223. https://doi.org/10.1016/j.jpubeco.2024.105092.

Goodman-Bacon, A. 2021. "Difference-in-differences with variation in treatment timing." *Journal of Econometrics* 225 (2): 254–277. https://doi.org/10.1016/j.jeconom.2021.03.014.

Hayashi, T. 2009. "Review of collection rate index in Taxation and empirical analyses from the root causes of the collection rate differences among local government -from questionnaires and investigation of the actual conditions- (in Japanese)." *Kansai Gakuin Daigaku Repositori*.

Henderson, J. V. 2007. "Understanding knowledge spillovers." *Regional Science and Urban Economics* 37 (4): 497–508. https://doi.org/10.1016/j.regsciurbeco.2006.11.010.

HMRC, HM Revenue & Customs. 2018. "Measuring tax gaps 2018 edition." *Technical report, Her Majesty's Revenue and Customs London*.

IMF, International Monetary Fund. 2015. "Current Challenges in Revenue Mobilization: Improving Tax Compliance." International Monetary Fund.

IRS, Internal Revenue Service. 2006. "A Comprehensive Strategy for Reducing the Tax Gap." *U.S. Department of the Treasury Office of Tax Policy*.

Isozaki, T. 2006. "Zeishuu Kakuho ni Muketa Torikumi to Choushuu Tantou Shokuin ni Motomerareru Mono." *Jichi Osaka* 56 (10): .

Jia, J., S. Ding, and Y. Liu. 2020. "Decentralization, incentives, and local tax enforcement." *Journal of Urban Economics* 115 103225. https://doi.org/10.1016/j.jue.2019.103225.

Kashiwagi, M. 2009. "Chihou Jichitai no Kyoudou Choushuu no Genjou to Kongo no Houkou-sei." *Gekkan "Zei"* 7.

LeRoux, K., and J. B. Carr. 2007. "Explaining Local Government Cooperation on Public Works: Evidence From Michigan." *Public Works Management Policy* 12 (1): 344–358. https://doi.org/10.1177/1087724X07302586.

Martinez-Vazquez, J., E. Sanz-Arcega, and J. M. Tránchez-Martín. 2022. "Tax Revenue Management and Reform in the Digital Era in Developing and Developed Countries.." *Research Handbook on Public Financial Management* 22–01.

Mas, A., and E. Moretti. 2009. "Peers at Work." *American Economic Review* 99 (1): 112–145. 10.1257/aer.99.1.112.

Ministry of Internal Affairs and Communications. 2009. "hihou Koukyo Dantai no Jimu no Kyodo Shori no Kaikaku ni Kansuru Kenkyukai Hokokusho (in Japanese)."

Murakami, Y. 2012. "Chouzei Gyousei no Jinzai Ikusei ni Okeru Jichitai Kan Renkei no Shuho to Kanousei (in Japanese)." *Nihon Toshi Senta*.

Notsu, N. 2024. "Inter-municipal cooperation cloud and tax administrative costs." *Regional Science and Urban Economics* 105 103991. https://doi.org/10.1016/j.regsciurbeco.2024.103991.

Okunogbe, O., and V. Pouliquen. 2022. "Technology, taxation, and corruption: Evidence from the introduction of electronic tax filing." *American Economic Journal: Economic Policy* 14 (1): 341–72. https://doi.org/10.1257/pol.20200123.

Pomeranz, D., and J. Vila-Belda. 2019. "Taking State-Capacity Research to the Field: Insights from Collaborations with Tax Authorities." *Annual Review of Economics* 11 755–781. https://doi.org/10.1146/annurev-economics-080218-030312.

De la Roca, J., and D. Puga. 2017. "Learning by Working in Big Cities." *Review of Economic Studies* 84 (1): 106–142. https://doi.org/10.1093/restud/rdw020.

Sanford, C. 1978. *Economics of Public Finance*. Pergamon Press, , 2nd edition.

Sant'Anna, P. H. C., and J. Zhao. 2020. "Doubly robust difference-in-differences estimators." *Journal of Econometrics* 219 (1): 101–122. https://doi.org/10.1016/j.jeconom.2020.06.003.

Slemrod, J. 2019. "Tax compliance and enforcement." *Journal of Economic Literature* 57 (4): 904–54. https://doi.org/10.1257/jel.20181437.

Sun, L., and S. Abraham. 2021. "Estimating dynamic treatment effects in event studies with heterogeneous treatment effects." *Journal of Econometrics* 225 (2): 175–199. https://doi.org/10.1016/j.jeconom.2020.09.006.

Tezuka, Y. 2012. "Chozei Gyousei no Jinzai Ikusei ni Okeru Jichitai Kan Renkei no Shuho to Kanousei (in Japanese)." *Nihon Toshi Senta*.

Tricaud, C. 2024. "Better alone? Evidence on the costs of intermunicipal cooperation." *American Economic Journal: Applied Economics* 17 (1): 160–207. 10.1257/app.20230344.

A Appendix

Figure A.1: Trends in tax collection amount per taxpayer
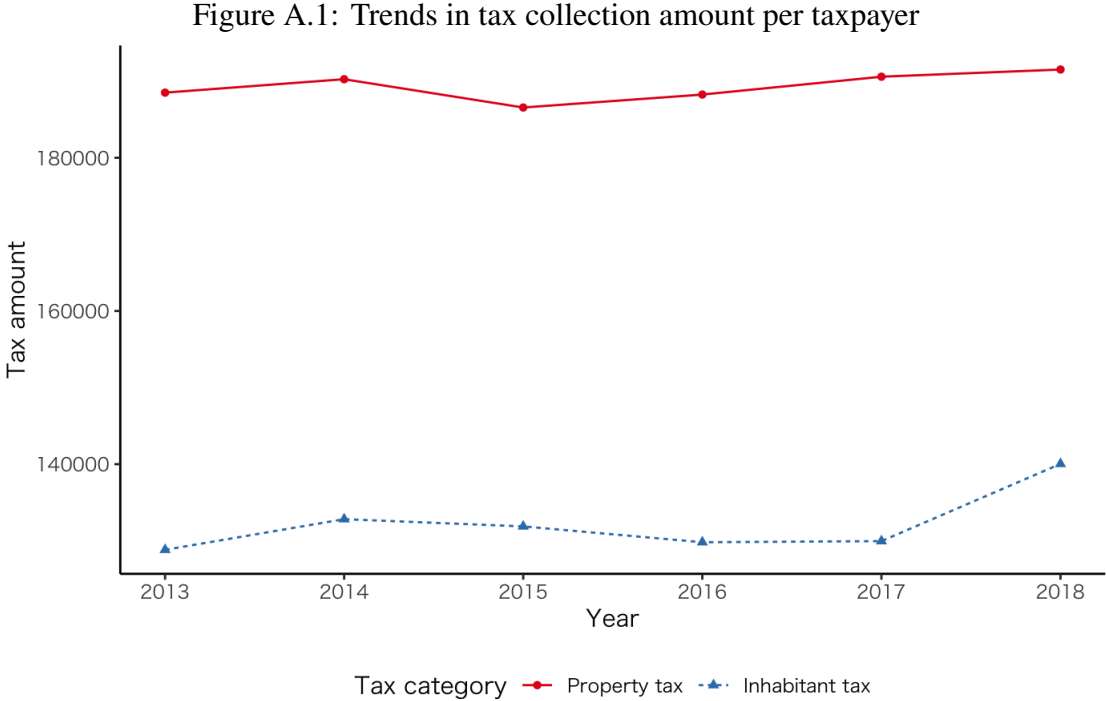
Note: Trends in the tax collection amount per taxpayer in Japan from 2013 to 2018. The red line shows the tax collection amount for the inhabitant tax per taxpayer, and the blue line shows the tax collection amount for the property tax per taxpayer. The monetary unit is Japanese yen.

Figure A.2: The number of municipalities implementing IMC
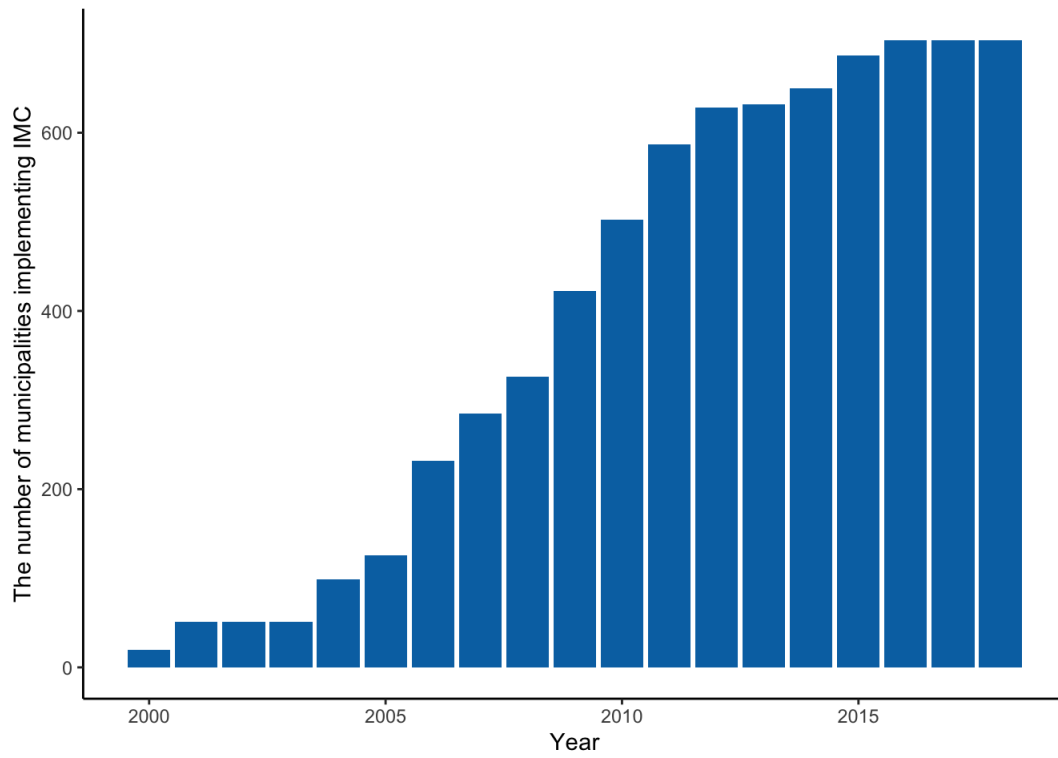
Note: The number of municipalities implementing IMC from 2000 to 2018.

Figure A.3: Introduction of IMC in Japan
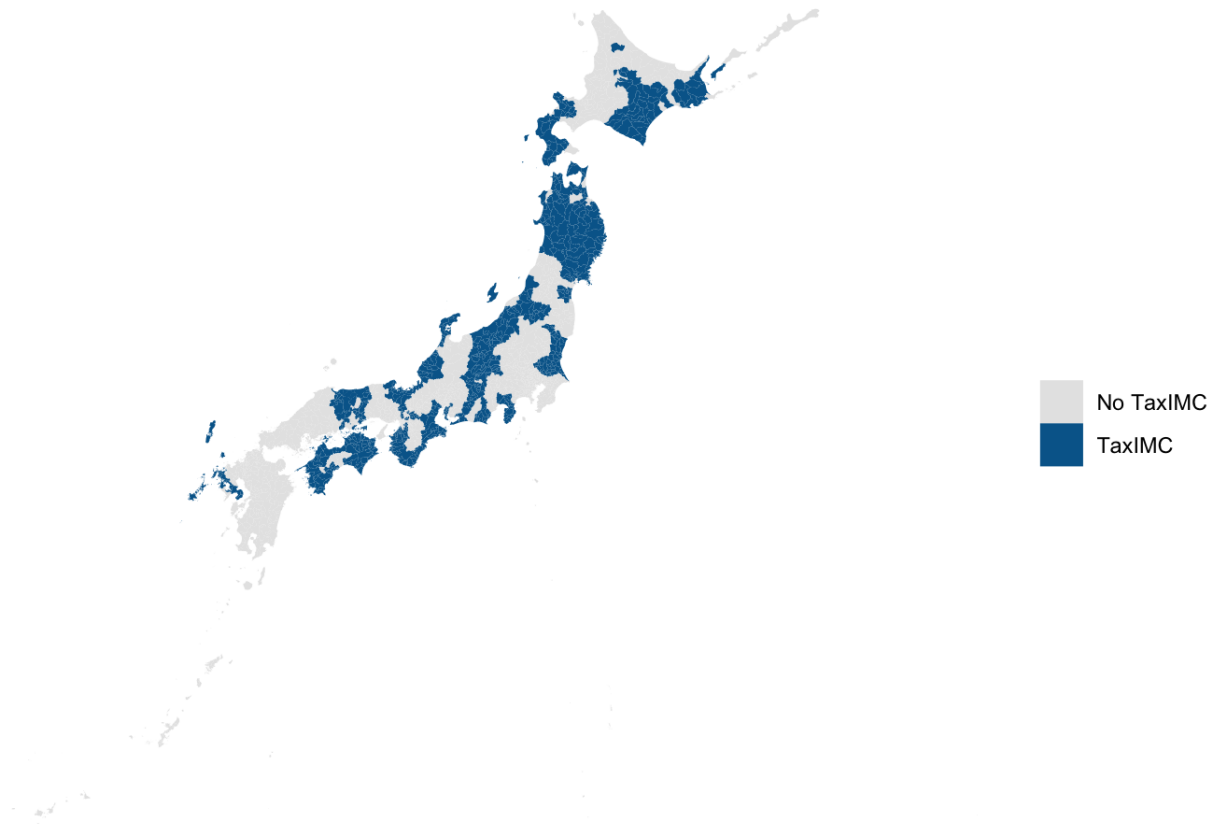
Note: This map shows the distribution of the introduction of IMC in municipalities. The blue regions represent the regions implementing IMC as of 2018.

Table A.1: Summary statistics for 2007

Variables	Mean	SD
Outcome variables		
Unpaid tax collection rate		
Inhabitant tax	0.22	0.096
Property tax	0.18	0.096
Total expenditures by category		
Personnel (thousand JPY)	92	47
Supplies and services (thousand JPY)	60	42
Maintenance (thousand JPY)	4.9	6.3
Social assistance (thousand JPY)	41	19
Tax administrative costs by category		
Total costs (thousand JPY)	6.3	2.9
Personnel (thousand JPY)	4.5	2.4
Supplies and services (thousand JPY)	1.4	0.94
Subsidies (thousand JPY)	0.37	0.5
Covariates		
Population	73680	218126
Pop. 65 (%)	0.24	0.064
Pop. 15 (%)	0.13	0.023
Primary ind. (%)	0.10	0.11
Secondary ind. (%)	0.27	0.08
Financial indicator	0.64	0.35
Local debt	2037570	8795084
Taxable income	113689	380836
Number of municipal officials	538	1656
Number of workers	35215	103954

Note: The monetary unit is 1,000 yen (approximately 6.7 dollars at an exchange rate of 150 yen to 1 U.S. dollar). All cost categories in total expenditures and tax administrative costs are measured on a per capita basis. The first column shows the average of the outcome variables, treatment variables, and covariates. The second column shows the standard deviation of the outcome variables, treatment variables, and covariates.

Table A.2: DID estimate: Impact of IMC on the unpaid tax collection rate in the 2007 standard

|	(1)	(2)
	Inhabitant tax	Property tax
A. Samples before 2007		
TaxIMC	0.152**	0.189**
	[0.060]	[0.090]
R-squared	0.567	0.550
B. Samples after 2007		
TaxIMC	0.168**	0.172*
	[0.074]	[0.101]
R-squared	0.567	0.550
Municipality FE	Yes	Yes
Pref*Year FE	Yes	Yes

Note: The table shows the results in Equation (1). Columns (1) and (2) represent the effects of IMC on the unpaid collection rate for the inhabitant tax and property tax. In addition, Panels A and B in the table present the results before and after 2007, respectively. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at levels of 1%, 5%, and 10%, respectively.

Table A.3: DID estimate: Adding Covariates

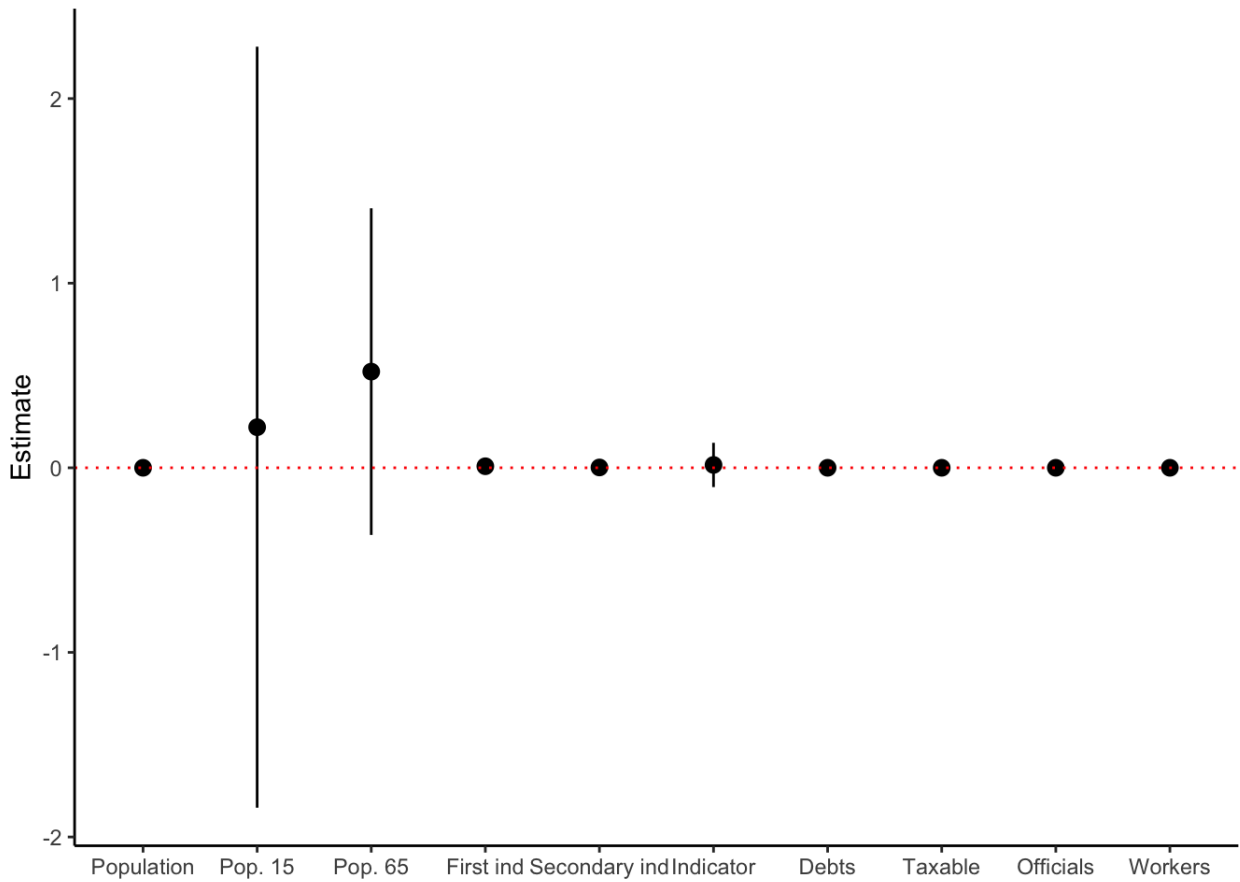| | Inhabitant tax | | | Property tax | | |
	(1)	(2)	(3)	(4)	(5)	(6)
TaxIMC	0.175***	0.174***	0.213***	0.283***	0.282***	0.279***
	[0.048]	[0.048]	[0.052]	[0.075]	[0.075]	[0.080]
Observations	22135	22135	15320	22264	22264	15362
R-squared	0.568	0.568	0.565	0.551	0.551	0.573
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Pref*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Basic characteristic covariates	Yes	Yes	Yes	Yes	Yes	Yes
Local public finance and administration covariates		Yes	Yes		Yes	Yes
Tax officials			Yes			Yes

Note: The table shows the results in Equation (1). Basic geographic covariates include the population size, share of the population size under the age of 15 years, share of the population size over the age of 65 years, share of secondary industrial workers among total workers in the private sector, and share of tertiary industrial workers among total workers in the private sector. Local public finance covariates include the financial capability indicator, local government debts, taxable income, the amount of corporate tax, number of municipal officials, and the number of workers in the private sector. Column (1) represents the effect of IMC on the unpaid tax collection rate on inhabitant tax, controlling for covariates on basic geographic characteristics, and Column (2) additionally controls for covariates on local public finance. Column (4) represents the effect of IMC on the unpaid tax collection rate on property tax, controlling for covariates on basic geographic characteristics, and Column (5) additionally controls for covariates on local public finance. Columns (3) and (6) represents the effect of IMC on the unpaid tax collection rate for inhabitant tax and property tax, controlling for the number of tax officials which sample is limited from 2004 to 2018 due to data limitation. Columns (3) and (6) present the effects of IMC on the unpaid tax collection rates for inhabitant and property taxes, respectively, controlling for the number of tax officials. The sample in Columns (3) and (6) is restricted to the period from 2004 to 2018 due to data limitations.

Figure A.4: Event study plots: Adding Covariates
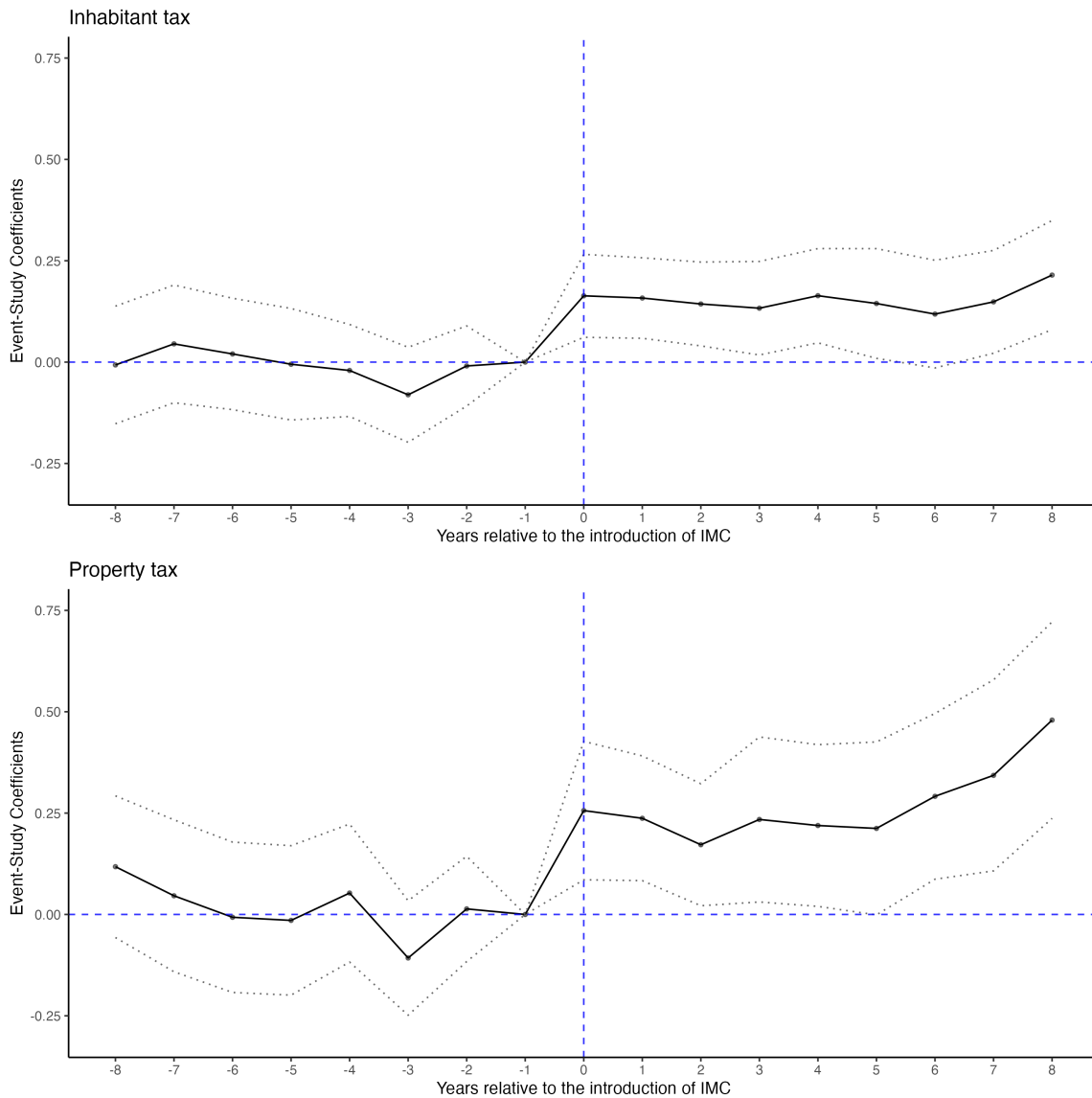
Note: This figure plots the estimation results of the event study analysis and 95% confidence intervals (dotted lines). The horizontal axis indicates years relative to the introduction of IMC. The model controls for basic geographic characteristic and local public finance covariates, municipality fixed effects, and prefecture-by-year fixed effects. Standard errors are clustered at the municipality level.

Figure A.5: Covariate balance in 2007

Note: This figure provides a test of covariate balance in 2007. I regress the treatment indicators (which equal 1 for municipalities with the introduction of IMC) on all covariates.

Table A.4: DID estimate: Matched sample

	(1)	(2)
	Inhabitant tax	Property tax
TaxIMC	0.223***	0.343***
	[0.054]	[0.088]
Observations	22135	22264
R-squared	0.532	0.503
Municipality FE	Yes	Yes
Pref*Year Yes	Yes	Yes

Note: The table shows the results in Equation (1). Columns (1)and (2) represent the effects of IMC on the unpaid collection rate for the inhabitant tax and property tax. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at the levels of 1%, 5%, and 10%, respectively.

Figure A.6: Event study plots: Expenditure item
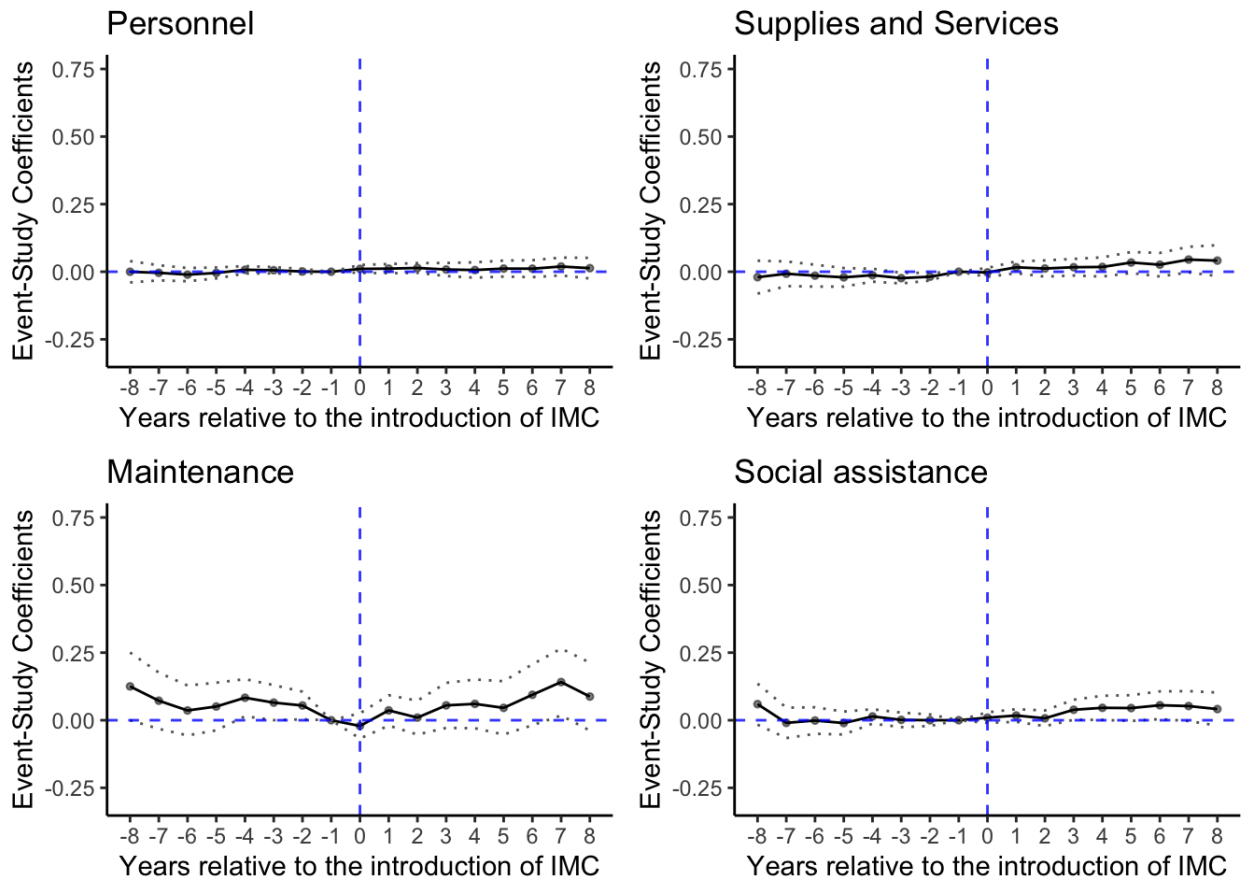
Note: This figure plots the estimation results of the event study analysis and 95% confidence intervals (dotted lines). The horizontal axis indicates years relative to the introduction of IMC. The model controls for municipality fixed effects and prefecture-by-year fixed effects. Standard errors are clustered at the municipality level. The top left panel shows the dynamics of the effect of IMC on personnel expenditure. The top right panel shows the dynamics of the effect of IMC on supply and service expenditures. The bottom left panel shows the dynamics of the effect of IMC on maintenance expenditure. The bottom right panel shows the dynamics of the effect of IMC on social assistance expenditure.

Table A.5: DID estimate: The unpaid tax collection amounts relative to the tax in 2000

	(1)	(2)
	Inhabitant tax	Property tax
TaxIMC	0.233***	0.158**
	[0.058]	[0.071]
Observations	22135	22264
R-squared	0.701	0.647
Municipality FE	Yes	Yes
Pref*Year Yes	Yes	Yes

Note: The table shows the results in Equation (1) using year fixed effects instead of prefecture-by-year fixed effects. Columns (1) and (2) represent the effects of IMC on the standardized unpaid collection amounts on inhabitant tax and property tax. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at the levels of 1%, 5%, and 10%, respectively.
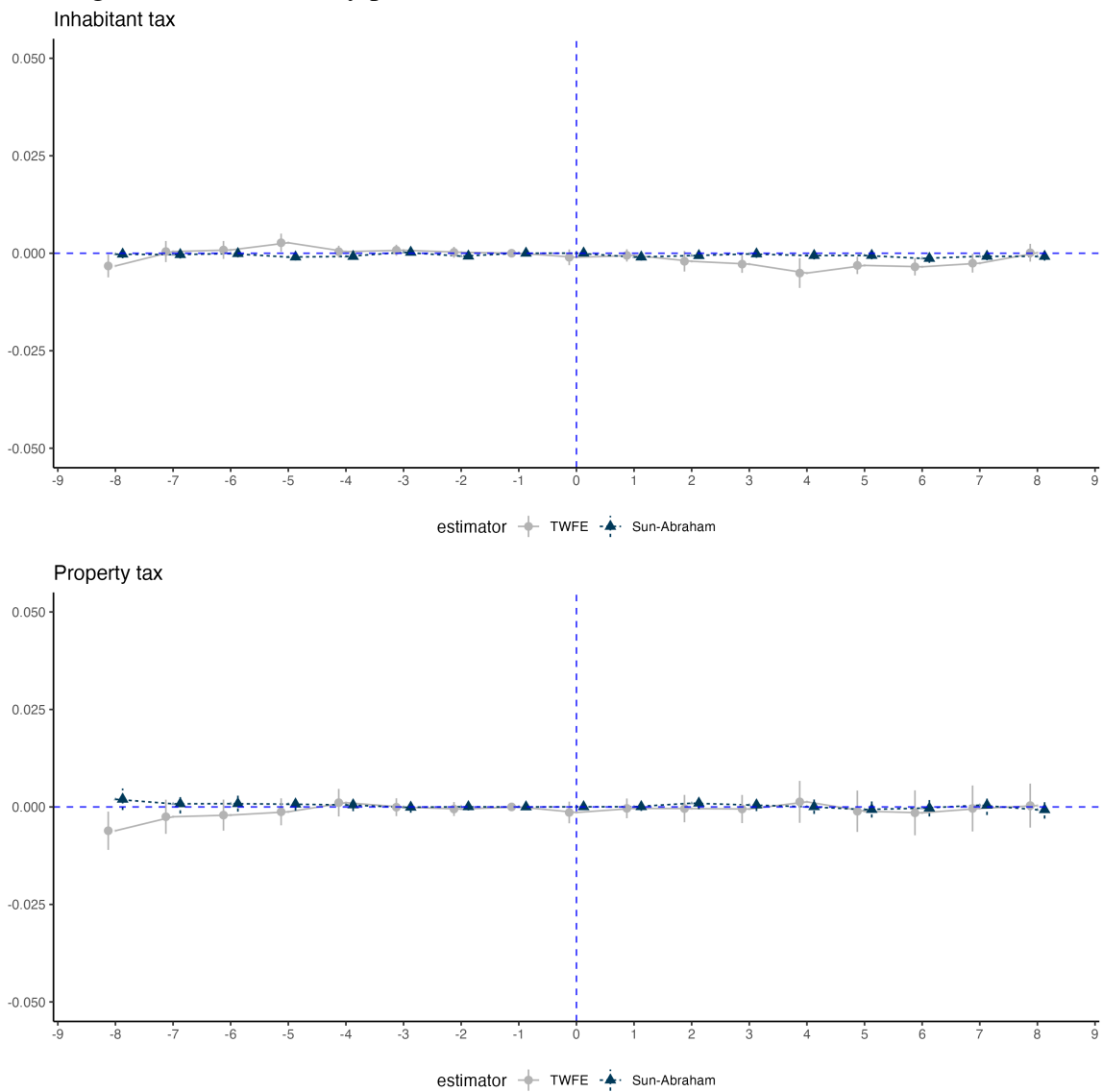
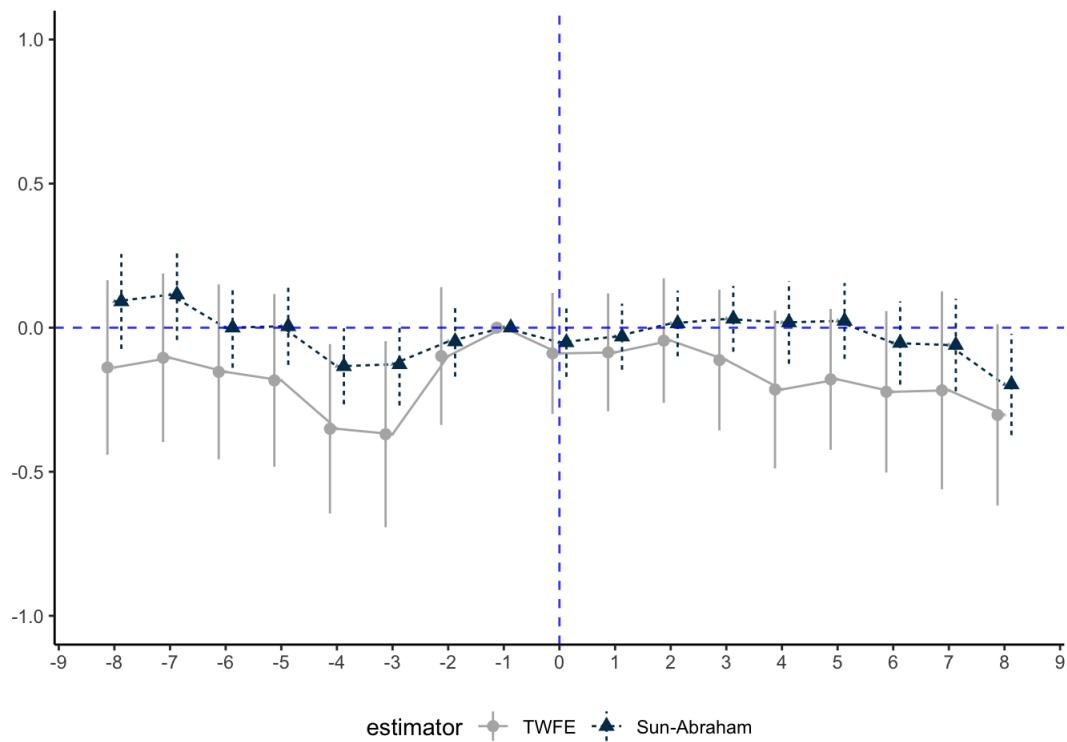Figure A.7: Event study plots: Sun and Abraham (2021)
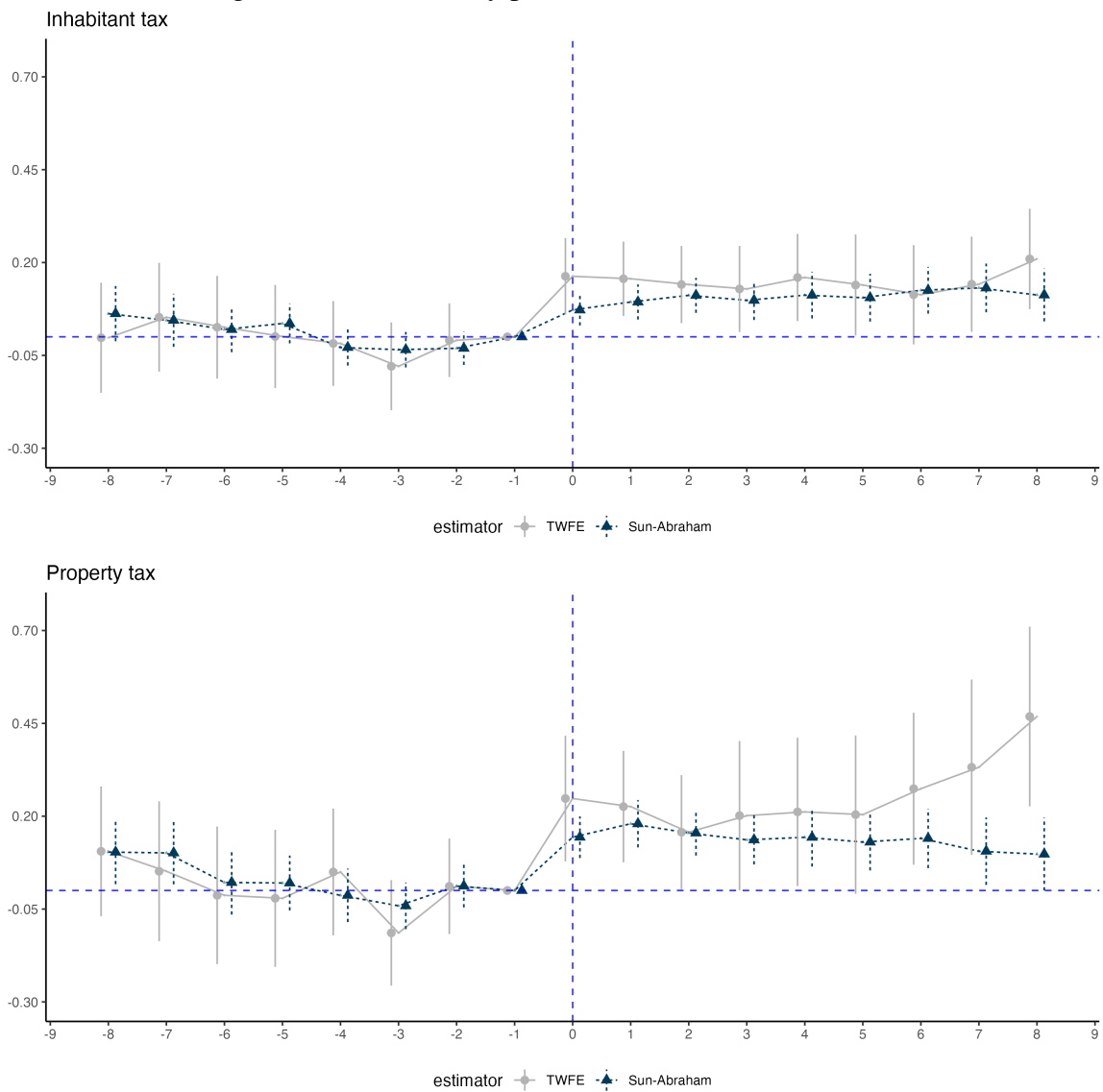
Note: This figure plots the estimation results of the event study analysis and 95% confidence intervals (dotted lines). The horizontal axis indicates years relative to the introduction of IMC. The gray line is the estimation results in Equation (2), and the blue line is are results using the estimation proposed by Sun and Abraham (2021). In Sun and Abraham (2021), the full set of cohort-time-specific treatment effects estimated is aggregated using weights considering the sample shares of each cohort in the relevant period.

Figure A.8: Event study plots: The current tax rate in Sun and Abraham (2021)

Note: This figure plots the estimation results of the event study analysis and 95% confidence intervals (dotted lines). The horizontal axis indicates years relative to the introduction of IMC. The gray line is the estimation results in Equation (2), and the blue line is are results using the estimation proposed by Sun and Abraham (2021). In Sun and Abraham (2021), the full set of cohort-time-specific treatment effects estimated is aggregated using weights considering the sample shares of each cohort in the relevant period.

Figure A.9: Event study plots: The unpaid corporate tax rate in Sun and Abraham (2021)

Note: This figure plots the estimation results of the event study analysis and 95% confidence intervals (dotted lines). The horizontal axis indicates years relative to the introduction of IMC. The gray line is the estimation results in Equation (2), and the blue line is are results using the estimation proposed by Sun and Abraham (2021). In Sun and Abraham (2021), the full set of cohort-time-specific treatment effects estimated is aggregated using weights considering the sample shares of each cohort in the relevant period.

Table A.6: DID estimate: Baseline estimates

	(1)	(2)
	Inhabitant tax	Property tax
TaxIMC × Officials	0.086***	0.130***
	[0.024]	[0.031]
R-squared	0.534	0.523
Observations	18580	18714
Municipality FE	Yes	Yes
Year FE	Yes	Yes

Note: The table shows the results in Equation (1) using year fixed effects instead of prefecture-by-year fixed effects. Columns (1) and (2) represent the effects of IMC on the standardized unpaid collection amounts on inhabitant tax and property tax. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at the levels of 1%, 5%, and 10%, respectively.

Table A.7: DID estimate: The case of municipal officials from all municipalities participating in IMC

	(1) Inhabitant tax	(2) Property tax
TaxIMC × Officials	0.121**	0.080
	[0.047]	[0.059]
R-squared	0.559	0.541
Observations	20313	20455
Municipality FE	Yes	Yes
Year FE	Yes	Yes

Note: The table shows the results in Equation (6). The outcome variables in Columns (1) and (2) are the unpaid collection rate on inhabitant and property taxes, respectively. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at the levels of 1%, 5%, and 10%, respectively.

Table A.8: DID estimate: Tax administrative costs

	(1) Total	(2) Personnel	(3) Supplies and services	(4) Subsidies
TaxIMC	0.001	-0.015	-0.029	0.307***
	[0.021]	[0.027]	[0.039]	[0.106]
R-squared	0.880	0.847	0.800	0.739
Observations	22,523	22,467	22,518	22,511
Municipality FE	Yes	Yes	Yes	Yes
Pref*Year FE	Yes	Yes	Yes	Yes

Note: The table shows the effects of IMC on tax administrative costs, where columns correspond to Total, Personnel, Supplies and services, and Subsidies. Panel A corresponds to Equation (4) and Panel B corresponds to Equation (5). Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates are significantly different from zero at levels of 1%, 5%, and 10%, respectively.

Figure A.10: Event study plots: Tax administrative costs in Sun and Abraham (2021)
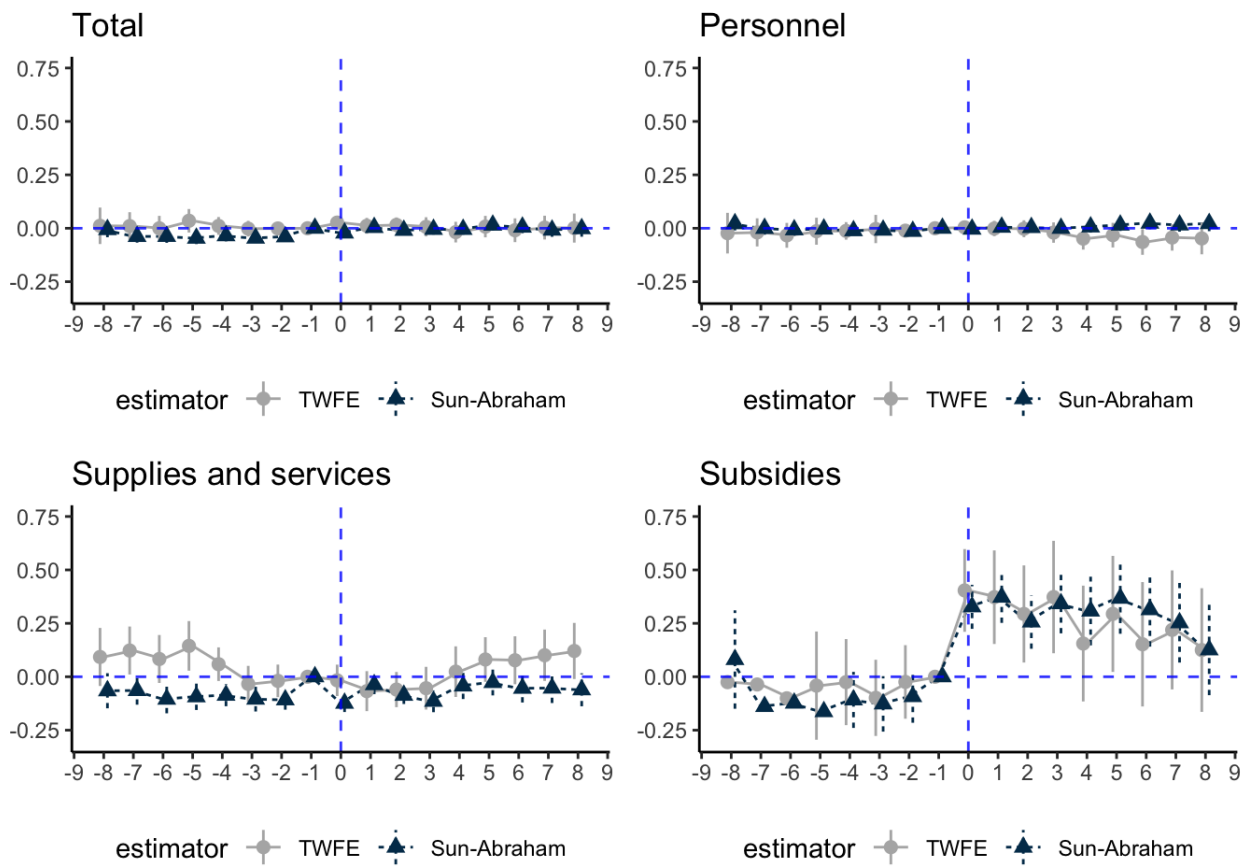
Note: This figure plots the estimation results of the event study analysis and 95% confidence intervals (dotted lines). The horizontal axis indicates years relative to the introduction of IMC. The gray line is the estimation results in Equation (2), and the blue line is are results using the estimation proposed by Sun and Abraham (2021). In Sun and Abraham (2021), the full set of cohort-time-specific treatment effects estimated is aggregated using weights considering the sample shares of each cohort in the relevant period. The top left panel shows the dynamics of the effect of IMC on tax administrative costs. The top right panel shows the dynamics of the effect of IMC on personnel expenditure in tax administrative costs. The bottom left panel shows the dynamics of the effect of IMC on supply and service expenditures in tax administrative costs. The bottom right panel shows the dynamics of the effect of IMC on social assistance expenditure in tax administrative costs.