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Inter-municipal cooperation and tax enforcement capabilities

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Naruki Notsu[1]

PhD.student, Osaka School of International Public Policy, Osaka University

Haruaki Hirota[2]

Professor, Faculty of Economics, Musashi University

Nobuo Akai[3]

Professor, Osaka School of International Public Policy, Osaka University

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JEL Classification: H71, H77, H83

Keywords: Inter-municipal cooperation, Tax enforcement, Tax compliance

[1] notsu.naru@gmail.com

[2] hirota@cc.musashi.ac.jp

[3] akai@osipp.osaka-u.ac.jp

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†Naruki Notsu, Graduate student, Osaka School of International Public Policy, 1-31, Machikaneyama, Toyonaka, Osaka, 560-0043, Japan. E-mail:notsu.naru@gmail.com, Corresponding author

‡Haruaki Hirota, Faculty of Economics, Musashi University; 1-26-1, Toyotamakami, Nerima-ku, Tokyo, 176-8534, Japan. E-mail: hirota@cc.musashi.ac.jp

§Nobuo Akai, Osaka School of International Public Policy, 1-31 Machikaneyama, Toyonaka, Osaka, 560-0043, Japan. E-mail: akai@osipp.osaka-u.ac.jp

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). Therefore, closing this gap by increasing tax collection is a key objective for governments in both developed and developing countries worldwide (HMRevenue&Customs 2018; De Neve et al. 2021; Basri 2021; Garriga and Tortarolo 2024). To close the gap, governments can take two main approaches. One approach is to facilitate taxpayer compliance. (Slemrod 2019; Martinez-Vazquez, Sanz-Arcega, and Tranchez-Martin 2022).[1] The other approach is to enhance the tax enforcement capabilities of the administration (IRS 2006; 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 limits research from the perspective of administrative tax enforcement. For instance, 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).[2] 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 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 municipal official levels. First, collaborative collection efforts at the IMC organization level 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 local tax officials with opportunities for training in professional development and exposure to more sophisticated tax collection practices through

[1] Many studies examine tax compliance focusing on interventions to 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.

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

interactions between officials from participating municipalities. This training and interaction within IMC can lead to more effective tax enforcement of each official.[3] Therefore, IMC has the potential to enhance tax enforcement at both the inter-municipal organization and local municipal official levels.[4]

To investigate evidence, we take advantage of 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.[5]

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.

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 two tax categories—inhabitant tax and property tax. We find that IMC increases unpaid tax collection rates for inhabitants and property taxes by approximately 17 percent and 28 percent, respectively. However, the pre-implementation 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 perform placebo tests, which reveal that the main results are robust. Furthermore, in the event study analysis, we confirm that there are no differences in the pre-trends of the outcomes before IMC implementation.

In addition, we perform a triple-difference analysis by stacking the present tax collection rates with unpaid tax collection rates as an additional variation in the outcome. The present tax collection rate is a measure of the tax collection rate that is unrelated to unpaid taxes and noncompliance and is not subject to IMC operations. For the triple difference, it is not necessary to assume two parallel trends for the present and unpaid tax collection rates under specific assumptions. Using this stacked dataset, we find that IMC increases unpaid tax collection rates,

[3]Some literature points out the importance of the relationship between learning and experience and human capital interaction (Acemoglu and Angrist (2000); Henderson (2007); 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); Grip and Sauermann (2012); Bentsen, Munch, and Schaur (2019))

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

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

which is consistent with the baseline results.

We also show the heterogeneous effects of IMC. First, to focus on channels, we demonstrate the heterogeneous effects of the composition of IMC. IMC is expected to increase unpaid tax collection rates through inter-municipal organizations and municipal official levels. At the municipal official level, training and interaction within the IMC lead to more effective tax enforcement by municipal officials, and this effect occurs only when municipal officials are part of the IMC. Therefore, we analyze the heterogeneous effects of IMC based on the presence of municipal officials. We find that IMC composed of municipal officials increases unpaid tax collection rates relative to that composed of nonmunicipal officials in terms of inhabitant taxes. These findings suggest that training and interaction within the IMC lead to the specialization of tax officials in the municipality, thus improving tax enforcement.

Second, we show the heterogeneous effects of IMC on tax administrative costs by population share. Tax administrative costs are the comprehensive costs associated with tax collection. In the context of IMC, both positive and negative aspects of cost are often pointed and their heterogeneity depending on the population size of the municipality is also emphasized (Bel and Warner 2015; Allers and de Greef 2018; Ferraresi, Migali, and Rizzo 2018; Notsu 2024). This paper investigates the heterogeneity of effects by population size across municipalities and population share within IMC to determine whether IMC affects cost aspects. The results show that IMC decreases in tax administrative costs only in municipalities with larger populations and otherwise has null effects. These results suggest that collaborative tax collection via IMC is not a costly measure and may even reduce the costs of tax collection.

Finally, we examine the effects of IMC advertisements. Some IMCs advertise the sale of assets seized from taxpayers with unpaid dues as a warning, aiming to facilitate compliance. By using variations in whether IMCs engage in such advertising, we investigate the heterogeneous effects of IMCs. We find no significant differences in the impact of IMC on unpaid tax collection rates based on these warnings. The findings suggest that IMC can close the tax gap by enhancing tax enforcement on the administrative side, rather than by encouraging compliance on the taxpayer side.

This study is most related to the work of Jia, Ding, and Liu (2020), which examines the effects of administrative reform on local tax revenue. However, our research diverges in terms of its focus. While the above study focused on the amount of tax revenue, we focus on the tax gap. Furthermore, the biggest distinction between our study and the work of Jia et al. (2020) is their interest in the effects of fiscal decentralization, whereas we are interested in enhancing tax enforcement through municipal cooperation

More generally, this paper contributes to the broad literature on policy responses to tax 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.[6] While most of these studies examine 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 et al. 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) demonstrates that in France, IMC leads to more construction and fewer public services, while 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.

Also, Breuillé, Duran-Vigneron, and Samson (2018) examines 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 change 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 Inter-municipal cooperation

2.1.1 Inter-municipal cooperation in Japan

IMC is formed beyond municipal boundaries to enhance the efficiency of public service delivery by leveraging economies of scale. The structure of local governments in Japan comprises

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

two levels—47 prefectures and 1.78 municipalities. While IMC is not embedded in these two layers of government, it establishes an additional level of jurisdiction for specific tasks and has the responsibility of performing the work instead of each municipality itself. In Japan, these collaborations are utilized across various services, including joint waste management, firefighting, and healthcare, in addition to tax collection, to leverage economies of scale.

In Japan IMC, municipal collaboration on tax collection exists.[7] This IMC involves collaborative tax collection specializing in unpaid taxes by residents and property taxes and does not involve independent fiscal authority, such as the creation of taxation rights. Notably, IMC does not jointly collect all unpaid taxes among participating municipalities, and individual municipalities also continue to collect unpaid taxes themselves. The operation of unpaid tax collection involves 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. 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. In addition, knowledge of tax laws is necessary for seizure and public auctions. Therefore, property investigations, seizures, and public auctions are considered more sophisticated techniques (Tezuka 2012).

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 population percentage, tax revenue percentage, and the amount of unpaid tax for each municipality.

2.1.2 Inter-municipal cooperation on tax collection

IMC is expected to enhance tax enforcement through two potential channels, as shown in Figure 1. First, tax enforcement can be enhanced by collecting taxes at the IMC organization level. Collaborative tax collection in IMC increases the deployment of tax collection officials on a per-case basis. 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 increasing activities may allow for more division of labor into more specialized functions (Blom-Hansen,

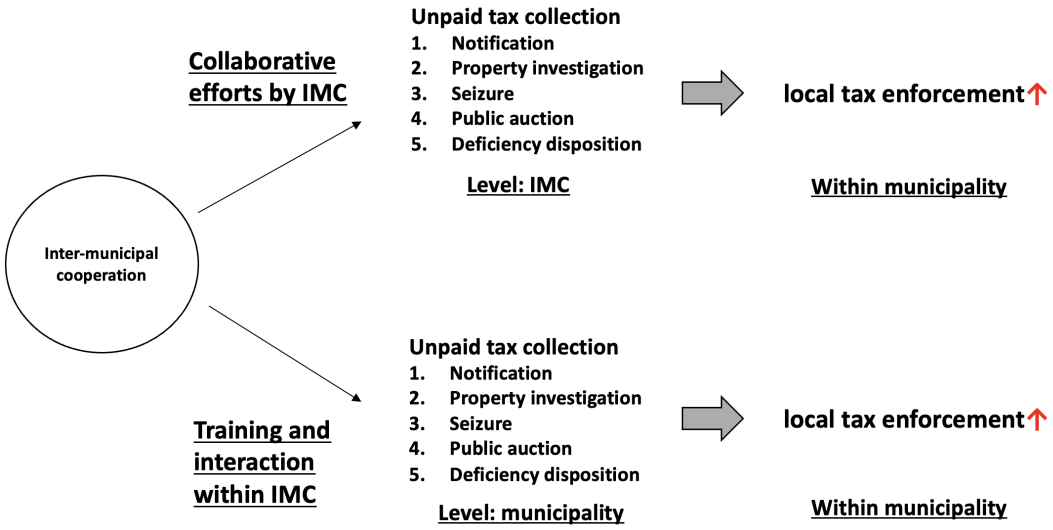
[7]This type of IMC can be organized in the form of a "multitask extended association," "single-task extended association," or "voluntary organization." Multitask and single-task extended associations are types of IMC that constitute legal entities. In contrast, voluntary organizations have no legal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

Houlberg, and Serritzlew 2014). Establishing specialized departments, based on 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 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 leads to the provision of more services and may compensate for the lack of services for tax collection.

Second, training and interaction within IMC may improve the tax enforcement of each municipal 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 Local Tax Management and Collection Organization, one of the IMCs, provides training and conferences to improve the tax enforcement skills of staff members. Furthermore, IMC establishes teams of knowledgeable and novice tax officials, to provide the latter an opportunity for them to be exposed to more sophisticated tax collection practices (Murakami 2012). Such training and worker interactions can lead to increased productivity (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 to 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.

Figure 1: Relationship between IMC and local tax enforcement



Note: This figure shows the workflow of IMC intervention.

2.2 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 tax and consumption tax. In local governments, the tax base differs between prefectures and municipalities. In particular, at the municipal level, inhabitant and property taxes account for 70 percent of total revenue. Property tax accounts for 41 percent, and inhabitant tax accounts for 37 percent of total municipal tax revenues in 2021.[8] However, 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 tax per taxpayer. The collection of inhabitant tax is distributed among municipalities and prefectures, leading to comparatively modest amounts per case.[9]

IMC prioritizes high-value tax cases.[10] Therefore, IMC is more likely to focus on property tax, the most expensive tax category per taxpayer among municipal tax revenues, than on inhabitant tax.

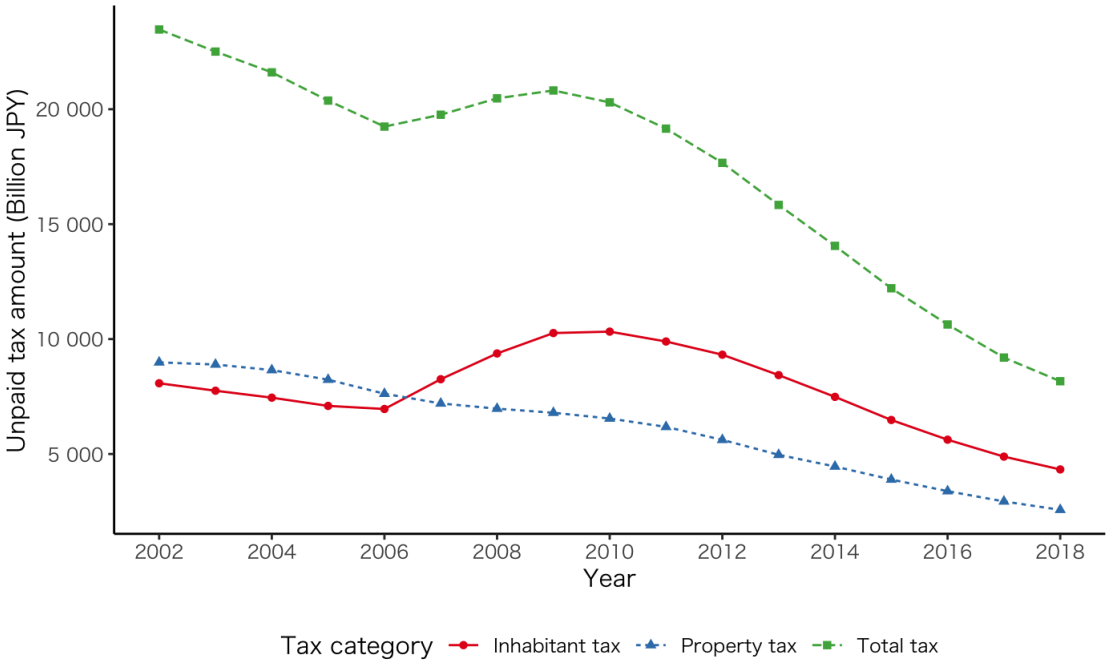
Tax collection can be divided into present and unpaid tax collection. The present tax revenue is the tax amount to be collected within the fiscal year and serves as a measure of flow. In contrast, unpaid tax revenue is the total tax due that has not been collected in the current period, representing a stock measure. Figure 2 presents the unpaid tax amount from 2000 to 2018, where the blue and red lines represent the unpaid inhabitant and property taxes, respectively, and the green lines represent the total amount of unpaid taxes. In all tax categories, unpaid taxes are approximately 400 billion yen or higher (approximately 26 billion U.S. dollars). Furthermore, as with local tax revenues, the sum of the inhabitant tax and property unpaid tax accounts for 70 percent of the total unpaid tax.

[8] The third largest share, corporate income tax, accounts for approximately 9 percent.

[9] The inhabitant tax in municipalities is generally set at 6 percent of an individual's income.

[10] More than 70 percent of instances of IMC set the conditions for collaborative tax collection as amounts of unpaid taxes and difficult-to-process cases.

Figure 2: 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 total amount of unpaid tax for all tax categories, 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.

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.[11] In addition, excluding the 23 wards of Tokyo and amalgamated municipalities, we create a balanced panel dataset.[12]

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

[11] 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.

[12] 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.

rate in municipality i in year y is as follows:

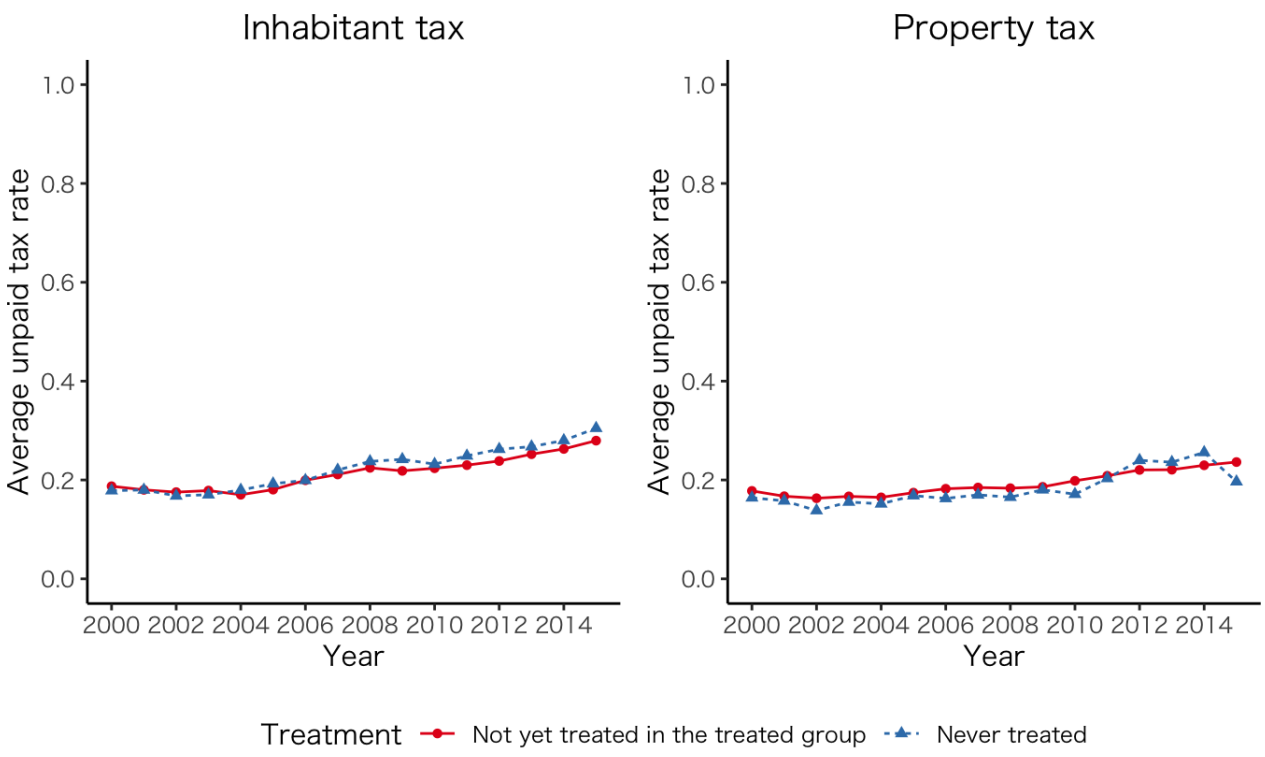
$$Unpaid\ tax\ collection\ rate_y = \frac{Unpaid\ tax\ collection_y}{Total\ unpaid\ tax}$$

where $Unpaid\ tax\ collection_y$ is the unpaid tax collected by municipality i in year y. $Total\ unpaid\ tax_y$ is the stock of the unpaid tax. In other words, the denominator captures the total tax with which has not been complied, while the numerator reflects the actual amount collected within the denominator. 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).

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. Figure A.2 shows the distribution of municipalities participating in IMC. Because IMC is implemented within neighboring municipalities, its distribution is concentrated in certain regions. A potential concern regarding treatment timing is the possibility of the municipality's decision to participate in IMC being confounded by other specific features. 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. This comparison reveals minimal differences in unpaid tax collection rates between the two groups over time. In addition, our analysis incorporates municipal fixed effects and prefecture-by-time fixed effects, which ensure 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. Moreover, when including observable covariates in our analysis, the magnitudes of the estimated coefficients remain largely unchanged, implying that confounders in terms of IMC implementation are unlikely to be a concern.

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:

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

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

logarithmic form. $IMC_{i,p,y}$ is a binary dummy variable that equals 1 if IMC is adopted in municipality i within prefecture p during year y and 0 otherwise. The parameter of interest is β. 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.2, 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 y and the year when the municipality i first participated in IMC.

$$Y_{i,p,t} = \sum_{-8,\tau\neq-1}^{8} \beta_\tau IMC^\tau_{i,p,t} + \mu_i + \rho_{p,y} + \varepsilon_{i,p,y} \qquad (2)$$

IMC^τ_{ipt} 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.[13] 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.

[13] 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) Inhabitant tax	(2) Property tax	(3) Corporation tax
TaxIMC	0.168***	0.279***	0.021
	[0.048]	[0.076]	[0.092]
Observations	22135	22264	17038
R-squared	0.567	0.550	0.439
Municipality FE	Yes	Yes	Yes
Pref*Year Yes	Yes	Yes	Yes

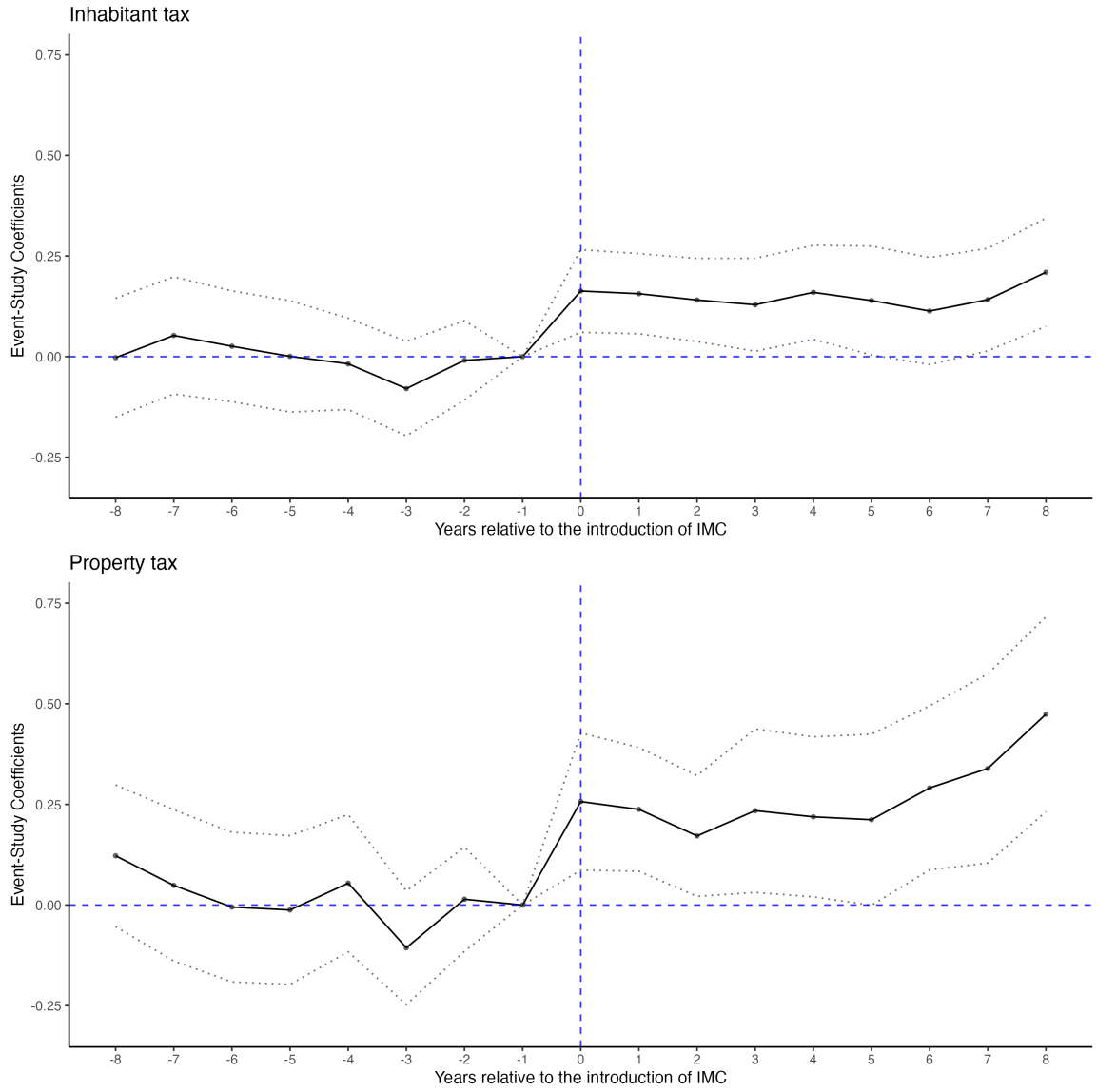
Note: The table shows the results in Equation (1). Columns (1), (2) and (3) represent the effects of IMC on the unpaid collection rate on inhabitant tax, property tax, and corporation tax. Clustered standard errors at the municipality level are given in brackets. ***, **, * represent that the estimates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

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 and we cannot observe the effects of IMC. This result is consistent with the fact that IMC covers resident and property taxes but does not cover corporation taxes.

Figure 4 presents the event study results in Equation (2) with 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 spike 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 and indicate that the introduction of IMC continually improves tax enforcement.

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 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.

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

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

	Inhabitant tax		Property tax	
	(1)	(2)	(3)	(4)
TaxIMC	0.175***	0.174***	0.283***	0.282***
	[0.048]	[0.048]	[0.075]	[0.075]
Observations	22135	22135	22264	22264
R-squared	0.568	0.568	0.551	0.551
Municipality FE	Yes	Yes	Yes	Yes
Pref*Year FE	Yes	Yes	Yes	Yes
Basic characteristic covariates	Yes	Yes	Yes	Yes
Local public finance and administration covariates		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, and share of tertiary industrial workers among total workers. Local public finance covariates include the financial capability indicator, local government debts, taxable income, number of municipal officials, and number of workers. 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 (3) represents the effect of IMC on the unpaid tax collection rate on property tax, controlling for covariates on basic geographic characteristics, and Column (4) additionally controls for covariates on local public finance.

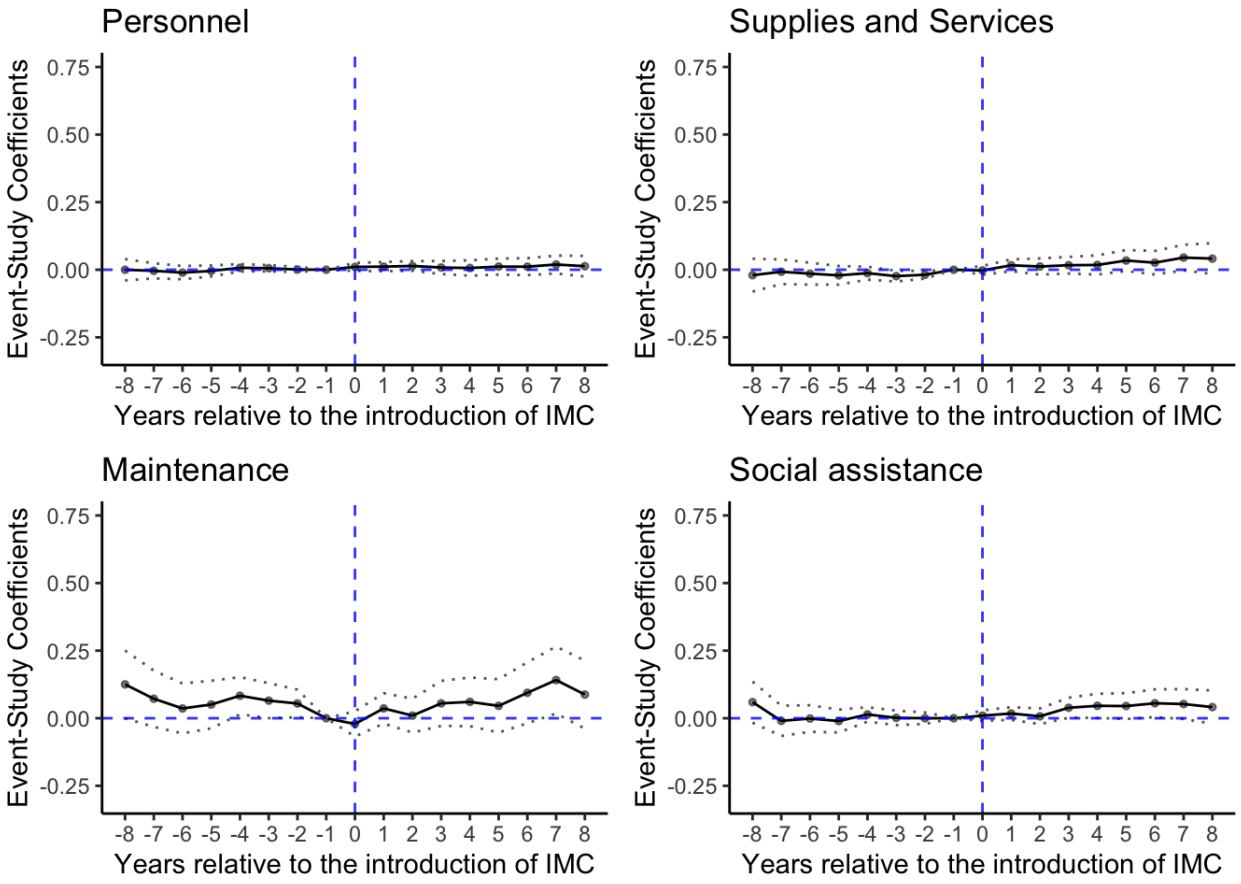
years old, the share of the population older than 65 years old, the share of secondary industrial workers among total workers, and the share of tertiary industrial workers among total workers as covariates of basic geographic characteristics and ii) the financial capability indicator, local government debts, taxable income, the number of municipal officials and the number of workers as covariates of local public finance and administration. Columns (1) and (3) of Table 2 show the results of the specification in Equation (1), controlling for basic geographic characteristic covariates. Columns (2) and (4) of Table 2 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.3 in the Online Appendix 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.[14]

Expense item The financial status of municipalities can also be a potential confounding factor in IMC implementation. For instance, 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 expenditures by character. Expenditure by character is local

[14]In addition, Figure A.4 in the Online Appendix presents a test of covariate balances.

government expenditure categorized into personnel, supplies and services, maintenance, and social assistance expenditures. Figure 5 shows the impact of IMC on expenditure by character using Equation (2), where all point estimates are indistinguishable from zero. Moreover, the results do not show any specific trend prior to IMC adoption, reinforcing the conclusion that implementing IMC is not influenced by the fiscal conditions of municipalities.

Figure 5: 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.

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.5 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.

4.4 Triple-Difference Results

Our findings thus far suggest that the unpaid tax collection rate in municipalities substantially increases after the introduction of IMC. In this section, we estimate triple-difference specifications to demonstrate that the results are robust even under weaker assumptions.

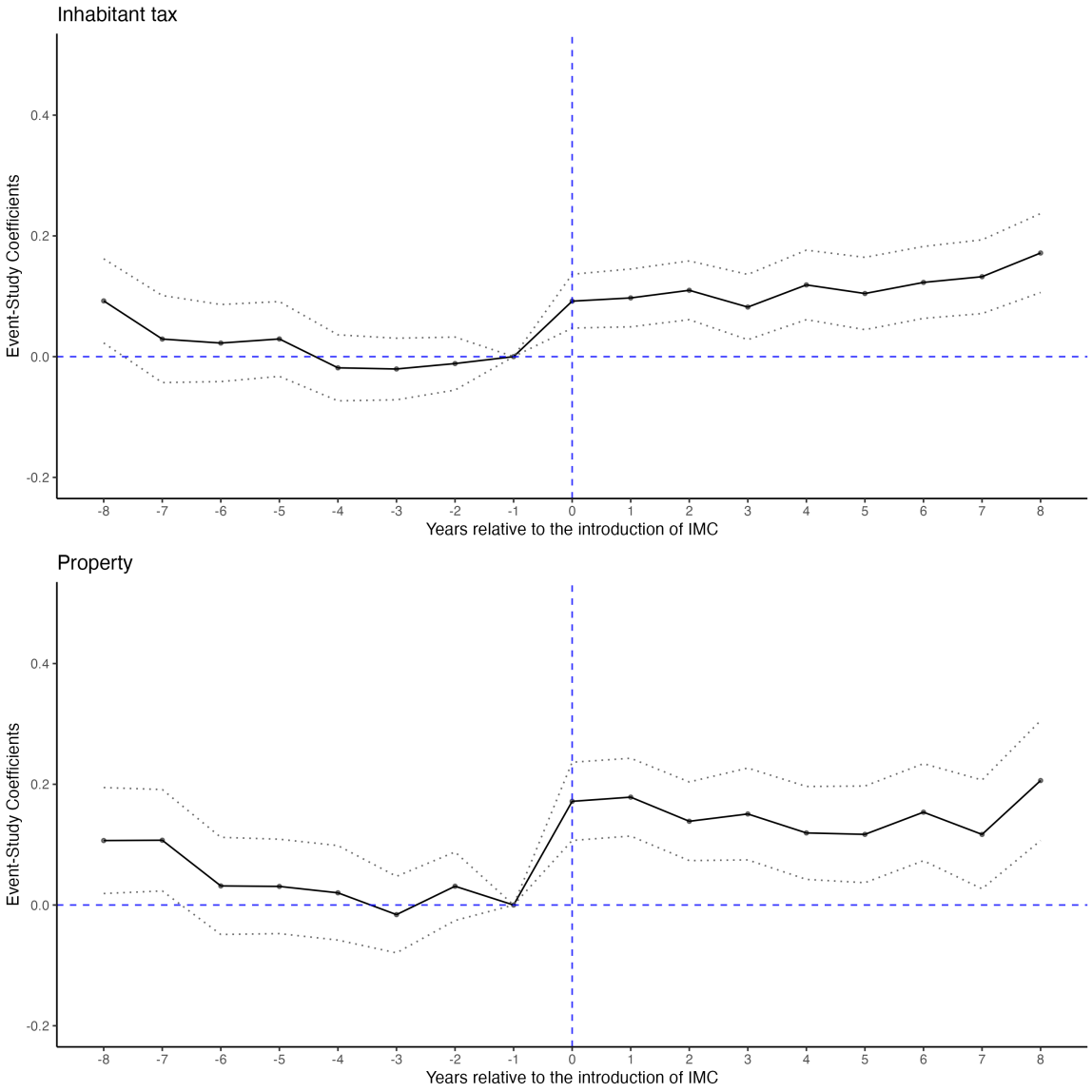
In this specification, we stack the unpaid tax collection rate with the present tax collection rate, which is not affected by IMC, and use the difference between these outcome variables as an additional variation. Therefore, this specification includes dummy variables capturing the timing of the introduction of IMC, which interact with indicators of two tax collection rates. The specification is as follows:

$$Y_{i,p,t,u} = \sum_{-8,\tau\neq-1}^{8} \beta_\tau IMC^\tau_{i,p,t,u} + \sum_{-8,\tau\neq-1}^{8} \eta_\tau IMC^\tau_{i,p,t,u} \times I_u + \mu_{u,y} + \alpha_{u,i} + \rho_{p,y} + \varepsilon_{i,p,y,u} \quad (3)$$

$Y_{i,p,y,u}$ is the tax collection rate of tax type u (either the unpaid or present tax collection rate) in municipality i of prefecture p in year y. I_u is an indicator variable that equals 1 if Y_{uipy} is the unpaid tax collection rate and 0 if Y_{cipy} is the present tax collection rate. μ_{uy} and α_{ui} are tax-type-by-municipality and tax-type-by-time fixed effects, respectively. The parameters of interest are η, which captures the effects of IMC on the unpaid tax collection rate relative to the present tax collection rate.

In this specification, we can capture the effect of IMC under the assumption that in the absence of treatment, the relative outcomes of the two tax collection rates follow the same trend between the treatment and control groups. In other words, it is not necessary to assume two parallel trends for the two tax collection rates (Olden and Møen 2022). Therefore, this specification allows for the introduction of IMC to be correlated with unobserved factors, thus requiring only the assumption of this relative comparison.

Figure 6: Event study plots by the Triple-Difference: The tax collection rate



Note: This figure plots the estimation results of the event study analysis counterpart of the triple-difference specification and 95% confidence intervals (dotted lines). The horizontal axis indicates years relative to the introduction of the IMC. The model controls for tax-type-by-municipality and tax-type-by-time fixed effects. Standard errors are clustered at the municipality level.

Figure 6 presents the triple-difference estimator in Equation (3) with 95 percent confidence intervals, in which the top and bottom panels indicate the results for the inhabitant and property taxes, respectively. In all the panels of Figure 6, we observe that the coefficients spike to positive and significant in the post-treatment periods and that the estimated coefficients are close to zero prior to the introduction of IMC. These results are consistent with the DID results.

5 Heterogeneity

5.1 Inter-municipal organization and municipal official levels

In this section, we explore two potential channels, focusing on IMC composition.[15] First, IMC establishes a new jurisdiction, that takes over a part of the tax collection for unpaid taxes within each municipality. Collaborative tax collection at the IMC organization level increases the deployment of tax collection officials on a per-case basis, leading to effective tax enforcement. Second, training and interaction within IMC may improve the tax enforcement capabilities of officials at each municipal level. Therefore, implementing IMC may improve tax enforcement through the channels at the inter-municipal organization and municipal official levels.

To investigate two levels, we focus on IMC composition, particularly the inclusion of municipal officials. The lack of municipal officials within IMC implies the absence of interaction between each local tax official within IMC, suggesting that the impact of IMC on tax enforcement is derived solely from collaborative collection at the IMC organization level. Thus, we estimate the heterogeneous effects of IMC on tax enforcement based on its composition with the following specification:

$$Y_{i,p,y+1,c} = \beta_1 IMC_{i,p,y,c} + \beta_2 IMC_{i,p,y} \times \textit{Municipal official}_c + \mu_i + \sigma_y + \varepsilon_{i,p,y,c} \qquad (4)$$

where $Y_{i,p,y+1,c}$ is the tax collection rate with a one-period lead. This specification incorporates a lead period of outcome variables, considering that municipal officials who benefit from IMC may require some time to enhance their tax enforcement capabilities. $\textit{Municipal official}_c$ is an indicator variable that equals 1 if municipality i's official participates in IMC and 0 otherwise. μ_i and σ_{py} are municipality and time fixed effects, respectively.[16] The parameter of interest β_2 is the differential impact of IMC on tax enforcement redbetween the group composed of municipality officials and the group composed of other than municipality officials. If there are externalities through training and interaction within IMC, then the sign of β_2 should be positive.

The estimates of Equation (4) for IMC composition are shown in Table 3.[17] The coefficients of the interaction term in Table 3 are positive and statistically significant exclusively in Column (1), which pertains to the inhabitant tax. This result suggests that the tax collection of inhabitant taxes benefits from the learning and interaction within IMC, resulting in improved tax enforcement.

[15] See Section 2.1 for more information on the IMC channels.

[16] While 46 municipalities participate in the IMC without sending any officials, the majority of municipalities participated in these collaborations. Therefore, due to the small degree of variation between the treatment group and the control group within prefectures, we use time fixed effects instead of prefecture-by-time fixed effects in the estimation of Equation (4).

[17] Table A.2 shows the estimates of Equation (4) 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.

Table 3: DID estimate: Heterogeneous effects by IMC composition

	(1)	(2)
	Inhabitant tax	Property tax
TaxIMC × Municipal official	0.184***	0.141
	[0.062]	[0.102]
TaxIMC	-0.091	0.244***
	[0.058]	[0.098]
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 (4). 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.

In contrast, the coefficients of the interaction on property tax in Column (2) are null. In addition, the coefficients that do not involve an interaction term are positive and statistically significant, while it is difficult to obtain the exact suggestion from this result because of unrelated taking the lead of the outcome and collaborative tax collection at the IMC level. However, assuming that the effect of collaborative collection at the IMC level is constant, this positive effect may imply that only property taxes benefit from collaborative tax collection at the IMC level.

These findings are consistent with the fact that IMC prioritizes property taxes, which are more expensive per case, over inhabitant taxes. Property tax is subject to collaborative collection by IMC, which may increase the unpaid collection rate. In contrast, collecting inhabitant tax is primarily done at the municipal level, and improving the capability of officials at each municipal level may lead to more effective tax collection. Therefore, the effects of training and interaction at the municipal level are more effective for tax categories where there is room for individual municipalities to intervene.

These findings suggest that human resource development is crucial, not just to augment human capital, but for enhancing local tax enforcement. Furthermore, in municipal cooperation, it may be necessary to consider the effects of interactions within the IMC rather than merely focusing on scaling operations.

5.2 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 additional tax collections may be costly. In the context of IMC, two conflicting mechanisms of

cost efficiency are considered: cost savings from economies of scale and operational efficiencies of administration, and increasing cost due to coordination issues (Bel and Warner 2015; Allers and de Greef 2018). Additionally, some studies emphasize the importance of population size in a municipality for cost reduction (Bel and Warner 2015; Ferraresi et al. 2018; Notsu 2024). In the setting of IMC and tax enforcement, collaborative collection at the inter-municipal level can impact the costs of tax collection.[18] Specifically, this collaboration is likely to target tasks involving substantial amounts per case, such as property taxes. In Japan, where the population is declining, the issue of unpaid property tax on vacant houses has become increasingly problematic, and particularly, municipalities with larger populations tend to have more vacant houses. Therefore, IMC may be more cost saving in these larger municipalities through collaborative collection efforts at the inter-municipal level.

From a cost perspective, we examine the heterogeneous effects of IMC on tax administrative costs based on population share. Tax administrative costs include comprehensive costs associated with tax collection, such as personnel expenditures, travel expenditures, demand-related expenditures, and consignment expenses for creating program systems. We estimate as follows:

$$Y_{i,p,y} = \beta_1 IMC_{i,p,y} + \beta_2 IMC_{i,p,y} \times pop50000_i + \beta_3 IMC_{i,p,y} \times (1 - pop50000_i) + \mu_i + \rho_{p,y} + \varepsilon_{i,p,y} \quad (5)$$

where $Y_{i,p,y}$ is the tax administration costs in municipality i of prefecture p in year y, which are converted into their logarithmic forms. Tax administrative costs refer to the comprehensive costs associated with tax collection (Notsu 2024). Pop50000 is a binary dummy variable that equals 1 if municipality i has more than 50,000 inhabitants and 0 otherwise.[19] The parameters of interest β_2 and β_3 are the effects of IMC in municipality i on more than 50,000 inhabitants and the effects of IMC in municipality i on fewer than 50,000 inhabitants.

In addition, we consider the population shares relative to the total population within IMC and estimate as follows.

$$Y_{i,p,y} = \beta_1 IMC_{i,p,y} + \beta_2 IMC_{i,p,y} \times Share_i + \mu_i + \rho_{p,y} + \varepsilon_{i,p,y} \quad (6)$$

where $Share_i$ is the population share of municipality i relative to the total population of all municipalities engaged in IMC. β_2 indicates differences in the impact of IMC by higher population share within IMC.

[18] Tax collection involves personnel, travel, demand-related expenditures, and system expenditures. In particular, joint collection by IMC is expected to spread out the fixed costs of these expenses and reduce personnel expenditures by improving operational efficiency (Notsu 2024). Meanwhile, additional costs may be incurred in coordinating among municipalities for joint collection.

[19] We use this binary variable because a population of 50,000 or more is one of the general requirements for a Japanese city

Table 4: DID estimate: Tax administrative costs

	(1)	(2)	(3)
TaxIMC	0.001		0.029
	[0.021]		[0.024]
pop50000		0.010	
		[0.026]	
TaxIMC × pop50000		-0.078***	
		[0.030]	
TaxIMC × (1 - pop50000)		0.008	
		[0.021]	
TaxIMC × Share			-0.222***
			[0.060]
R-squared	0.880	0.880	0.880
Observations	22523	22523	22523
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Note: The table shows the effects of IMC on tax administrative costs, where columns 1, 2, and 3 correspond to Equations (1), (5), and (6), 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 4 presents the estimation results of heterogeneous effects by population size, where columns (2) and (3) correspond to the estimated Equations (5) and (6), respectively. Column (1) of Table 4 provides the baseline estimate without any interaction with the population, and we cannot observe the effects of IMC on tax administrative costs. In Column (2), only the coefficients of the interaction term between IMC and a population of more than 50,000 inhabitants indicate a decrease in tax administrative costs by IMC implementation. Furthermore, in Column (3), the coefficients of the interaction term between IMC and population share demonstrate the negative effects of IMC on tax administrative costs, consistent with the results of Column (2) in Table 4. These results suggest that IMC decreases tax administrative costs in municipalities with larger populations.

These results indicate that collaborative tax collection at the inter-municipal level does not lead to increased costs of tax collection. Rather, costs are reduced in larger municipalities with numerous projects subject to inter-municipal collaborative tax collection. Furthermore, as detailed in subsection 4.3.2, there is no observed increase in costs for other expense items due to IMC. Those results suggest that IMC could be a rational governmental reform for enhancing tax enforcement.

5.3 Taxpayer compliance

In this section, we examine whether IMC influences taxpayer behavior. Some IMCs advertise the sale of seized assets as a warning to those with unpaid taxes. These IMC warnings may increase unpaid tax collection rates by promoting taxpayer compliance rather than by enhancing administrative tax enforcement capabilities. To explore this, we demonstrate the heterogeneous effects of IMC based on its engagement in advertising, a specification similar to that in Equation (6).

Table A.3 presents the estimation results of the heterogeneous effects based on advertisements. The coefficients of no interaction are almost consistent with the baseline effects in Table 1, and the coefficients of the interaction term between IMC and the presence of advertisements are null. These results suggest that advertising by IMCs does not significantly affect unpaid tax collection rates. Furthermore, the findings imply that IMC can close the tax gap by enhancing tax enforcement on the administrative side, rather than by encouraging compliance on the taxpayer side.

6 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. First, to examine potential channels, we use data on whether the IMC is composed of municipal officials. The results show that the unpaid tax collection rate for inhabitant taxes increases when the IMC is composed of municipal officials, while there is no observed relationship between the composition of IMC and property taxes. This finding suggests that, in the case of inhabitant taxes, training and interaction within IMC lead to more effective tax collection for each municipal official, which is consistent with the fact that property taxes are prioritized in collaborative efforts at the inter-municipal organization level. Second, we estimate the heterogeneous effect of IMC on tax administrative costs by population size. The analysis does not show any increase in tax administrative costs due to IMC, rather, in municipalities with larger populations, IMC reduces tax administrative costs. These results suggest that IMC reform to enable enhanced tax enforcement could be a rational governmental reform compared to 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 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.

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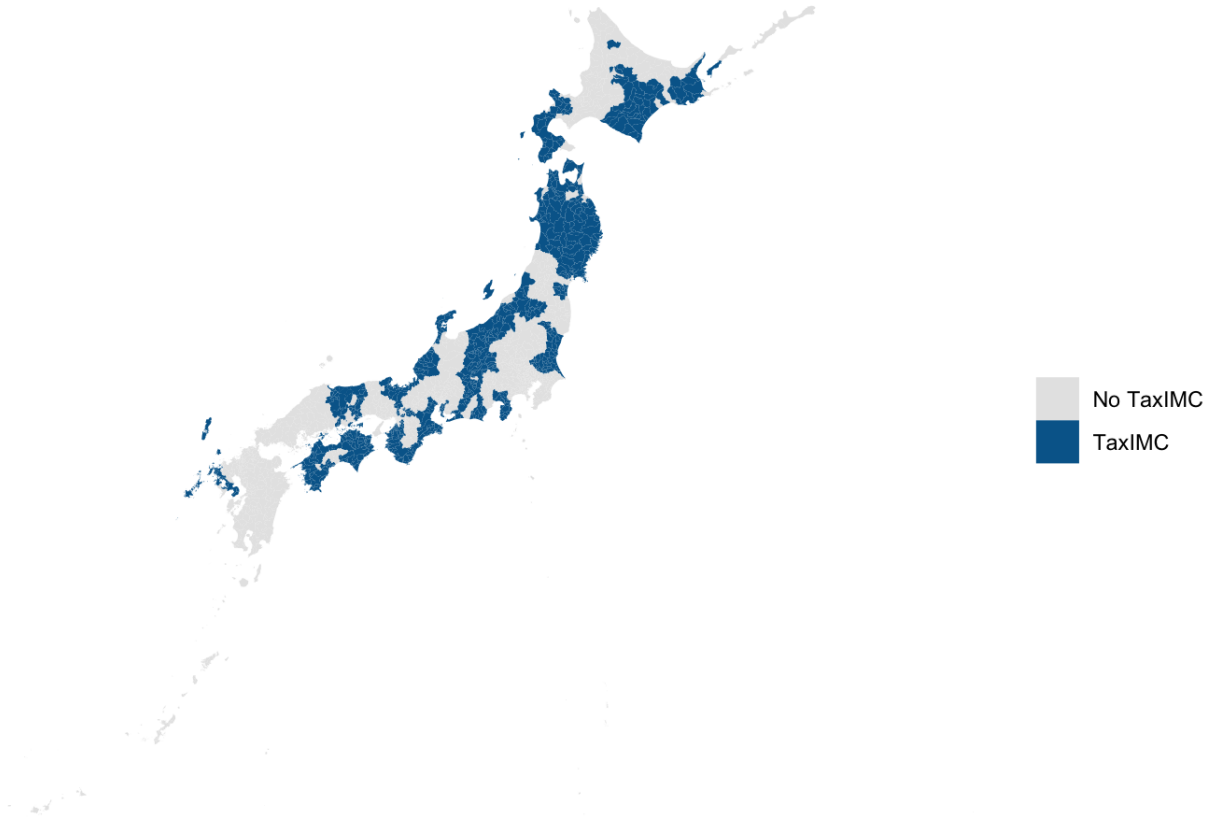
A Appendix

Figure A.1: Reform of tax collection amount per taxpayer

Note: Trends in the total 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.

Figure A.2: Introduction of IMC in Japan



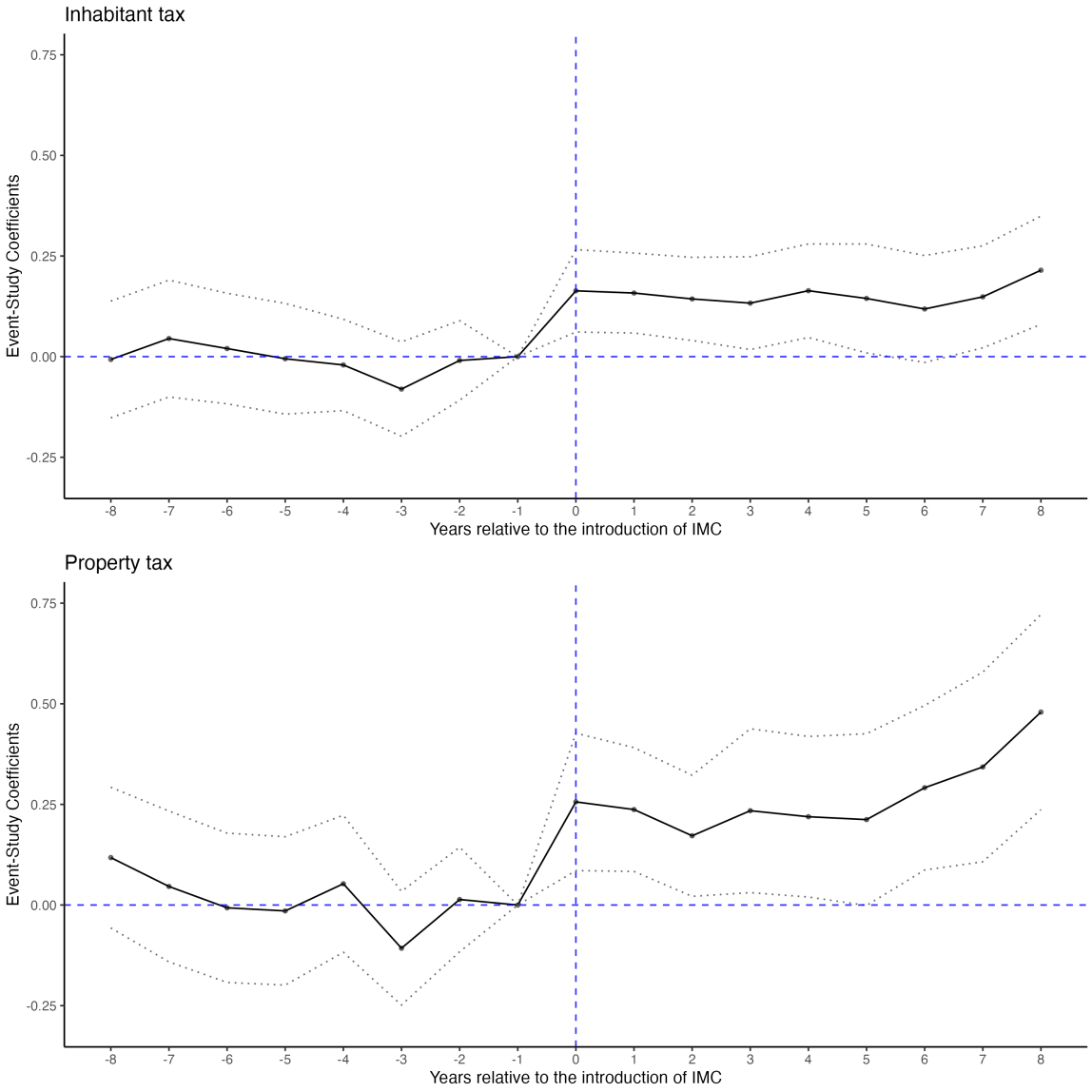
Note: This map shows the distribution of the introduction of IMC in municipalities. The blue regions represent the regions implementing IMC as of 2018.

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
Expenditures by character		
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
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

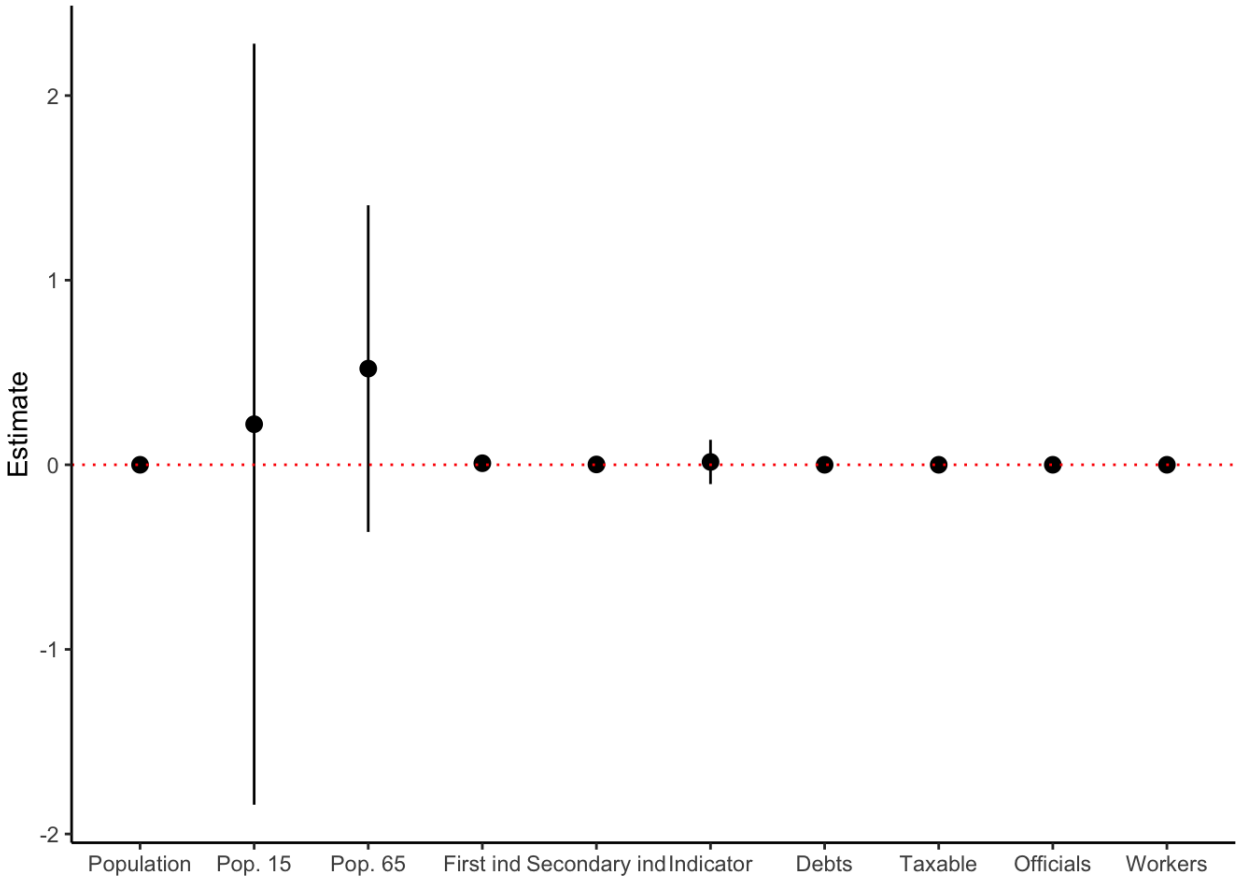
Note: The monetary unit is 1,000 yen (approximately 6.7 dollars at an exchange rate of 150 yen to 1 U.S. dollar). Tax administrative, personnel, supplies and services, maintenance, and social assistance expenditures are measured on a per capita basis. Overtime payment is measured per municipal official. This summary uses samples as of 2007. 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.

Figure A.3: Event study plots: Adding Covariates



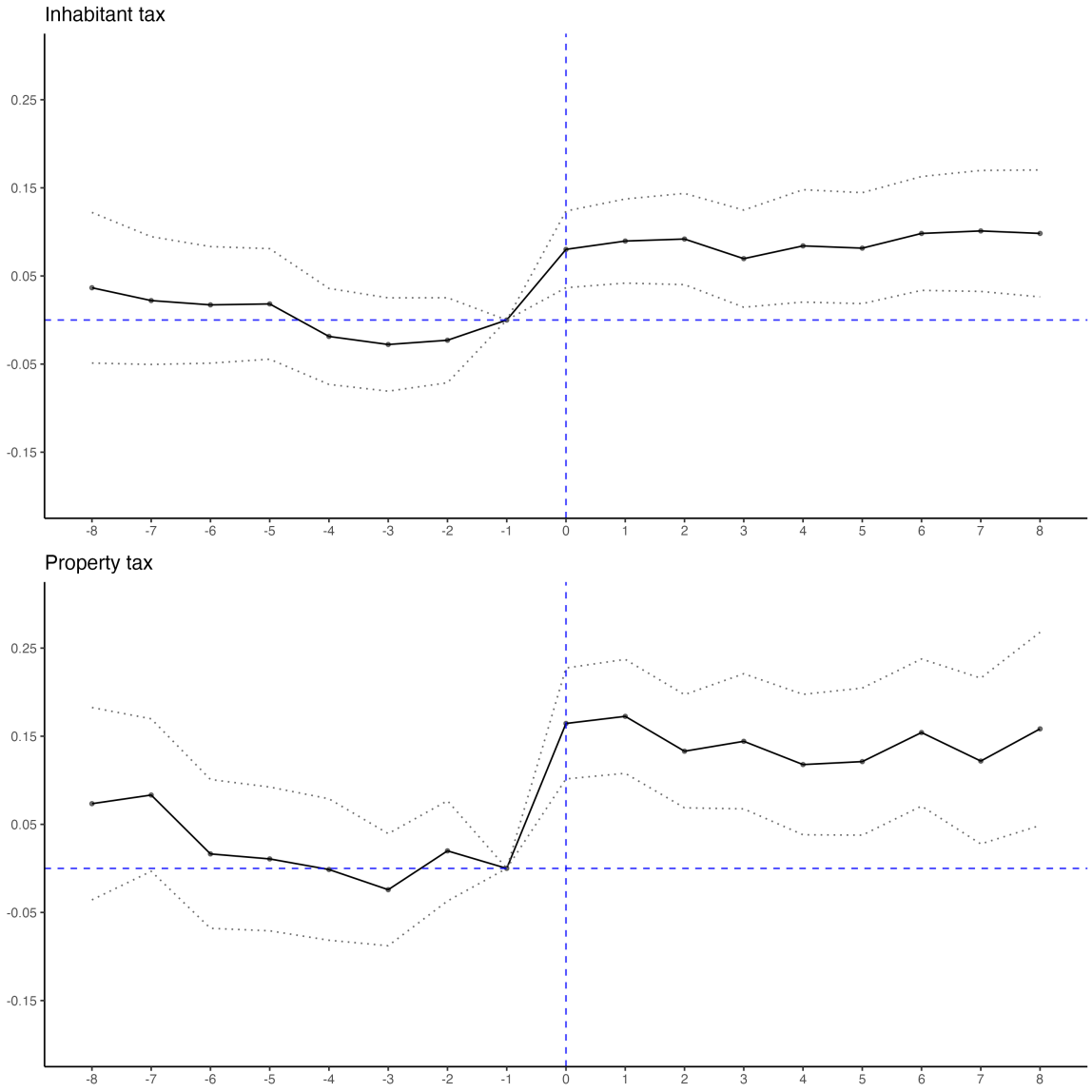
Note: This figure plots the estimation results of the event study analysis and 95% confidence intervals (dotted lines). The horizontal axis indicates years relative to the introduction of IMC. The model controls for basic geographic characteristic and local public finance covariates, municipality fixed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

Figure A.4: 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.

Figure A.5: 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), corrected following Sun and Abraham (2021). The horizontal axis indicates years relative to the introduction of IMC. In Sun and Abraham (2021), the full set of cohort-time-specific treatment effects estimated is aggregated using weight considering the sample shares of each cohort in the relevant period.

Table A.2: DID estimate: The case of municipal officials from all municipalities participating in IMC

	(1) Inhabitant tax	(2) Property tax
TaxIMC × Municipal official	0.121**	0.080
	[0.047]	[0.059]
TaxIMC	-0.018	0.178***
	[0.042]	[0.050]
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 (4). 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.3: DID estimate: Heterogeneous effects by IMC advertising

	(1) Inhabitant tax	(2) Property tax
TaxIMC × Warning	0.049	-0.038
	[0.084]	[0.133]
TaxIMC	0.162***	0.283***
	[0.052]	[0.082]
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 (4). 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.