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# **Development of a method for measuring the impact of Technology Transfer Acceleration Companies scheme (SATTs)**



**Summary of the final report for the Agence  
Nationale de la Recherche**



**The content of this publication does not necessarily reflect the position or opinion of the sponsor or stakeholders.**

## Introduction

This note summarises the results of a study aimed at developing a method for analysing the socio-economic impact of the Technology Transfer Acceleration Companies scheme (SATT). The study was conducted by a consortium led by Technopolis | group | France with the support of RITM<sup>1</sup> laboratory (Université Paris-Saclay) and Strasbourg Conseil.

It proposes a method for evaluating the impact of the SATT scheme as well as a first set of findings from tests aimed at validating the method. The method was established from a literature review, database analysis, field visits, interviews, and micro-econometric estimation of the impact of the SATT scheme on companies having acquired intellectual property (IP) assets.

It is acknowledged that the SATT scheme is too recent<sup>2</sup> to be able to fully assess its impacts to date. This is due to the lack of available data, as well as the necessary hindsight needed to analyse an action aimed at transforming a whole system and practices. Therefore, this study focuses on identifying the potential and/or proven impacts of the scheme and testing the methods that will be deployed in two to five years after this study.

The SATTs were created between 2012 and 2014 (5 SATTs for batch A, 4 for batch B and 5 for batch C) to significantly improve the efficiency of technology transfer from their shareholder institutions (universities, research organisations) and the subsequent economic value created. As of September 30<sup>th</sup>, 2019, the SATTs had signed 855 licenses to client companies.

This work was conducted in 2019-2020<sup>3</sup>.

## 1 Qualitative and quantitative approaches to assess a complex object with multiple interfaces.

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The study focuses the analysis on the two main objectives of the SATT scheme<sup>4</sup>: i) the creation of economic value for SATTs' client companies and for the SATT shareholders; and ii) the simplification and clarification of the research valorisation landscape. We study the latter through the evolution of the relations between the actors of the innovation ecosystem (client companies, shareholder institutions, partners).

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<sup>1</sup> RITM : Réseaux- Innovation – Territoires - Mondialisation

<sup>2</sup> The technology transfer cycle frequently lasts between 4 and 6 years: it starts with the detection of an invention in a laboratory, its transformation into a sufficiently mature technology for a company to wish to acquire it, through investment in technology maturation, then the sale of licences to companies and finally the integration of the technology into the company's products/processes. The first SATT royalty payments are recognized the year after the technology is put on the market.

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<sup>4</sup> State-ANR Convention, 2010

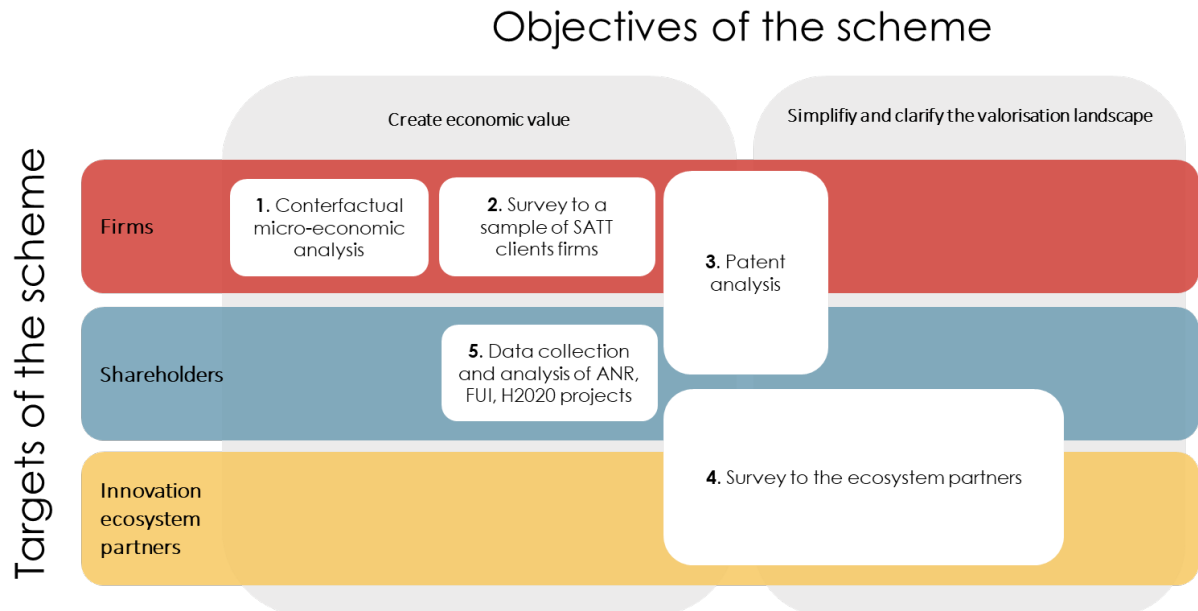
In order to measure the impacts, the study proposes the use of five methodological tools (see Figure 1) on three targeted actors: SATT client companies, SATT shareholders and partners from the innovation ecosystem.

The types of impacts expected are:

- For SATT client companies: improving their performance, developing their capacity for innovation in connection with the public sector and increasing their workforce;
- For SATT shareholders: improving their attractiveness, increasing their means for valorisation and their income from valorisation, strengthening collaboration with the socio-economic sector;
- For the partners of the SATT ecosystem: strengthening of interactions in connection with the projects supported and funded by the SATTs.

The aim of the SATT scheme is, ultimately, to improve the use of French public research results and thus to boost economic growth. Indicators have been defined for each of the intended effects and are supposed to be measured during the implementation of the full impact study.

Figure 1 Recommended tools for impact assessment



## 2 First findings highlighting the role of the SATT scheme in economic value creation

### 2.1 SATT client companies are more dynamic compared to non-client companies

Compared to a group of French R&D-performing Small and Medium Enterprises (SMEs) and mid-caps from the same sectors, SATTs' client companies have a significantly higher growth trend in their financial and R&D indicators over the 2010-2016 period.

The decrease in the share of executives in the workforce, observed overall in SMEs and mid-caps, seems, on average, to be greater among SATT clients, although this difference is not

statistically significant<sup>5</sup>. Patent registrations seem to be decreasing, but significantly less so for SATT clients than for non-clients<sup>6</sup>. It should be noted that the very principle of acquiring an asset resulting from a contract with a SATT (patent, software, know-how, etc.) may justify a lower need for internal R&D by companies and fewer patents filed<sup>7</sup>.

Figure 2 Average growth rates over the 2010-2016 period for financial indicators

	Turnover	Balance sheet (net assets)	Workforce (FTE)	Added value (excl. VAT)	Share of executives
Business clients of SATT [n=96]	14.1%	14.8%	10.1%	12.5%	-27.7%
Non-SATT companies [n=31,455]	6.2%	7.8%	5.3%	6.1%	-17.6%

Reading: the turnover of SATTs' SME and mid-caps clients increased by an average of 14.1% per year between 2010 and 2016; that of non-client SMEs and mid-caps increased by an average of 6.2%. Note: Growth rates are obtained by regression of interest indicators on a trend variable  $t=(1,2,...,7)$  and fixed effects of companies. Source: FARE (INSEE), DADS (INSEE).

Figure 3 Average growth rates over the 2010-2016 period for R&D indicators

	Internal R&D expenses	External R&D expenses	Total R&D budget	No. of patents	No. of researchers
Business clients of SATT [n=62]	5.4%	8.2%	5.5%	-1.5%	7.3%
Non-SATT companies [n=13,242]	2.1%	3.6%	2.2%	-4.1%	0.5%

Reading: the domestic R&D expenditure (Internal R&D expenses) of SMEs and mid-caps which are clients of the SATTs increased by an average of 5.4% per year between 2010 and 2016; that of non-client SMEs and mid-caps increased by an average of 2.1%. Note: Growth rates are obtained by regression of interest indicators on a trend variable  $t=(1,2,...,7)$  and fixed effects of companies. Source: Survey on resources devoted to R&D (MESRI-SIES).

The existence of differences between the two groups of companies (clients and non-clients of the SATTs) may stem from the initial characteristics of the client companies and not directly from the specific action of the SATTs. Econometric methods of impact assessment should therefore be used to better identify the contribution of SATTs.

## 2.2 Encouraging indications regarding the impact on value creation by client companies, but need to be confirmed over time

The econometric tests conducted to illustrate the proposed counterfactual method cover the period 2012 to 2015. Therefore, the test does not include all of the licences signed by the SATTs. In December 2015, 268 licenses had been signed with the companies, i.e. 30% of the total number of companies contracting between 2012 and 2018. This test was limited to the 2012-

<sup>5</sup> according to a Student's t-test.

<sup>6</sup> according to a Student's t-test.

<sup>7</sup> For the share of executives, the observation made has no specific explanations. However, this finding should be put into the context of the overall growth in the SATT's clients' workforce.

2015 period because company data for the years 2017 and 2018 were not available when the study was carried out (2019). At the very least, a year's hindsight is necessary to observe the potential impacts of the scheme on the companies' activity indicators (which therefore excludes client companies in 2016).

The study distinguishes between three types of client companies: SMEs/mid-caps, start-ups and large corporations. Licences signed with large corporations were excluded from this analysis because of the methodological difficulties in identifying French companies of the same size for a counterfactual exercise. Preliminary tests were carried out on start-ups. However, the method will have to be deployed again when a reliable comparison group is available, which was not the case at the time of the study.

The test results presented therefore concern the group of SME/mid-cap clients of SATTs. The availability of data at the date of the analysis made it possible to conduct tests on 46 SMEs and 50 mid-caps that are clients of SATTs<sup>89</sup>.

These tests are based on the use of matching techniques that compare SATT client companies, defined as having acquired an asset from a SATT (patent, software, know-how), with enterprises with a similar economic, social, financial and research and development (R&D) profile but that have never been clients of a SATT (the so-called counterfactual group, see Annex A)<sup>10</sup>.

The results of the tests carried out on the 96 SME/mid-cap clients of SATTs show encouraging trends across several key business indicators. The small number of client companies (less than 100) and the few years of hindsight available would advocate in favour of only partial consideration of the results. In any case, these results would have to be confirmed in two- or three-years' time, when the observations will have more historical depth.

These results are as follows:

- A clear effect on the added value of client companies is already noticeable: on average, in the years following the acquisition of an IP asset, the added value (excluding VAT) of SATT client companies would be 17% higher than the added value of non-client companies with a similar profile;
- A second favourable result indicates that the balance sheet of SATT client companies would be 15.8% higher than that of non-client companies with a similar profile in the years following the acquisition of an asset;
- A third, slightly less positive, result can also be noted: the evolution of the workforce (in FTEs) of companies after the acquisition of an asset would not be significantly affected by becoming a client of a SATT.

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<sup>8</sup> The study carried out was subject to the agreement of the Statistical Confidentiality Committee allowing access to confidential business and household data.

<sup>9</sup> The main files in the databases that made it possible to constitute the counterfactual samples are the GECIR and MVC-CIR files (on R&D expenditure declarations, DGFIP, from 2010 to 2016), FARE (for financial indicators, INSEE, 2010-2016), DADS (for employment indicators, INSEE, from 2010-2015) and the survey on resources devoted to R&D (for R&D indicators, MESRI-SIES, from 2010-2017). In our sample, 6 companies became clients in 2012, 21 in 2013, 31 in 2014 and 38 in 2015.

<sup>10</sup> It should be noted that it is usual, with such a counterfactual impact measurement methodology, to interpret these results causally. In our opinion, it is advisable to remain cautious in such interpretations because of a selection bias that may still exist due to the very fact that client companies have decided to be clients of a SATT. Other characteristics, more or less observable, may also hinder a causal reading: for example, participation in state aid schemes may influence the probability of firms to acquire a license via a SATT and thus partly explain more sustained dynamics in the evolution of financial and R&D indicators than those of counterfactual firms.

Interesting, but still fragile, observations are made on R&D indicators with a stronger increase in domestic R&D expenditure (Internal R&D expenses). This trend is not observed when analysing the number of patent applications.

- SATT clients seem to have a total R&D budget that is 22% higher on average than non-client companies in the years following the acquisition of an asset:
  - The domestic R&D expenditure of SATT client companies would be 16% higher than that of non-client companies after the acquisition of an asset. This goes hand in hand with a higher increase in R&D personnel and researchers observed after the acquisition of an asset. One hypothesis is that client companies, after acquiring an asset, focus on investments useful for the absorption and development of their technological asset.
- The patent filing strategy does not appear to be changed and no significant results emerge from the analysis: the assumption is that companies that have acquired an asset from a SATT focus on absorbing the technology and developing their product/service and therefore do not need to file more patents.

### 2.3 The difficult measurement of the effects of the SATT scheme on the organisation of the valorisation landscape

The study team conducted interviews at the national level and visited three SATT sites (Conectus, Lutech and AxLR). Three types of actors were interviewed: 1) the most important shareholder institutions providing maturation projects (not necessarily on the board of directors), 2) the least active shareholder institutions in maturation, 3) partners in the local innovation ecosystem. The objective was to identify the transformative impacts that the scheme could produce and that could be measured.

- Generally speaking, the nature of the potential impacts of SATTs is rather difficult to qualify for shareholder institutions and for the partners in the SATT ecosystem. It is even more difficult to quantify them.
- Generally speaking, SATTs are expected to have an impact on the socio-economic landscape, i.e., on the companies that are clients of SATTs and therefore on the territory. The SATT is not expected to structure the upstream innovation ecosystem itself, but to fit into it as smoothly as possible.
- The emergence of SATTs, and the new resources they have brought, has strengthened the interest and concern of shareholder institutions for innovation and their impact on the socio-economic landscape. This seems to be particularly true for smaller institutions, which often have fewer resources for valorisation. This is a real positive acculturation effect.
- Most of the establishments that are shareholders in SATT are not equipped today to adequately monitor the impact of their valorisation policy and therefore the impact that SATTs can have on their own innovation strategy.

## 3 Conclusions

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The study highlighted the specificity of the SATT scheme and the need to combine qualitative and quantitative approaches to assess the plurality of its impacts. The first tests tend to show a positive impact on the creation of economic value when client companies have a particularly dynamic profile.



- The most robust results indicate that SME and mid-cap clients of SATTs saw their value added and balance sheets grow faster than non-clients after acquiring an asset from a SATT.
- The workforce does not appear to be affected by the acquisition of a SATT IP asset.
- Presumed results for turnover and domestic R&D expenditure indicate a stronger increase in both indicators for SME and mid-caps clients of SATT compared to non-clients.
- The patent filing activity does not appear to be affected by the acquisition of an asset over the analysis period.
- The robustness tests carried out with different matching methods (nearest neighbour, ten nearest neighbours, radius matching, etc.) and the centralised difference in differences model reveal the fragility of certain results due to the lack of years of observation available, the difficulty in ensuring a common evolution of the SATT client companies with the counterfactual group before the implementation of the scheme.
- Due to the unavailability of data in the files of the main databases (ending in 2016), the first causal impacts have been tested on a small proportion of the licences currently signed by the SATTs (see above).

The method developed in this study is intended to be extended to all SATT client companies and to all SATT ecosystems (shareholders and partners). It is to be implemented at least starting 2021, in order to assess the existence and extent of impacts, and to measure them more precisely.

## Appendix A Methodological approach

Figure 4 Average gap in financial, employment and R&D indicators between SATT and non-SATT client companies since the launch of the scheme

Indicator	Turnover	Balance sheet (net assets)	Workforce (FTE)	Added value (excl.VAT)
Average effect of the SATT scheme on financial indicators	20,9%*	15,8%*	2,2%	17,0%*

Indicator	Internal R&D expenses	External R&D expenses	Total R&D budget	Patent application	No. of researchers	R&D workforce
Average effect of the SATT scheme on R&D indicators	15,7%**	20,0%	21,7%***	0,8%	16,5%**	11,9%*

\*\*\* : significant at 1%, \*\* : significant at 5%, \* : significant at 10%. The significance of the estimation coefficients is obtained using parametric z-tests based on standard errors grouped by company. The results are obtained from a sample of 96 client companies and 459 non-client companies (counterfactual) for financial and employment indicators (max. 3,454 observations), as well as from a sample of 62 client companies and 289 non-client companies (counterfactual) for R&D indicators (max. 1,703 observations).



## Appendix B Methodological approach

### B.1 Definition of counterfactual sets of enterprises

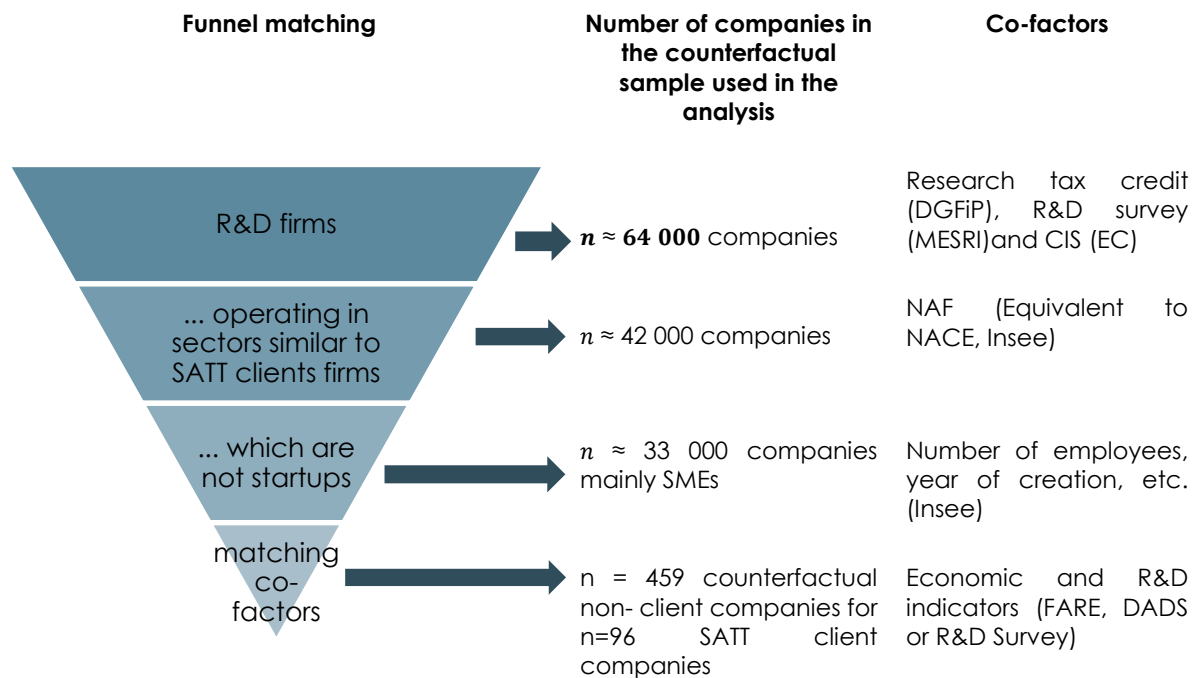
We built a set of "clone" companies of the SATT client companies sharing the same characteristics (business sectors, age, size, level of economic activity and R&D) during the pre-processing period of each client company.

We chose as a reference match the "five closest neighbours" on the basis of these co-factors (the most recurrent in the literature)<sup>11</sup>. What defines a good set of counterfactual firms?

- The pre-treatment mean values of the indicators of interest must be statistically equal for the two groups;
- The selection bias<sup>9</sup> must have been significantly reduced.

In addition, since all client companies had not acquired any assets at the same period (year), it was necessary to perform a total of four matches (one per year from 2012 to 2015) and to verify common trends in the pre-acquisition periods of clients and non-clients.

The causal impacts of SATTs on client companies are obtained by comparing the growth rates of client company indicators with the growth rates of matched non-client companies. The global sample analysed is a sample of SATT client enterprises excluding large groups (14 client companies): 96 SATT client companies, 459 non-client companies (counterfactual).



<sup>11</sup> However, other matching techniques are used to test the robustness of the results: matching by kernel, radius, nearest neighbour, on common year.

## B.2 The model of difference in differences and staggered difference in differences

The empirical model which estimates the difference in the averages between client and non-client companies of the counterfactual set is written as follows:

$$\log(z_{it}) = \alpha_i + \lambda_{tk} + \delta T_{it} + u_{it}, \quad (1)$$

where  $z_{it}$  is an indicator of interest for the company  $i$  to the period  $t$ . The period  $t$  corresponds to the years 2010 to 2016 (or 2017 for R&D indicators), years for which we have the largest number of indicators and company panels. The two terms  $\alpha_i$  and  $\lambda_{tk}$  are scalars relative to the company  $i$  and to the year-sector couple  $tk$  and correspond to the "double differences": they respectively allow to take into account the systematic differences between companies as well as the macroeconomic evolution (by sector) which would bias the analysis<sup>12</sup>.

The explanatory variable of interest is here  $T_{it}$  which represents the acquisition of assets (company  $i$  client of a SATT or not within the year  $t$ ), its coefficient  $\delta$  therefore corresponds to the difference in averages between client and non-client companies during the treatment period, under the assumption that the analysis sample is random.

Estimation of the lagged double difference model defined by equation (3) is performed using ordinary least squares (OLS) plus two-way fixed effects corresponding to the scalars  $\alpha_i$  and  $\lambda_{tk}$ .

In order to provide a more accurate estimate of the effects of treatment on client companies having acquired a licence at different periods, we additionally estimate a centralised double difference model, which normalises the temporal dimension of treatment by taking into account the years before and after the acquisition of a licence via SATT. This model is defined by the following equation:

$$\log(z_{it}) = \alpha_i + \lambda_{tk} + \sum_{j=-m}^g \pi_j T_i \mathbf{1}(t - T_{0,i} = j) + u_{it}, \quad (2)$$

where the treatment indicator in equation (3) is replaced with a set of interactions defined by the term  $T_i \mathbf{1}(t - T_{0,i} = j)$ , where  $T_i$  takes the value 1 if the company  $i$  is a client of the SATTs and the term  $\mathbf{1}(t - T_{0,i} = j)$  takes the value 1 if the period  $t$  is there  $j$ -th period before or after the acquisition of an asset via SATT defined by the period  $T_{0,i}$ . The coefficients  $\pi_j$  corresponds to the difference in value of the indicator  $z_{it}$  SATT client companies and non-client companies (of the counterfactual) in the periods before and after the acquisition of assets. By controlling for the annual change in an indicator before and after treatment, this model makes it possible to assess the effect of treatment corrected for these changes and to understand the time it takes for the effects of treatment to materialise on companies. Moreover, the coefficients associated with the years prior to treatment also make it possible to carry out the common trend test, where the indicators for the years prior to treatment are supposed to be statistically close between treated and untreated enterprises in order not to bias the results.

The reference period chosen to measure the impact of the device is equal to  $j = -1$  in order to be able to identify the temporal treatment effects on company indicators compared to the year preceding the first acquisition of assets via SATT: in other words, we omit the interaction of our treatment variable  $T$  with the year preceding the acquisition ( $t_{-1}$ ) and therefore interpret the coefficients  $\pi_j$  such as pre- and post-acquisition effects relating to this year.

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<sup>12</sup> Let's imagine that the period  $t = 3$  or a period of strong growth, we could falsely attribute the increase in turnover to treatment and then overestimate its impact



### B.3 Estimation of treatment effects on start-ups

The impact analysis of the SATT scheme includes start-ups created following a transfer of assets. The methodological approach to assess this precise impact is different from that of the client companies because (by definition) these start-ups do not have a pre-processing period. It is then necessary to match these start-ups with other similar businesses and to look at the evolution of the indicators of the former in relation to the latter.

We therefore initially matched the 57 start-ups resulting from asset transfers via the SATTs with a maximum of five Young Innovative Enterprises (JEs) on the basis of their headcount, balance sheet, equity and age. Then, in a second step, we compare the values of a set of indicators in the years following the creation of the entities (within four years of their creation,  $t$ ,  $t_{+1}$ ,  $t_{+2}$ ,  $t_{+3}$  and  $t_{+4}$ ).

In view of the data currently available, the recommended method does not yet provide sufficiently reliable results to be presented in this synthesis.