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Entries and Exists (2005-2022), plus Technical Note

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EU ETS Installation Entries and Exits Dataset

This Technical Note refers to the dataset *EU Emissions Trading System Installations Entries and Exits* which can be retrieved from the EUI Research Repository Cadmus:

Mazzarano, M., Raude, M., Borghesi, S. (2024). *EU Emissions Trading System Installations Entries and Exits*. https://hdl.handle.net/1814/77336.

EU ETS Installation Entries and Exits - Technical note illustrating the methodology

Context

This dataset aims to provide a list of installation entries and exits into and from the EU ETS. To the extent possible, we also specify the reason for an identified entry/exit.

Almost twenty years have passed since the EU ETS started operating, and keeping track of firm dynamics in the EU ETS – which the EU ETS itself could potentially affect – has become increasingly important. Knowing whether an observed entry reflects new production capacity, increased production capacity, a change in EU ETS legislation, or a mere administrative decision would allow studies on the impact of the EU ETS on firm dynamics and, more generally, increase the quality of studies on economic performance. The methodology for estimating installation entries and exits builds upon the work of (Verde, Graf, & Jong, 2019).

Description

1. *Data sources*

- *EUETS.INFO (EUTL)*: European Union Transaction Log data vintage 2023 parsed by Jan Abrell (https://www.euets.info/)

Data is centralised at the EU level. Specific tables containing relevant data for estimating entries and exits are the account, installation, and compliance tables.

2. *Entry definition*

Officially, an installation is considered to have entered the regulatory scope of the EU ETS on the:

- **Permit date Entry**: the date when the Permit ID was created. The Permit ID is the permit identifier of the installation.
- **Monitoring first year**: concerns aircraft operators only. The first year when the monitoring plan becomes applicable.

The first year of monitoring is specified for all aircraft operators, but the permit entry date is missing for most installations (16,310, more than 90% of total installations). To bypass the lack of information in the official entry date variables, we turn to compliance data to infer the entry date of the installations. We specifically check the information of the following variables:

- **Verified emissions**: the yearly emissions reported by an installation. The first year an installation reports its verified emissions is considered the year of entry.
  - Surrendered volume: the yearly volume of permits surrendered by an installation. The first year the installation surrendered permits is considered the year of entry. Further, if an installation never surrenders permits throughout the whole period[1], then we consider that

[1] Surrendered volume is missing or zero for every year from 2005 to 2022.

the installation has not entered the EU ETS. It is the case for 7,920 installations, which represents 44% of the installations listed in the installation table in the EUTL.

- **Free allowance allocation**: the yearly volume of permits distributed to the installation for free. The first year that an installation receives free permits is considered the year of entry.

For most installations, the entry year is determined by the first year an installation reports its verified emissions. If this information is missing, it corresponds to the first year an installation receives free permits. Again, if this information is missing, the entry year is the first year an installation surrenders permits. See the diagram below for details on entry definition.

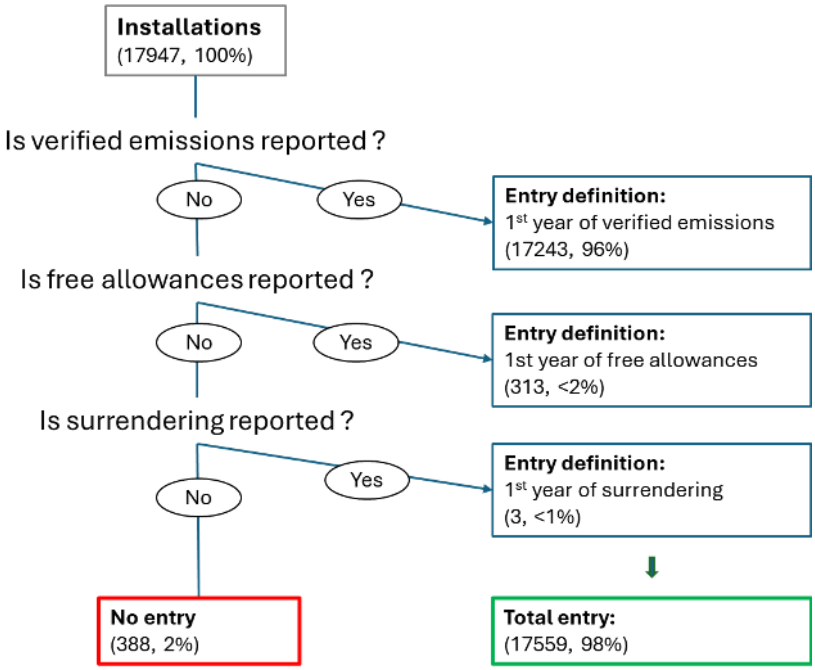

Figure 1: Diagram describing entry definition

Out of the 17,947 installations listed in the EUTL installation table, 388 do not show any record of activity: they don't have reported verified emissions, free allowances or surrendering volumes. We assume these installations are administratively registered in the system but are not in practice regulated by the EU ETS. We assume these installations never enter the system. For the rest of the installations (98% of total), most of the installation entry year is defined as the first year verified emissions are reported.

3. *Entry Reason*

We justify installation entry according to three reasons[2]:

[2] The specific code used to label each entry reason is provided in the Appendix.

- **Initial coverage**: concerns installations meeting the conditions of the regulatory scope implemented at the launch of the system in 2005. It delimits the initial coverage in terms of countries and sectors covered.
- **Extended country coverage**: concerns installations included in the EU ETS due to increased country coverage.
- **Extended sector coverage**: concerns installations included in the EU ETS due to increased sector coverage. This change in sector coverage happened around the beginning of Phase 3 (2003).

Initial coverage. Initially, the EU ETS covered CO2 emissions of installations in the 28 EU countries (which included the United Kingdom at the time). The scope of regulation included specific activities from power stations and other combustion installations with >20 MW thermal rated input (except hazardous or municipal waste installations), industry (various thresholds) including oil refineries, coke ovens, and iron and steel plants, as well as production of cement, glass, lime, bricks, ceramics, pulp, paper, and cardboard (Directive 2003/87/EC).

Extended country coverage[3]. Since the launch of the EU ETS, two waves of country extensions have happened. In 2007, the linkage of the EU emissions trading system with the European Free Trade Association countries (Norway, Iceland and Liechtenstein) was agreed to take place through the incorporation of the EU ETS revised Directive (Directive 2009/29/EC) into the European Economic Area agreement. Following the fulfilment of national approval procedures, installations from Norway and Liechtenstein were included in the EU ETS in 2008 and the ones from Iceland in 2012.
The country coverage of the EU ETS has also increased due to the enlargement of the EU to Bulgaria, Romania, and Croatia during the lifetime of the EU ETS. After Bulgaria, Romania and the EU Member States signed the accession treaty, installations from Bulgaria and Romania joined the EU ETS in 2007. Following the signing of the accession treaty by Croatia and the EU Member States, installations from Croatia also joined the EU ETS in 2013.

Extended sector coverage. The first sectoral extension concerned aviation. In 2012, flights within the EEA were included in the EU ETS with the following thresholds: >10,000 tCO2/year for commercial aviation, and >1,000 tCO2/year for non-commercial aviation (Directive 2008/101/EC).
At the start of phase 3 in 2013, additional industrial sectors were included in the regulatory scope. This concerned carbon capture and storage installations, production of petrochemicals, ammonia, nonferrous and ferrous metals, gypsum, aluminium, and nitric, adipic, and glyoxylic acid (various thresholds) (Directive 2009/29/EC).

[3] The EU ETS is linked with the Swiss ETS since January 2020 (Agreement OJ L 322/2017). As the Swiss ETS still operates as an independent system, the Swiss installations are not reported under the EU ETS, and consequently, no entries are recorded due to the link between both ETSs.

4. Exit definition

Similarly to Entry, exits of EU ETS installations can be tracked by looking at the following variables in EUTL:

- **Permit date Expiry**: the date when the Permit ID expires.
- **Monitoring Expiry**: the date when the aircraft operators' monitoring plan expires.

The permit date expiry is specified for 12,859 installations (28% of total installations), and none of the aircraft operators have a monitoring expiry date. As we noted that these official dates were not complete and accurately recorded for entries, we also rely on other information to infer an exit date from the EU ETS.

Tracking the yearly evolution of the following compliance variables can give us a sign of a potential exit:

- **Verified emissions**
- **Surrendered volume**
- **Free allowance allocation**

Starting with the sample of installations that have entered the system, an installation is defined as inactive when all three variables are null, and they remain null for subsequent periods. For robustness, we also add the condition that the installation's permit expiry date is specified to define an exit. Further, we also check that the account linked to an inactive installation is closed to confirm the installation has exited the system.

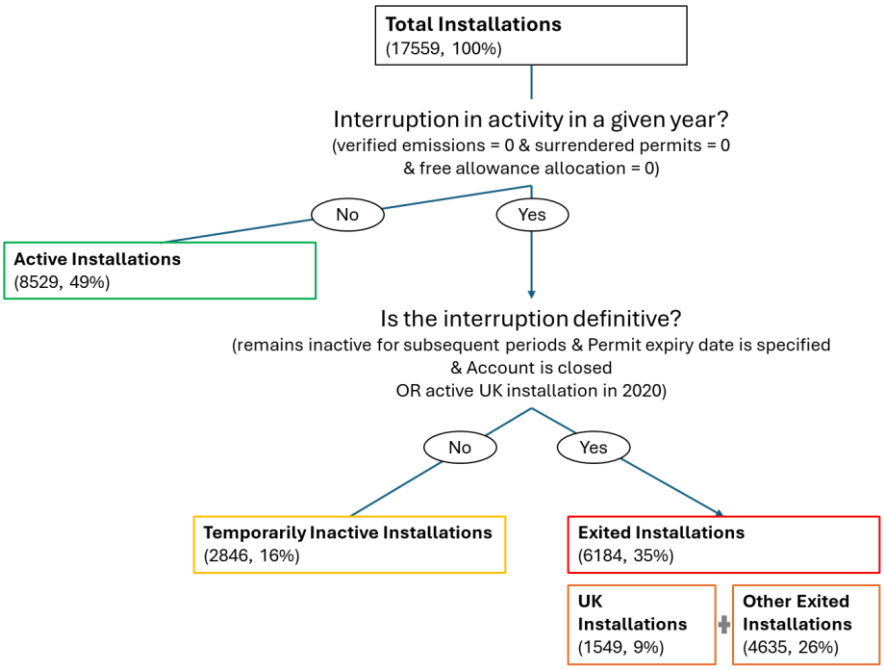

Figure 2: Diagram describing the steps to determine an exit

Half of the installations in the system are active every year of the period of study (Continuously active installations: 50%). 3,265 installations have exited the system (Exited installations: 35%), including the 1,012 UK installations which left due to Brexit. The rest of the installations have temporarily ceased activity or have no subsequent recorded activity but an open account with no specified permit expiry date (Temporarily inactive installations: 16%).

5. Reason for exit

A key event that impacted exit dynamics in the EU ETS was the United Kingdom's withdrawal from the EU (Agreement OJ C 384I/2019). Consequently, the UK implemented a national ETS to replace the EU ETS. The UK ETS began operating in January 2021, meaning all UK installations were in the EU ETS until 2020. We specify that all UK installations exited the system in 2021 if the installation did not already have an exit date. This is the case for 1,012 installations. Note: in 2022, there were 1,051 installations in the UK ETS and 378 Aircraft Operators (AOs) (DESNZ, 2023).

Due to a lack of detailed data, we justify installation exits with two reasons, separating exits due to Brexit and exits due to other reasons.

Brexit. Following the UK's decision to leave the EU, the UK ETS was set up to replace the UK's participation in the EU ETS (SI 2020 No. 1265). Therefore, the UK installations' exits recorded in 2021 are purely administrative and do not necessarily reflect any change in production or emission levels.

Other. This includes cessation of activity – plant closure. Alternatively, it could also mean a decreased production capacity, and the plant has passed below the regulatory threshold.

Appendix

1. Dataset overview

Variable Name	Definition	Database source	Notes
installation_id	Unique installation identifier.	EUETS.INFO	The unique installation ID as created by Abrell of type "XX_1234" (combination of the registry code and the installation ID defined by the registry ID).
entry_year	Year of entry in the regulatory scope of the EU ETS.	*Own Elaboration*	From 2005 to 2022.
definition	Information used to determine the year of entry.	EUETS.INFO/ *Own elaboration*	Categorical variable: - Verified - Allocation - Surrendered
entry_reason	Reason why the installation is in the regulatory scope.	*Own elaboration*	Categorical variable: - Initial scope - Extended country coverage - Extended sector coverage
exit_year	Year of *permanent* exit from the regulatory scope of the EU ETS.	EUETS.INFO/ *Own elaboration*	From 2006 to 2022.
exit_reason	Reason for the exit.	*Own elaboration*	Categorical variable: - Brexit - Other
nace_id	Sector of activity of the installations.	EUETS.INFO[4]	This variable was added to allow for analysis of the entry-exits at the sectoral level.

Table 1: List and definition of the variables, data sources and notes

[4] NACE code according to 2020 leakage list with missing values filled from 2015 list, as reported in the EUETS.INFO database.

2. Entry and Exit reason evolution

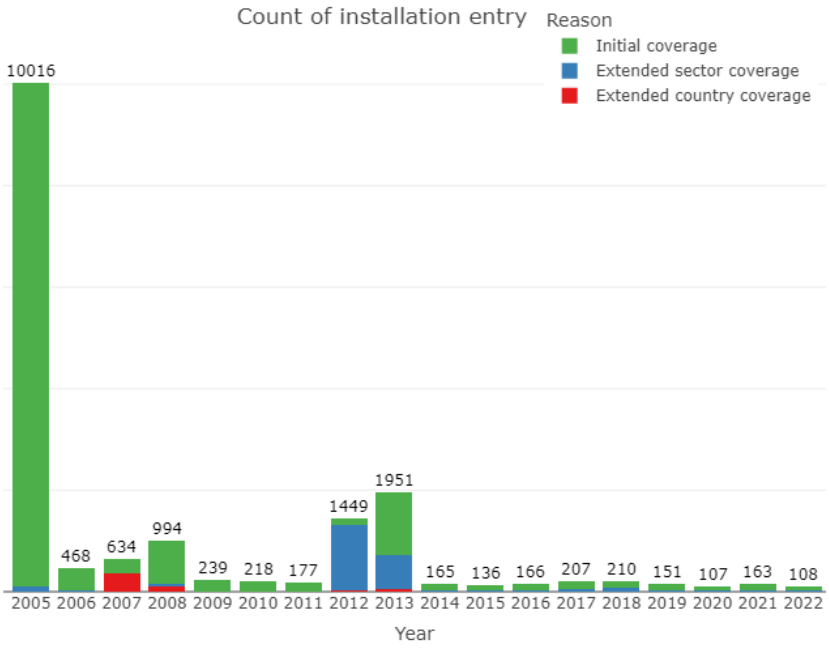

Figure 3: Evolution of installation entry and associated reason

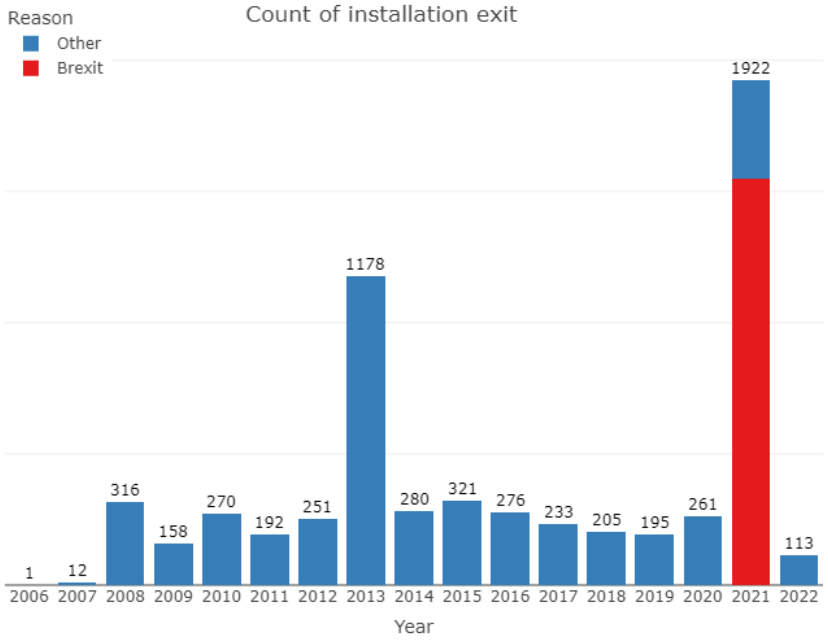

Figure 4: Evolution of installation exits

3. Code for entry and exit reason

```
# ENTRY REASON
# aircrafts ####
list8 <- list7 %>%
  mutate(reason = ifelse(isAircraftOperator == "True", "Aircrafts", NA))

# EFTA countries ####
list8 <- list8 %>%
  mutate(reason = ifelse(
    registry_id == "NO" & Entry == 2008, "EFTA countries", reason),
    reason = ifelse(
    registry_id == "IS" & Entry == 2012, "EFTA countries", reason),
    reason = ifelse(
    registry_id == "LI" & Entry == 2008, "EFTA countries", reason))

# extended coverage ####
list8 <- list8 %>%
  mutate(reason = ifelse(
    activity_id == 25 | activity_id == 26 | activity_id == 27 | activity_id == 28 |
    activity_id == 34 | activity_id == 38 |  activity_id == 39 |
    activity_id == 40 | activity_id == 41 |  activity_id == 42 |
    activity_id == 43 | activity_id == 44 | activity_id == 45,
    "Extended coverage", reason))

# EU Enlargement ####
list8 <- list8 %>%
  mutate(reason = ifelse(
    registry_id == "HR" & Entry == 2013, "Enlargement", reason),
    reason = ifelse(
    registry_id == "BG" & Entry == 2007, "Enlargement", reason),
    reason = ifelse(
    registry_id == "RO" & Entry == 2007, "Enlargement", reason))

# initial coverage ####
list8 <- list8 %>%
  mutate(reason = ifelse(is.na(reason), "Initial coverage", reason))

# to simplify visualisation, reason is grouped in 3 levels
list8 <- list8 %>%
  mutate(reason1 = ifelse(reason == "Initial coverage", "Initial coverage", "Extended
sector coverage"))
list8 <- list8 %>%
```

```
41.    mutate(reason1 = ifelse(reason == "EFTA countries" | reason == "Enlargement",
    "Extended country coverage", reason1))
42.
43. # EXIT REASON
44. # reason1: GB ####
45. list8 <- list8 %>%
46.   mutate(exit_reason = if_else(registry_id == "GB" & exit == 2021, "Brexit",
    "Other"))
47.
```

4. Official report data

Below is a summary of the information on installation coverage reported by the European Commission in their carbon market reports.

Year	Total stationary installations	Total aircraft operators	Total exits	Total entries	Source (period covered)
Phase 1 (2005 – 2007)					
Phase 2 (2008 – 2012)					
Phase 2	-	-	-	-	COM(2012) 652 (2008 – 2011)
Phase 3 (2013 – 2020)					
2013	11,400	-	-	-	COM(2015) 576 (2013 - 2014)
2014	11,200	610	-	-	COM(2015) 576 (2013 - 2014)
2015	10,950	524	-	-	COM(2017) 48 (2015)
2016	10,790	503	-	-	COM(2017) 693 (2016)
2017	10,688	541	-	-	COM(2018) 842 (2017)
2018	10,744	655	-	-	COM(2019) 557 (2018)
2019	10,569	611	-	-	COM(2020) 740 (2019)
2020	9,628	349	-	-	COM(2021) 962 (2020/Phase 3)
Phase 4 (2021 - 2030)					
2021	8,757	371	199[5]	-	COM(2022) 516 (2021)
2022	8,640	390	219[6]	-	COM(2023) 654 (2022)

Table 2: Official report data

[5] "ETS countries reported that 199 installations closed in 2021, mostly due to full cessation of activities or to reduced capacity, bringing the installation below the threshold for coverage under the system"(COM(2022) 516)

[6] "ETS countries reported that 219 installations closed in 2022, 133 of which were due to a reduction of capacity to below 20 megawatts of thermal input". (COM(2023) 654)

5. Yearly active installations

Below is a summary table of the entry and exit of installations, including the yearly balance and the resulting total number of active installations in the EU ETS.

Year	total_entry	total_exit	yearly_balance	Total active installation
2005	10,016	0	10,016	10,016
2006	468	1	467	10,483
2007	634	12	622	11,105
2008	994	316	678	11,783
2009	239	158	81	11,864
2010	218	270	-52	11,812
2011	177	192	-15	11,797
2012	1,449	251	1,198	12,995
2013	1,951	1,178	773	13,768
2014	165	280	-115	13653
2015	136	321	-185	13,468
2016	166	276	-110	13,358
2017	207	233	-26	13,332
2018	210	205	5	13,337
2019	151	195	-44	13,293
2020	107	261	-154	13,139
2021	163	1,922	-1,759	11,380
2022	108	113	-5	11,375

Table 3: Estimated total exits, entries and active installations

Comparison between the officially reported total number of installations and our estimates:

There is a disparity between the total active installations we estimate (last column in table 3) with the value shared in the official report (sum of columns 2 and 3 in table 2). We systematically have more active installations than what is reported in the official EU documents. The main reason for this mismatch could be the change in registry in 2013, with the centralisation of all national registries at the EU level. Duplicate accounts were created and are sometimes still in use or have not been closed.

A second observation is that official numbers of installations exits have been reported starting 2021. Our numbers don't align with the official numbers for 2021, as we count all GB installations that exited the system due to Brexit and the official report doesn't. For 2022, the EC reports more exits than we estimate. The main hypothesis is that the member states rely on internal information received directly by the installations. This information is then processed and recorded in the EUTL, which we use to estimate our exits. There could be a delay between when a Member State knows an installation has exited and when it is recorded on the EUTL.

References

Verde, S., Graf, C., & Jong, T. (2019). Installation entries and exits in the EU ETS: patterns and the delay effect of closure provisions. *Energy Economics*, 508-524.