International Tax Evasion,
State Purchases of Confidential Bank Data and
Voluntary Disclosures

Dirk Bethmann and Michael Kvasnicka

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Abstract

International tax evasion is a major source of discontent for tax authorities. State purchases of bank data on suspected tax evaders from international tax havens constitute one tool to combat such tax evasion. Increasing the risks of detection, such purchases may spur voluntary disclosures for fear of facing charges for tax fraud. Tax authorities in Germany have made repeated use of this tool in recent years, above all in North-Rhine Westphalia, Germany's most populous federal state. Using self-compiled data for North-Rhine Westphalia on the timing and content of data acquisitions and on monthly voluntary disclosures of international tax evasion involving Swiss banks, we study the effects that such acquisitions had on the evolution of voluntary disclosures over time. Our results show that purchases of data on potential tax evaders had a positive and sizeable effect on voluntary disclosures. Various robustness checks and additional explorations corroborate this conclusion.

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1 Introduction

International tax evasion has become a major source of discontent for tax authorities worldwide. Recent evidence produced in Zucman (2013) suggests that about 8% of the global financial wealth of households is held in tax havens, of which three-quarters goes unrecorded, and that offshore assets are owned in the main by residents of rich countries, particularly by Europeans.[1] Of these assets (recorded and unrecorded), a large fraction is held or managed in Europe itself, often in small landlocked Switzerland, a major offshore financial center and tax haven famous for its strict bank secrecy and data privacy laws.[2]

Tax havens harm state finances. By facilitating the avoidance or evasion of taxes, they erode countries' tax bases and undermine their regulatory and taxation processes. Lack of information on assets or income located abroad is the most important obstacle for tax authorities in their fight against tax evasion, for wealth or income that is unrecorded cannot be taxed. Tax havens, for obvious reasons, are reluctant to share such information with countries suffering from tax evasion.[3] Growing pressure amidst the financial and economic crisis of 2008/09, however, has led to an explosion of bilateral tax treaties that provide for an exchange of information between countries. Today, such treaties are the main policy instrument in the fight against international tax evasion. Recent evidence, however, suggests that such treaties may not be very effective.[4] In part, the problem is one of design. For such treaties generally require information only to be exchanged about a named person, 'fishing expeditions' are prohibited. Furthermore, to be effective, cooperation of those countries who benefit most from tax evasion is required, that is of tax

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[1] Earlier estimates of household offshore wealth are even larger than the $5.9 trillion in 2008 estimated by Zucman (2013). They include $6.7 trillion in 2008 (Boston Consulting Group, 2009) and $8.5 trillion in 2002 (Cap Gemini and Merrill Lynch, 2002). According to Palan et al. (2010), the global rich in 2007 held wealth worth $12 trillion in tax havens.

[2] According to Boston Consulting Group (2009), about a third of the world's offshore wealth is in Switzerland. Zucman (2013) estimates that one third of the global missing wealth can be traced back to Switzerland (estimated at $1,545 billions). According to data published by Swiss tax authorities, about 80% of the wealth held by Europeans in Switzerland seems to be evading taxes (Zucman, 2014).

[3] Strict bank secrecy and data privacy laws are a core feature of tax havens. It is for this reason that tax havens are also referred to as "secrecy jurisdictions".

[4] Evaluating the G20 tax haven crackdown in 2009, Johannesen and Zucman (2014) produce evidence that the information exchange treaties forced upon tax havens under the threat of economic sanctions caused tax evaders to shift deposits to havens not covered by a treaty with their home country, rather than to repatriate funds.

havens themselves.

To enforce tax compliance by their citizens, however, governments in recent years relied not only on bilateral tax agreements for acquiring data on wealth and income located abroad. Some countries, most notably Germany, acquired such data also unilaterally – by buying confidential bank data from tax havens offered to them for sale by whistle-blowers, often former employees of major international banks. Germany's most populous federal state, North-Rhine Westphalia, has been particularly active. Since 2010, it has bought data on ten occasions containing names of suspected tax evaders with accounts in Switzerland.[5] Although controversial, both within and outside Germany, the use of such unauthorized disclosure of information by tax authorities has been accepted by courts in Germany,[6] and it seems to have paid off significantly for the state of NRW. According the Ministry of Finance of NRW, purchases of data CDs led to an estimated additional tax revenue of two billion Euros for NRW, a sizeable amount both in absolute and in relative terms.[7]

State acquisitions of confidential bank data from tax havens increase the risks of detection for tax evaders. This may spur timely voluntary disclosures of tax evaders for fear of facing criminal charges. Voluntary disclosure programs exist in most OECD countries (see OECD (2015) for a concise review of existing country-specific programs). Voluntary disclosure is an act by which a delinquent taxpayer discloses voluntarily information not previously reported to tax authorities in return for immunity from prosecution for tax fraud. A voluntary disclosure (essentially an amended tax return) is only possible if tax authorities have not started investigations into fraud.[8] If effective, a tax evader has to pay the tax liability plus interest and possibly some penalty surcharges, but generally no longer faces the risk of being prosecuted for tax fraud.[9] The effects on voluntary disclosures of

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[5]Information on these purchases of Swiss data is provided in Table A-1 in the appendix.

[6]See, for example, the New York Times article from April 2, 2012 "Swiss Seek Arrest of 3 German Tax Officials Over Stolen Banking Data". Information on individual court decisions is provided on the official website of the Ministry of Finance of NRW at `http://www.fm.nrw.de/allgemein_fa/steuerzahler/Steuerhinterziehung/index.php` (in German).

[7]For the whole of Germany (not just for NRW) and for all kinds of voluntary disclosures (not only those involving untaxed wealth abroad), the additional revenue generated in the same period amounted to four to five billion Euros.

[8]It must also be complete and free of error to be effective and guarantee immunity.

[9]Rules, however, do vary across countries. In particular, not everywhere does a voluntary disclosure minimise, or eliminate, the risk of criminal prosecution.

such state-sponsored data purchases, however, have received surprisingly little attention in the literature. Hardly anything, as a consequence, is known on the effectiveness of such data acquisitions in helping states to tax hitherto untaxed wealth of domestic residents held abroad.

Using self-compiled unique data for North-Rhine Westphalia (NRW) for the period January 2010 to November 2015 on the timing and content of state data acquisitions of bank data from Switzerland and on monthly voluntary disclosures by NRW residents involving Swiss banks, we study the effects that such acquisitions had on the evolution over time of voluntary disclosures by NRW residents involving Swiss banks. Our results show that these exogenous shocks to the probability of detection had a positive and sizeable effect on the number of voluntary disclosures. Various robustness checks corroborate this conclusion, as do additional explorations, such as the study of google keyword searches for "voluntary disclosure" in Germany. As expected, the latter also show a positive response following the emergence of a new purchase. Furthermore, and also in line with expectations, this response both materializes more quickly and exhibits less persistence than the response of actual disclosures. We also find evidence for a more timely response of voluntary disclosures to purchases of data from Switzerland which have been linked in the press to specific banks in Switzerland. This more timely response may be explained by the perceived greater need of tax evaders to respond quickly by way of voluntary disclosure to such purchases of data, being faced with a greater and more imminent risk of identification and hence prosecution by tax authorities.

There is a large body of literature that is of broader relevance to our paper. First, there are numerous studies on tax evasion by individuals (see Slemrod (2007) for a review of and introduction to this strand of literature). Theoretical work on individual tax evasion started with Allingham and Sandmo (1972) and Yitzhaki (1974) (see Sandmo (2005) for an overview). Alm (2012) reviews the empirical work on the subject which is – despite the obvious difficulties in quantifying tax evasion – surprisingly large. Second, there is also some (although mostly theoretical) literature on temporary tax amnesties programs (see, for example, Malik and Schwab (1991), or Alm and Beck (1993)), which however differ

significantly in nature and regulation from permanent voluntary disclosure programs.[10] Finally, and of more immediate relevance to our paper, little work has been done on voluntary disclosure programs. To the best of our knowledge, only two studies have explored voluntary disclosure programs, albeit again predominantly from a theoretical perspective (see Andreoni (1991) and Langenmayr (2016)). What is more, only one of these studies has inquired empirically into the link between state purchases of confidential bank data and state tax revenues from voluntary disclosures (see Langenmayr (2016)). In a short appendix to her paper, Langenmayr provides tentative evidence for Germany that changes in detection risks can increase state tax revenues. Employing a difference-in-difference (DiD) approach and using the GENESIS data base of the German Federal Statistical Office, Langenmayr finds that the acquisition of whistle-blower data in February 2010 had a positive effect on the relative evolution in 2005-2012 of annual self-reported income tax revenue to that of annual payroll tax revenue. However, several shortcomings beset the analysis. First, there had been a data purchase already in the pre-treatment period (in 2006), and seven more data purchases occured in the post-treatment period (2010-2012). Second, self-reported income tax revenue (the chosen outcome measure) includes not only revenue raised after all types of voluntary disclosure (including disclosures on assets held domestically), but also on any type of entrepreneurial income - a sizable and much larger aggregate than total revenue from voluntary disclosures involving only foreign assets. Finally, tax data at annual frequency appears inappropriate as a measure of response of tax evaders filing voluntary disclosures.[11] In our empirical analysis, we improve upon these shortcomings in several ways, which provides for a more convincing identification strategy of the effects of state data purchases of confidential bank data on voluntary disclosures involving untaxed wealth held abroad. In our period of investigation (January 2010 to November 2015), we will consider *all* data purchases linked to Switzerland and employ a *monthly* measure of response (number of voluntary disclosures) that *only* covers voluntary disclosures involving Swiss banks.

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[10]Tax amnesties are discretionary, temporary programs (they run for about a quarter), which, unlike voluntary disclosure programs, usually do not fine tax evaders, are often open also to individuals already under investigation by tax authorities, and allow also only partial disclosure.

[11]To be valid, voluntary disclosures require very timely responses of tax evaders in the face of a pending investigation. Once authorities have started an investigation, tax evaders no longer can become tax compliant by filing a voluntary disclosure and thereby evade prosecution.

The paper proceeds as follows. Section 2 describes the self-compiled data and the identification strategy we use in our empirical analysis. Section 3 presents and discusses our regression results. Section 4 concludes.

# 2 Data and Empirical Strategy

2.1 Data and Summary Statistics

Since January 2010, Germany's largest federal state North-Rhine Westphalia (NRW) is collecting data on the number of voluntary disclosures involving Swiss banks that are filed each month by NRW residents.[12] Although publicly available from the Ministry of Finance of NRW, this unique data surprisingly has not yet been used in research of any kind, economic or other.[13] The data set we use in the empirical analysis covers the period January 2010 to November 2015 and consists of two main types of data, (i) the aforementioned official data on the monthly absolute number of voluntary disclosures involving Swiss banks made by NRW residents to tax authorities in NRW, and (ii) self-compiled data on the respective calendar months in which purchases of data on potential tax evaders from NRW by tax authorities in NRW have been made public in the press.[14] We use (i) to construct our dependent variable and (ii) to construct our explanatory variables of main interest. Some of our robustness checks and additional explorations make use also of further data, including data on keyword searches from google trends and monthly exchange rates between the Euro and the Swiss franc. We defer a discussion of these additional data until we first make use of them in the analysis.

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[12]Interestingly, NRW does not collect monthly data on the total number of voluntary disclosures, which include also domestic disclosures and disclosures involving assets in foreign countries other than Switzerland. To the best of our knowledge, no similar data is available for any other of the 16 federal states in Germany.

[13]The data can be downloaded from the website of the Ministry of Finance at `http://www.fm.nrw.de/allgemein_fa/steuerzahler/Steuerhinterziehung/index.php` (in German).

[14]Data acquisitions have generally not been announced (nor have they been later confirmed) by tax authorities in NRW. Information on the timing and content of data acquisitions has been compiled from press items in print and online media. Information on the first press coverage of individual data purchases, including the exact publication date, is provided in Table A-1 in the appendix.

Figure 1: MONTHLY NUMBER OF VOLUNTARY DISCLOSURES INVOLVING SWISS BANKS AND CALENDAR MONTHS OF PURCHASES OF SWISS BANK DATA, JANUARY 2010 TO NOVEMBER 2015
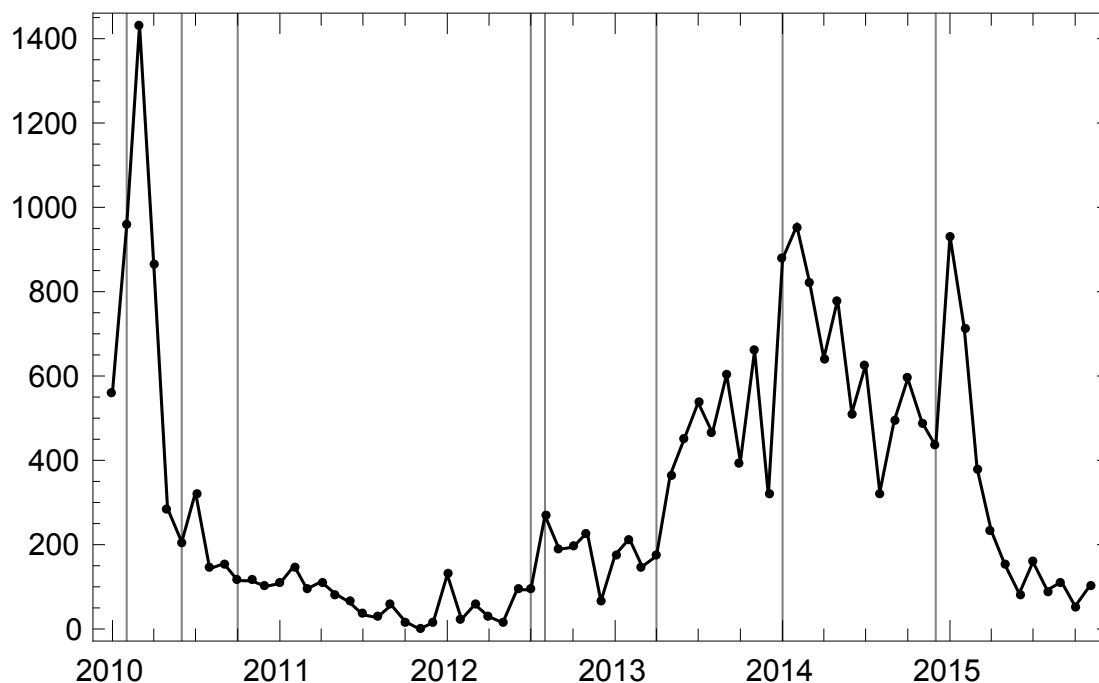
NOTES: The black curve shows monthly voluntary disclosures involving Swiss banks of NRW residents to NRW tax authorities in the period January 2010 to November 2015. Zero disclosures were filed in November 2011 (the only month). The eight grey vertical lines indicate the respective calendar months in which it became public that a new data CD with information on potential tax evaders holding illicit wealth in Switzerland has been bought by tax authorities in NRW. Data on monthly voluntary disclosures stem from the Ministry of Finance of NRW and can be accessed online (see footnote 13 for the link). Details on individual purchases of data CDs have been compiled by the authors from various press articles (references for these articles and further information on data purchases is provided in Table A-1 in the appendix).

Figure 1 plots our raw data for the period January 2010 to November 2015, as published online by the Ministry of Finance of NRW, on the monthly absolute number of voluntary disclosures involving Swiss banks made by NRW residents to tax authorities in NRW. Also documented in Figure 1 are the respective eight calendar months in which the altogether ten purchases of data over this period by tax authorities in NRW containing information on potential NRW tax evaders holding illicit wealth in Switzerland have become public.[15]

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[15]Both in June 2010 and August 2012, two sets of data purchases have been revealed in the press. The only purchase of data by tax authorities in NRW which did not involve Swiss banks (bank data from Luxembourg, made public in the press in October 2011) is not shown in Figure 1. For details on individual purchases of Swiss data, see Table A-1 in the appendix.

Three major insights may be gained from Figure 1. First, the evolution over time of the absolute number of voluntary disclosures involving Swiss banks made by NRW residents to tax authorities in NRW roughly follows a U-shaped pattern. After a peak in early 2010 (in April), voluntary disclosures decline rapidly, then remain relatively constant at low numbers in 2011 and the first half of 2012, and begin to rise again from 2013 onwards (from the second quarter of 2014, however, this rise looses pace and eventually levels off, despite a marked, albeit short-lived, resurgence in January 2015). Second, the surge in voluntary disclosures in January 2015 is surprising, as the rules governing voluntary disclosures were significantly tightened from January 1st, 2015. Many, including NRW's Finance Minister, had predicted a marked drop in voluntary disclosures for January 2015 (from their level in December 2014). Evidently, this drop did not materialize. Instead, voluntary disclosures surged in January 2015. Third, and of greatest relevance for our research question, the monthly number of voluntary disclosures appear to increase significantly in the first few months after data purchases have become public, but show no local hike immediately before such purchases emerge. This pattern in relative time (not calendar time) is suggestive of a sizeable and time-limited effect of data acquisitions on voluntary disclosures.

2.2 Empirical Strategy

To identify the effect of purchases by NRW tax authorities of Swiss bank data on the number of voluntary disclosures by NRW residents, we estimate variants of the following equation:

$$y_t = \alpha + year_t + \sum_{i=1}^{z} \gamma_i \times month_t^i + \sum_{j=-1}^{n} \beta_j \times data_{t+j} + \varepsilon_t, \tag{1}$$

where y_t is the log of the number of monthly voluntary disclosures (plus one[16]) involving Swiss banks made by NRW residents to tax authorities in NRW in calendar month t, $year_t$ is a full set of year dummies, $\sum_{i=1}^{z} month_t^i$ is a polynomial of degree z in (monthly) calendar

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[16]In November 2011, zero disclosures were filed. For this reason, we take the log only after adding one to each monthly disclosure observation.

time, and $\sum_{j=-1}^{n=5} data_{t+j}$ is a set of indicator variables capturing whether the current period (calendar month) t is leading a data purchase by one month, coinciding with a period of data purchase, or lagging a period of data purchase by one to n months. In the empirical analysis, we choose n, i.e. the number of lags, to equal 5. Finally, ε_t is an error term.

The treatment effect of interest are the β_j coefficients, for $j \geq 0$. They capture the contemporaneous ($j = 0$) and delayed responses ($j > 0$) of voluntary disclosures to a data purchase. The coefficient β_{-1} on our indicator for the month before a new purchase has emerged captures any anticipatory effects on voluntary disclosures. β_{-1} should be statistically indistinguishable from zero if our dating of the emergence of purchases is correct and emergences in the press are indeed shocks that change the information set and detection risk of potential tax evaders. The set of year dummies $year_t$ controls for level changes in voluntary disclosures between different calendar years, and the polynomial of degree z in (monthly) calendar time $\sum_{i=1}^{z} month_t^i$ controls in a flexible way for any underlying monthly trend affecting the evolution of voluntary disclosures over time, as could be caused, for instance, by trend changes in the efficiency of tax authorities, in economic conditions, or in tax honesty. In the empirical analysis, we consider $z \in \{0, 1, 2\}$, i.e. no monthly trend of any kind, a linear monthly trend, and a linear-quadratic trend. The latter is the most flexible specification, and arguably also the most suitable for our purposes, given the U-shaped evolution of voluntary disclosures over time (see Figure 1). Throughout, we use robust standard errors.

3   Results

Table 1 reports the main regression output of four different specifications of equation 1 in Section 2.2.[17] The first three specifications differ only in the type of underlying monthly trend considered in the analysis. Specification (I) considers no monthly trend of any kind,

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[17]The endogenous variable in all four specifications is the log of the monthly absolute number of voluntary disclosures involving Swiss banks made by NRW residents to tax authorities in NRW. All four specifications furthermore contain as regressors a set of year dummies for 2011-2015 (base year is 2010) and a set of indicator variables that capture systematic deviations in relative time (and not in calendar time) of the log of monthly voluntary disclosures in the vicinity of a month in which a new data purchase by the tax authorities in NRW has been made public in the press.

specification (II) a linear monthly trend, and specification (III) a linear-quadratic monthly trend. Being the most flexible, specification (III) will constitute our baseline specification that we later use both for robustness checks and additional explorations (see Tables 2 and 3, as well as the right diagram in Figure 2).

As it turns out, the estimated coefficient $\hat{\beta}_{-1}$ of the lead variable $data_{t-1}$ is insignificant in all three specifications. This lack of a pre-treatment effect is reassuring, as it suggests no anticipatory effects on monthly disclosures prior to the month in which a data purchase has been made public in the news.[18] The immediate response of voluntary disclosures to the emergence of a new data purchase in month t, given by the estimated coefficient $\hat{\beta}_0$ of $data_t$, is positive and of much larger magnitude than $\hat{\beta}_{-1}$ of the lead variable $data_{t-1}$, although also imprecisely estimated in the first two specifications. Finally, and in all three specifications, estimated coefficients $\hat{\beta}_{+1}$ through $\hat{\beta}_{+5}$ on the remaining set of indicator variables $data_{t+1}$ to $data_{t+5}$ show a strong positive and hump-shaped response of monthly voluntary disclosures in the first four months after a new data purchase by tax authorities in NRW has been made public in the press. In our most flexible specification (III), voluntary disclosures are on average 1.265 log points higher, which translates into an increase of 254%, in the first month after a new data acquisition has emerged compared to what they would have been, had no such purchase taken place, and still 1.138 log points (212%) higher in the second month after news of a new data purchase.[19] In the third and fourth month after the emergence of a new data purchase, a sizeable (yet also smaller) positive effect on disclosures is still observable; only in the fifth month do voluntary disclosures cease to show signs of a systematic positive response. Voluntary disclosures hence appear to react strongly to news of purchases of bank data that could identify potential tax evaders holding untaxed wealth in Swiss bank accounts. Observable in all three specifications, this hump-shaped pattern is robust to the way we model any underlying monthly trend in voluntary disclosures that may arise from changes in unobservables over time. The left diagram in Figure 2 illustrates the findings of our baseline specification (III) graphically.

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[18]The lack of a pre-treatment effect also suggests that our news-based dating of the month in which a data purchase has been made public does not suffer from systematic mis-measurement in the form of too late a recording of the month in which information on a new purchase actually became available.

[19]Percentage effects are obtained from the transformation: $\% \; change = (e^{\hat{\beta}_i} - 1) \times 100$.

Table 1: MAIN REGRESSION RESULTS

	(I)	(II)	(III)	(IV)
$data_{t-1}$	0.249 (0.300)	0.305 (0.310)	0.300 (0.259)	0.248 (0.259)
$data_t$	0.361 (0.318)	0.334 (0.298)	0.435* (0.249)	
$data_t \times (\leq 2 \text{ weeks})$				-0.061 (0.236)
$data_t \times (> 2 \text{ weeks})$				0.735*** (0.272)
$data_{t+1}$	1.035*** (0.333)	0.974*** (0.298)	1.265*** (0.290)	1.229*** (0.287)
$data_{t+2}$	0.720** (0.316)	0.781*** (0.267)	1.138*** (0.276)	1.133*** (0.276)
$data_{t+3}$	0.701*** (0.205)	0.667*** (0.208)	0.837*** (0.225)	0.846*** (0.221)
$data_{t+4}$	0.506* (0.267)	0.604** (0.236)	0.788*** (0.199)	0.804*** (0.207)
$data_{t+5}$	0.053 (0.295)	0.103 (0.287)	0.268 (0.244)	0.257 (0.241)
year indicators (2011-2015)	yes	yes	yes	yes
monthly trend (linear)	no	yes	no	no
monthly trend (linear-quadratic)	no	no	yes	yes
R^2	0.63	0.69	0.75	0.76

NOTES: The endogenous variable is the log of the monthly number of voluntary disclosures submitted by residents of NRW which involve illicit wealth held in Switzerland. Dummy variable $data_t$ takes the value one if it became public in period t that tax authorities in NRW had bought a new data CD with potential tax evaders. Dummy variable $data_{t-1}$ brings forward this information by one month to account for potential anticipatory effects, and dummy variables $data_{t+1}$ to $data_{t+5}$ capture the (the possibly highly non-linear) response over time of voluntary disclosures to news reports of a new data purchase on potential tax evaders with illicit wealth in Switzerland. All regressions include year dummies (base year is 2010). The estimation sample comprises voluntary disclosures submitted in the months January 2010 to November 2015. Sample size in all regressions is 71. ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Robust standard errors are used.

On several occasions, news of a new data purchase emerged only late in a calendar month, which left tax evaders possibly too little time (days) to file a voluntary disclosure in that same month.[20] In our analysis so far, we have disregarded this heterogeneity, which may explain (at least in part), why the contemporaneous effect of news of a new data purchase is positive but less precisely estimated. To investigate this possibility, we re-run a slightly changed variant of our baseline specification (III). This new specification (IV) is

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[20]In three out of the eight calendar months in which a new purchase of data became public, the news of such a data acquisition emerged only in the last two weeks of the respective calendar month. Exact dates of the emergence of individual data acquisitions are provided in Table A-1 in the appendix.

Figure 2: GRAPHICAL REPRESENTATION OF TREATMENT LEADS AND LAGS (BASELINE SPECIFICATION, SPECIFICATION USING BANK INFORMATION)
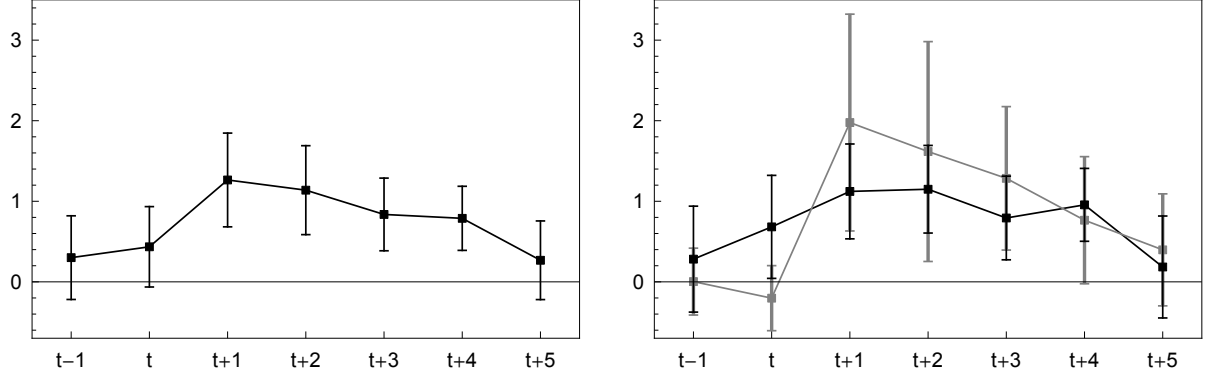
NOTES: Left diagram: Plotted estimates are from our baseline specification, as reported in column (III) of Table 1. Right diagram: Plotted estimates are from a regression that uses two sets of dummy variables $data_{k,t+j}$, with $j \in \{-1, 0, 1, ..., 5\}$ and $k \in \{1, 2\}$, one for purchases known to implicate specific Swiss banks ($k = 1$, shown in black), and one for purchases that were not ($k = 2$, shown in grey), but that is otherwise identical to our baseline specification. Point estimates in both diagrams are marked by a dot, and the vertical bands indicate the 95% confidence interval of each estimate.

identical to specification (III) but uses two dummies ($data_t \times (\leq 2$ weeks) and $data_t \times (> 2$ weeks)) instead of one ($data_t$) for the month in which it became public that a new data CD with potential tax evaders has been bought by tax authorities in NRW. Dummy $data_t \times (\leq 2$ weeks) is equal to one when two weeks or less within such a month remain for potential tax evaders to file a disclosure, and zero otherwise. Dummy $data_t \times (> 2$ weeks), in turn, equals one if more than two weeks remain, and zero otherwise.[21] Given that it takes time to file a disclosure, we would expect news on a new data purchase to exert a stronger positive effect on absolute monthly disclosures if such news break early rather than late within a calendar month, i.e. the estimated coefficient on $data_t \times (> 2$ weeks) should be positive and larger than that on $data_t \times (\leq 2$ weeks). As shown in the last column of Table 1, our regression results are consistent with this conjecture. Furthermore, estimated coefficients on our lead and five lags variables, i.e. on $data_{t+i}$ for $i \neq 0$, show the same hump-shaped response of voluntary disclosures to news of a new data purchase. In fact, estimated coefficients differ little in magnitude from those of the baseline specification.

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[21]Two data acquisitions became public in the same calendar month in June 2010 (on the 9th and one the 24th) and in August 2012 (on the 8th and on the 22nd). In each case, we classify the respective month based on the earlier date.

We conduct several further tests to assess the robustness of our findings. First, we trim our estimation sample by omitting the first 7, respectively the last 11 and the last 14 months of our observation period (January 2010 to November 2015). Our observation period starts in January 2010, just one month prior to the first data CD purchase we record, a purchase that furthermore saw the largest absolute rise in voluntary disclosures in our data. Omitting the first seven months (January to July 2010) from the estimation sample allows us to check the robustness of our results to the omission of this first data purchase and the marked global peak in voluntary disclosures we observe in its vicinity. By omitting the last 11 months of our observation period, in turn, we effectively omit all 2015 observations (January 2015 to November 2015). This restriction provides for a more homogeneous policy environment, as rules for voluntary disclosures were significantly tightened and fines increased from 2015. Finally, omitting the last 14 months from our observation period (October 2014 to November 2015) provides not only for a more homogenous policy environment by excluding all moths from 2015, but also helps to asses whether the last months of 2014, i.e. the last months under the old policy regime, differed somehow from preceding months because tax evaders, in anticipation of the approaching tightening of the rules for voluntary disclosures, filed in larger numbers a voluntary disclosure so as to become tax compliant still under the old "lower cost" policy regime. As shown in Table 2, however, our finding of a positive and hump-shaped response in the monthly number of voluntary disclosures proves robust to such alterations in the starting, respectively end points of our observation period.

Second, we add to the set of regressors in our baseline specification the log (mean) monthly exchange rate between the Swiss franc and the euro. The CHF/EUR rate has seen some major changes in our period of analysis.[22] The Swiss franc appreciated steadily

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[22]Floating against the euro, the Swiss franc appreciated steadily against the euro in 2010 and the first half of 2011, increasingly harming Swiss exporters. To halt this rise of the Swiss franc, the Swiss National Bank (SNB) introduced a peg in September 2011, intended to prevent the euro from trading below 1.20 Swiss francs. However, as the outlook for the euro darkened, the policy of defending the peg became increasingly costly for the SNB. Without prior notice, on 15 January 2015, the SNB stunned markets by abandoning the currency peg, which caused the Swiss franc to soar immediately and strongly against the euro. In our observation period, the monthly exchange rate between the Swiss franc and the euro averaged 1.22 CHF/EUR (standard variation of 0.10). It was lowest in April 2015 (1.04 CHF/EUR) and highest in January 2010 (1.48 CHF/EUR).

Table 2: Robustness Checks I (Trimmed Samples)

	Baseline specification (1)	Trimmed sample, excluding:		
		$t \leq 7$ (2)	$t \geq T - 11$ (3)	$t \geq T - 14$ (4)
$data_{t-1}$	0.300 (0.259)	0.405 (0.283)	0.104 (0.247)	0.161 (0.237)
$data_t$	0.435* (0.249)	0.427* (0.246)	0.384 (0.302)	0.617** (0.264)
$data_{t+1}$	1.265*** (0.290)	1.171*** (0.313)	1.093*** (0.242)	1.114*** (0.222)
$data_{t+2}$	1.138*** (0.276)	1.086*** (0.269)	0.982*** (0.233)	1.037*** (0.232)
$data_{t+3}$	0.837*** (0.225)	0.912*** (0.189)	0.751*** (0.224)	0.747*** (0.231)
$data_{t+4}$	0.788*** (0.199)	0.868*** (0.183)	0.688*** (0.215)	0.607*** (0.214)
$data_{t+5}$	0.268 (0.244)	0.330 (0.248)	0.259 (0.226)	0.293 (0.199)
year indicators (2011-2014)	no	no	yes	yes
year indicators (2011-2015)	yes	yes	no	no
monthly trend (linear-quadratic)	yes	yes	yes	yes
R^2	0.75	0.75	0.79	0.81
N	71	64	60	57

NOTES: Column (1) re-produces the results from our baseline specification (III) in Table 1. Column (2) omits the first seven months from the observation period (i.e January to July 2010)), column (3) omits all months from 2015, and column (4) omits all months after September 2014. Otherwise, estimations samples, specifications and covariates considered in these regressions are identical to those of our baseline specification (III) of Table 1 (see notes to Table 1). ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Robust standard errors are used.

against the euro throughout 2010 and most of 2011 (until the introduction of a peg to the euro in September 2011) and soared sharply in January 2015, when the Swiss National Bank (SNB) without prior notice and to the surprise of market participants suddenly abandoned the peg. The sharp appreciation of the Swiss franc may have affected the number of voluntary disclosures, which increased strongly, yet only temporarily, in January 2015. As shown in column (2) of Table 3, however, the CHF/EUR rate has an insignificant (albeit positive) effect on the number of voluntary disclosures per month. As such, there is little evidence that the marked rise in disclosures from December 2014 to January 2015, a surprising and unexpected development given the tightening of the rules for voluntary disclosure in January 2015, was driven by this change in the CHF/EUR exchange rate. The data purchase in December 2014 together with the hump-shaped response of voluntary

disclosures we find to such purchases in our data, however, can explain this local hike in voluntary disclosures at the beginning of 2015. In any case, our key finding again proves robust, i.e. voluntary disclosures continue to show a hump-shaped response to news of a data purchase by tax authorities in NRW. In fact, the pattern of this response differs only little from that in our baseline specification (reported again, for convenience, in column (1) of Table 3).

Third, we add to our baseline set of regressors a dummy variable, which takes value zero before November 2012, and value one from November 2012, to capture any level effect on voluntary disclosures of the failure on November 23rd 2012 of a long-awaited tax treaty between Germany and Switzerland in Germany's upper legislative chamber, the Bundesrat. The accord aimed to ensure the equal treatment of the wealth of German citizens, whether located in Germany or in Switzerland, and to restore tax equity for the past by means of a lump sum tax payment.[23] The failure of the tax treaty meant that voluntary disclosure was to remain the only option available to Germans to legalize their untaxed assets in Switzerland, i.e. become tax compliant, and escape prosecution for tax evasion. It is possible that some tax evaders refrained from disclosing undeclared wealth in Switzerland because they awaited the tax agreement to take force. If so, its failure may have spurred voluntary disclosures. As seen in column (3) of Table 3, we do indeed find evidence for a positive effect of the failure of the German-Swiss tax agreement on voluntary disclosures. Our core finding, however, proves robust once again. Voluntary disclosures still show a hump-shaped response to the emergence of new data purchases by tax authorities in NRW.

We also conducted a number of additional explorations. First, we obtained a measure from Google trends of the relative search frequency in Germany in our observation period of the German keyword 'Selbstanzeige' (voluntary disclosure) and used the log of this measure as dependent variable in our baseline specification to see whether data purchases by tax

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[23]Under the agreement, planned to take effect on January 1st 2013, undeclared wealth of Germans in Switzerland over the last 10 years would have been taxed at a rate of between 21 and 41 percent, and tax evaders would have remained anonymous. From 2013, they would have been be taxed at normal German rates. Similar Swiss accords (withholding tax deals) had been signed, for example, with Austria and the U.K.

authorities in NRW spurred public interest in voluntary disclosures.[24] Increased keyword searches may stem from tax evaders which, shocked by news of a new data purchase, seek information on how to file a timely disclosure. If so, news of a new data purchase should have a positive effect on keyword searches for voluntary disclosure. Furthermore, such a positive effect should materialize more quickly (following the emergence of a new purchase) and show less persistence than the effect on actual disclosures. As shown in column (4) of Table 3, all three predictions find empirical support. Keyword searches from Germany for voluntary disclosure in Google do respond positively to news of a new data purchases, and this response is both more immediate and less persistent than that of voluntary disclosures (see baseline estimates, re-produced in column (1) of Table 3). Of course, this auxiliary piece of evidence is only suggestive, since we do not know if it is indeed tax evaders who account for this increase in keyword searches. The time structure of the effect (i.e. an immediate and short-lived response), however, is supportive of such an interpretation and also consistent with a causal interpretation of our core finding on the evolution of actual disclosures following a new data acquisition.

Second, we differentiate in our baseline specification between purchases of data from Switzerland which have been linked in the press to specific banks in Switzerland and purchases which have not.[25] A priori, it is unclear which type of data purchase generates more voluntary disclosures. In the former case, a smaller absolute number of tax evaders is potentially at risk of being identified by the tax authorities. However, this smaller group is also facing a much more elevated risk of detection, given that it is their Swiss bank from which tax authorities in NRW have allegedly acquired data. To explore this question empirically, we replace in our baseline specification the set of dummy variables $data_{t+j}$,

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[24]Google trends does not provide monthly information on the relative search frequency at the level of individual federal states in Germany. We therefore use information for the whole of Germany. Data on a keyword search from Google are normalized by the absolute number of search queries in the geographical region of interest to remove any trends from growth in internet usage or from changes in the relative popularity of Google as a search engine. The normalized data are then rescaled to an index with a maximum value of 100. In our observation period, the average value of the index for the keyword search 'Selbstanzeige' (voluntary disclosure) was 18.4 (s.d. 15.8) with a minimum of 9 and a maximum (by construction) of 100.

[25]Of the altogether 10 purchases, which were made public in the news in eight different calendar months (multiple purchases occured in two months), seven purchases (in six calendar months) were known to affect certain Swiss banks. Purchases emerging in June 2010 and December 2014 were publicized to involve Swiss accounts, but did not name any particular Swiss bank. For more details, See Table A-1 in the appendix.

Table 3: ROBUSTNESS CHECKS II (EXCHANGE RATE, GERMAN-SWISS TAX AGREE-MENT) AND ADDITIONAL EXPLORATIONS (GOOGLE TRENDS)

	(1)	(2)	(3)	(4)
$data_{t-1}$	0.300 (0.259)	0.293 (0.257)	0.317 (0.270)	-0.112 (0.135)
$data_t$	0.435* (0.249)	0.418* (0.246)	0.475* (0.256)	0.568** (0.225)
$data_{t+1}$	1.265*** (0.290)	1.199*** (0.314)	1.269*** (0.285)	0.370*** (0.127)
$data_{t+2}$	1.138*** (0.276)	1.100*** (0.304)	1.142*** (0.269)	0.218 (0.210)
$data_{t+3}$	0.837*** (0.225)	0.803*** (0.246)	0.742*** (0.218)	0.176* (0.103)
$data_{t+4}$	0.788*** (0.199)	0.743*** (0.244)	0.590*** (0.193)	0.026 (0.113)
$data_{t+5}$	0.268 (0.244)	0.252 (0.251)	0.165 (0.269)	-0.117 (0.109)
CHF/EUR exchange rate (in logs)		3.417 (5.993)		
tax agreement failure			0.858* (0.441)	
R^2	0.75	0.75	0.76	0.67

NOTES: Column (1) re-produces the results from our baseline specification (III) in Table 1. Column (2) reports results when we add the log of the EUR/CHF exchange rate to the set of regressors in our baseline specification, and column (3) results when we add a dummy variable that takes value one from November 2012 (and zero before that month). Finally, column (4) reports results from our baseline specification when we use as dependent variable the log of the monthly relative search frequency in Google for the German keyword 'Selbstanzeige' (voluntary disclosure) in Germany in our observation period (January 2010 to November 2015). Estimations samples, specifications and covariates considered in these regressions are otherwise identical to those of our baseline specification (III) of Table 1 (see notes to Table 1). In particular, all regressions include year dummies (base year is 2010) and a second-order polynomial in time (calendar months). Sample size in all regressions is 71. ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Robust standard errors are used.

where $j \in \{-1, 0, 1, ..., 5\}$, with two such sets $data_{k,t+j}$, one for purchases which are known to involve data from specific Swiss banks ($k = 1$), and one for purchases that are not ($k = 2$). Estimated coefficients on these two sets of dummy variables are plotted in the right diagram of Figure 2.[26] As is evident, voluntary disclosures in the aftermath of both type of purchases do show a hump-shaped response, but one that differs somewhat in shape and magnitude, not only between these two types of purchases, but also from the estimated structure of response to a data purchase (of any kind) in our baseline regression (see left diagram in Figure 2. A data purchase known to involve specific Swiss banks (black line) exerts a statistically significant positive effect (at the 5% level of significance) already from

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[26]The full tabulated regression output is available from the authors upon request.

the very month it emerged (unlike in our baseline regression), whereas no such significant contemporaneous effect emerges for the subgroup of purchases of bank data which were publicized without implicating specific financial institutions (grey line). This more timely response may be explained by the greater need of tax evaders to respond quickly by way of voluntary disclosure as they face a greater and more imminent risk of identification and hence prosecution by tax authorities following such a purchase. Reassuringly, for both subgroups of purchases, the estimated lead coefficient on $data_{k,t-1}$ is again insignificant, which speaks against anticipatory effects of any kind also at level of these subgroups of purchase types, and any positive stimuli provided by these data acquisitions again has fully faded out 5 months after a purchase had become public.

4 Conclusion

International tax evasion is a major concern to policy makers and tax authorities. Lack of information on domestically owned assets held abroad is at the heart of states' inability to enforce tax compliance of its citizens. Tax havens, for obvious reasons, are reluctant to share information on unrecorded wealth with countries suffering from tax evasion. This hampers the effectiveness of bilateral tax treaties. By acquiring confidential bank data from tax havens, however, countries suffering from tax evasion may identify (at least) some tax evaders and furthermore increase risks of detection for all those domestic residents who hold untaxed wealth abroad. What is more, this policy tool is subject only to own discretion, and hence can be used unilaterally by countries suffering from tax evasion.

In this paper, we investigated the discretionary and unilateral use of such state-sponsored data purchases to identify untaxed wealth held abroad. For this purpose, we compiled and analysed information on data acquisitions involving Swiss banks by tax authorities from Germany's most populous federal state, North-Rhine Westphalia (NRW), in the years 2010 through 2015, and on monthly voluntary disclosures made by NRW residents over this period. Our results strongly suggest that such data purchases have been effective in promoting tax compliance by inducing tax evaders to identify themselves and declare untaxed assets by way of voluntary disclosure. Various robustness checks corroborate this conclu-

sion, as do additional explorations. State purchases of confidential bank data from tax havens hence appear to be a valuable additional policy tool for governments in their fight against international tax evasion. We also found evidence that the failure of a prospective tax agreement between Germany and Switzerland spurred voluntary disclosures, which is suggestive that the two are seen at least as partial substitutes by tax evaders.

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A Appendix

Table A-1: DATA SOURCES FOR INDIVIDUAL CD PURCHASES

CD	First made public		Allegedly Involved Bank	
	on	by	bank	source
1	2010–02–04	HB (2010)	Credit Suisse	HB (2010)
2a	2010–06–09	STERN (2010)	−/−	−/−
2b	2010–06–24	SPON (2010)	−/−	−/−
3	2010–10–17	SPIEGEL (2010)[a]	Julius Bär	ZEIT ONLINE (2010)
4	2012–07–13	STERN (2012)	Coutts	STERN (2012)
5a	2012–08–08	HB (2012)	UBS & an unknown bank	HB (2012)
5b	2012–08–22	MM (2012)	Julius Bär	MM (2012)
6	2013–04–16	FAZ (2013)	Neue Aargauer Bank, Clariden Leu, Credit Suisse	FAZ (2013)
7	2014–01–12	SPON (2014)	Leumi	SPON (2014)
8	2014–12–20	BamS (2014)	−/−	−/−

NOTE: [a] Information was released one day before publication of the print issue.

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- HB (2012): "Steuersünder-CDs", *Handelsblatt*, 2012–08–08.
- FAZ (2013): "Durchsuchungen nach Kauf von Steuer-CD", *Frankfurter Allgemeine Zeitung*, 2013–04–16.
- MM (2012): "Julius-Bär-Kunden im Visier der Fahnder", *Manager Magazin*, 2012–08–22.
- SPIEGEL (2010): "Geschäfte mit Ganoven", *Der Spiegel*, 2010–10–18.
- SPON (2010): "Spanien will Milliarden Euro von Steuersündern eintreiben", *Spiegel Online*, 2010–06–24.
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- STERN (2012): "NRW kauft weitere Steuer-CD aus der Schweiz", *Der Stern*, 2012–07–13.
- ZEIT ONLINE (2010): "Fiskus erhält Zugriff auf Schweizer Konten", *Die Zeit Online*, 2010–10–17.