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Research Report

Characteristics of enterprises cooperating with the Centre Suisse d'Electronique et de Microtechnique (CSEM) and the contribution of the CSEM activities to the behaviour and the performance of cooperating enterprises: Study commissioned by the CSEM

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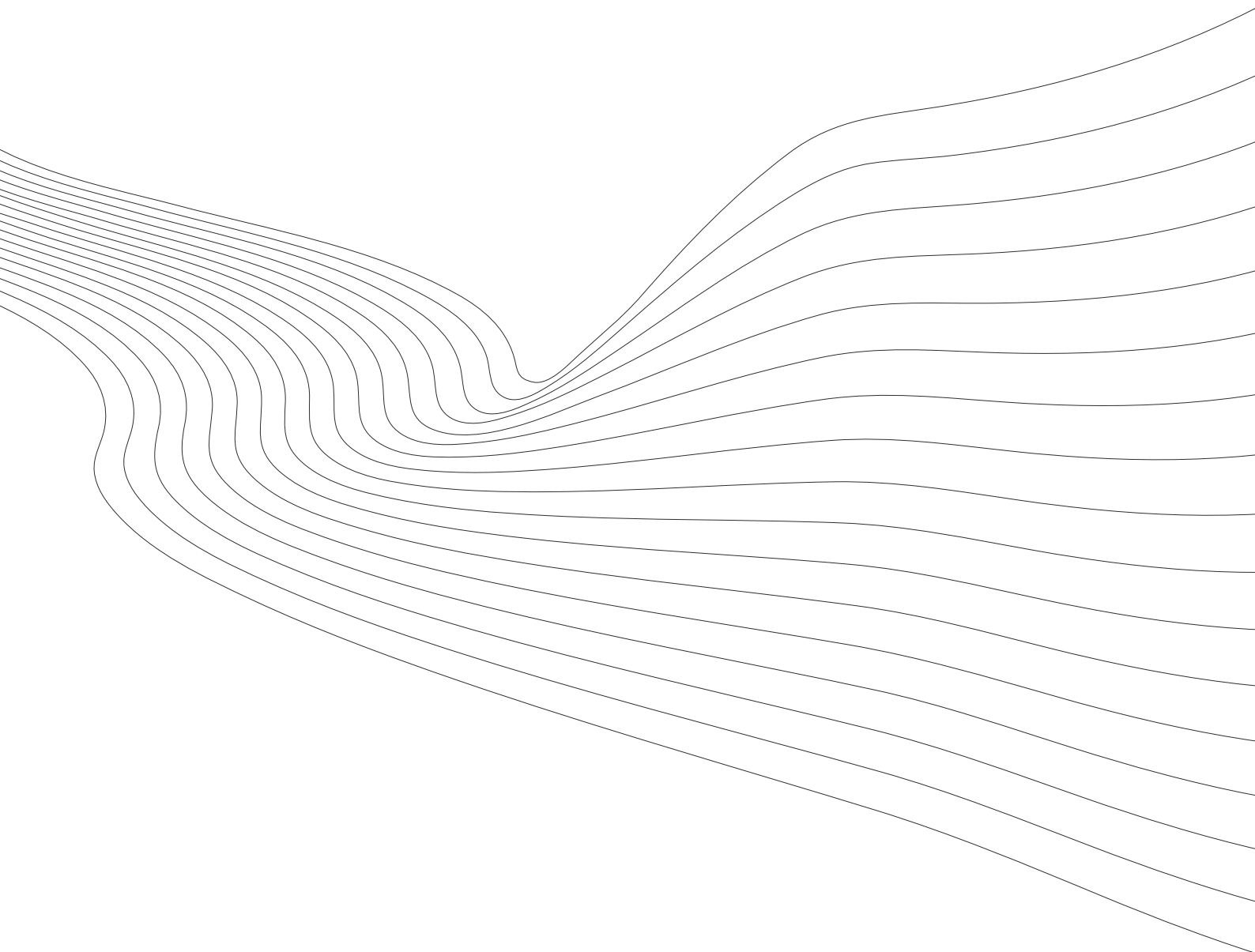
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Study Commissioned by the CSEM

Spyros Arvanitis • Martin Wörter
(with the cooperation of Raphael Kaufmann)



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Characteristics of enterprises cooperating with the Centre
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Zurich, October 2012

1. Introduction

1.1 Aim of the study

The study aims at capturing (a) the characteristics of firms cooperating with the CSEM and (b) the impact of the collaborative R&D projects of the CSEM on the behaviour and the performance of the partners and clients in the period 2009-2011.

2. Concept

In order to obtain information on the characteristics of the firms cooperating with the CSEM and analyze the effects of the CSEM activities on the performance – in the wide sense of the word including also behavioural effects – we collected data on the profile, activities and performance of the involved firms by a postal survey based on a questionnaire that was designed specifically for this study (see the appendix).

The questionnaire is composed of two parts. The first part refers to general characteristics of the firms such as number of employees, sales, composition of the workforce as to vocational education, labour costs, intermediate inputs, R&D, patents, new products and processes, etc.. The second part contains questions that capture the impact of projects in cooperation with the CSEM on several performance measures. This part has to be newly designed, partly based on existing literature, and is most important for this study.

The postal survey took place between March and June 2012 and yielded 39 valid answers (out of 123 questionnaires that were sent out; response rate of 31.7%). The organization of the survey was undertaken by Raphael Kaufmann, a Master student of the University of Neuchâtel, who worked as trainee for the CSEM in the first half of this year.

The collected data were analyzed descriptively. An econometric analysis was not feasible due to the low number of observations but also the fact that many firms avoided to give quantitative information about their performance for reasons of confidentiality.

For the characterization of the firms that cooperated with the CSEM we used as a reference the respective information of the Innovation Survey 2011¹ for a sample that contained all firms of the most important industries in the CSEM sample. A valid comparison of a number of relevant variables was possible because most questions about the general characteristics of the firms were common in both surveys.

In section 2 we construct a profile of the firms that have been clients of the CSEM in the period 2009-2011 and answered our questionnaire. Section 3 refers to the contribution of the CSEM to the performance of its clients via the common projects as it is reported in the questionnaire by the firms themselves. Section 4 concludes.

¹ The Innovation Survey is conducted by the KOF every third year on behalf of the State Secretariat of Economic Affairs (SECO). The last one took place on autumn 2011 and referred to the period 2009-2011.

2. Profile of firms cooperating with CSEM

2.1 General firm characteristics and market environment

Industry, firm size, region

About 77% of the firms that cooperate with the CSEM are affiliated in machinery, electronics, medical instruments and watches (Table 1a). The concentration to these industries corresponds quite closely to the profile of technological competences of the CSEM, which contains divisions for microrobotics and packaging, thin film optics, photonics, microsystems technology, systems engineering, integrated and wireless systems, nanomedicine, and nanotechnology and life sciences. With the exception of machinery, the Innovation Survey sample shows considerably lower shares of firms in the “CSEM industries”, especially in the field of medical instruments. 33% of CSEM firms (13 out of 39 firms) are *foreign-owned*.

The CSEM firms are strongly represented in the segment of micro firms (up to 10 employees) due to the fact that high-tech start-ups utilize the specialized technological services of CSEM as compared with the respective segment in the Innovation Survey (Table 1a). Firms cooperating with the CSEM are considerably weaker represented in the segment of medium-sized firms (50-249 employees) than firms in the Innovation Survey.

Table 1a: Composition of the sample of CSEM firms by industry and firm size (number of employees in full-time equivalents)

	CSEM firms		Innovation Survey 2011 (*)
<i>Industries</i>	Number of firms	Percentage	Percentage
Pharmaceuticals	2	5.1	5.8
Plastics	1	2.6	9.4
Machinery & equipment	9	23.1	26.9
Electrical equipment	1	2.6	9.9
Electronics/optical products	10	25.5	18.8
Medical instruments	8	20.4	3.3
Watches/clocks	3	7.7	7.3
Other manufacturing	1	2.6	5.2
Water/environment	1	2.6	3.5
Telecommunication	1	2.6	1.9
Information technology/services	2	5.2	8.0
<i>Size</i>			
Micro (1-10 employees)	14	35.9	8.7
Small (10-49 employees)	8	20.5	25.5
Medium (50-249 employees)	10	25.6	47.8
Large (> 250 employees)	7	18.0	18.0
<i>Total</i>	39	100.0	100.0

(*): Sample that contains the same industries as in the CSEM sample (N=573).

Human capital

A further important characteristic of the CSEM firms is the high endowment with *human capital*. About 63% of them (20 out of 32 firms) reported a share of employees with tertiary-level education (universities, universities of applied sciences (Fachhochschulen), etc.) higher than 80%. Among them there is a relatively high percentage of newly founded firms (2008/2009) of about 24% (9 out of 38 firms).

Further, the activities of CSEM are concentrated in the regions Espace Mittelland and Zurich. About 50% of firms are located in these two large regions (Table 1b).

Table 1b: Composition of the sample by region

<i>Region</i>	Number of firms	Percentage
Lake Léman	5	12.9
Espace Mittelland	11	28.2
Northwestern Switzerland	2	5.1
Zurich	8	20.5
Eastern Switzerland	6	15.4
Central Switzerland	5	12.8
Ticino	0	0.0
Outside Switzerland	2	5.1
<i>Total</i>	<i>39</i>	<i>100.0</i>

Export activities

With respect to export propensity there is almost no difference between the CSEM firms and the firms in the Innovation Survey: 84.6% versus 86.7% of all firms (Table 2).

Table 2: Export propensity and export intensity

	CSEM firms		Innovation Survey 2011 (*)
	Number of firms	Percentage	Percentage
<i>Exports (yes/no)</i>	33	84.6	86.7
<i>Exports as percentage of sales:</i>			
1%-25%	4	21.1	20.1
25%-75%	3	15.8	25.1
> 75%	12	63.1	54.8

(*): Machinery, electronics/optical products, medical instruments, watches/clocks (N=322).

We have information on the sales share of exports (export intensity) only for 20 out of 39 CSEM firms. The comparison with the respective figures of the reference sample shows an equal share for the CSEM firms in the segment up to 25%, a lower share in the middle segment (25%-75%) and a higher share in the upper segment (more than 75%).

Market environment

There are considerable differences between the CSEM firms and the reference firms as to four important *determinants of innovation activities*: current demand development and demand perspectives; price and non-price competition; and the number of principal competitors as a measure of market concentration. In accordance with existing literature we would expect that these variables show a positive impact on the innovation propensity up to a certain level of market concentration. For very high levels of market concentration the relationship would change to a negative one² The shares of firms in each category that reported (a) an increase of demand in the reference period (2009-2011) as well as an increase of expected demand for 2012-2014, (b) high intensity of price and non-price competition and (c) the number of principal competitors in the main sales markets are shown in Table 3. According to these

Table 3: Characteristics of market environment

	CSEM firms		Innovation Survey 2011 (*)
	Number of firms	Percentage	Percentage
Demand development (**):			
- period 2009-2011	28	71.8	48.1
- period 2012-2014	28	71.8	37.6
Intensity of price competition (**)	19	48.7	68.3
Intensity of non-price competition (**)	17	43.6	34.5
Number of principal competitors:			
- 0-5	23	58.9	40.4
- 6-10	11	28.2	31.1
- 11-15	4	10.3	11.1
- 16-50	1	2.6	10.6
- more than 50	0	0.0	6.8

(*): Machinery, electronics/optical products, medical instruments, watches/clocks (N=322).

(**): Demand: percentage of firms that report increase or strong increase of demand in their main sales markets (levels 4 and 5 on a five-point Likert-scale); intensity of price or non-price competition: percentage of firms that report strong or very strong competition in their main sales markets (levels 4 or 5 on a five-point Likert-scale).

² See Cohen 1995 for a survey of relevant literature and Aghion et al. (2005) for the so-called inverted-U relationship between innovation and competition. Arvanitis 2(008) and in Peneder and Woerter (2012) show evidence for the Swiss manufacturing).

figures, the CSEM firms are embedded in a market environment with stronger demand impulses, lower price competition, higher non-price competition, most of them in market “niches” with less than five main competitors. This pattern is indeed widespread in the innovative segments of the Swiss manufacturing, particularly for SMEs, but it looks to be even more pronounced among CSEM firms (see Arvanitis and von Arx 2004).

2.2 Innovation profile

We collected information on both the *input* side (internal and external R&D activities, including R&D cooperation in form of joint ventures, technology agreements, R&D expenditures) and the *output* side of the a multi-level (from research to market introduction) innovation process (publications, patents, introduction of product and process innovations, sales shares of innovative (new and considerably modified products). In this context, the innovation process is understood primarily as a continuous process of *incremental* innovation. More than one innovation indicator is used because the phenomenon of innovation is too complex and multifaceted to be appropriately covered by a single indicator or category of indicators (Kleinknecht et al. 2002).

Innovation input

According to the information in Table 4, significantly more CSEM firms conduct R&D than similar firms in the Innovation Survey (89.7 versus 69.6%), but the share of firms that conduct R&D continuously is comparable with that of the reference firms. Of course, it is not astonishing that almost all CSEM firms are conducting R&D, 77% of them report that they have an R&D department, otherwise they would be less interested in cooperating with the CSEM. Moreover, the propensity to cooperate with the CSEM (in form of contracted R&D, acquisition of other technological services, and consulting) is positively correlated with the tendency to engage in other forms of R&D cooperation: 54% of the CSEM firms reported such cooperation, the respective figure of the Innovation Survey was 42%.

The information on R&D expenditure is based on data for only 21 out of 39 firms. According to these data 43% of the CSEM firms invested more than 100'000 CHF per employee in total R&D (in-house and external) in the period 2009-2011, the rest less than 100'000 CHF. The respective figures for the reference firms are 32% and 68%, respectively. On the whole, it appears that not only more CSEM firms invest in R&D but also that they invest more per employee than the reference firms.

Table 4: R&D activities

	CSEM firms		Innovation Survey 2011 (*)
<i>Indicator</i>	Number of Firms	Percentage	Percentage
R&D in-house (yes/no)	35	89.7	69.6
R&D external (contracted R&D) (yes/no)	37	94.9	-
R&D continuously	33	84.6	83.5
R&D department	30	76.9	-
R&D cooperation (joint ventures, etc.)	21	53.9	41.5
R&D expenditures per employee: (**)			
< 100,000 CHF	12	57.1	68.3
> 100,000 CHF	9	42.9	31.7

(*): Machinery, electronics/optical products, medical instruments, watches/clocks (N=322);

(**): Only 21 firms answered this question.

Innovation output

A considerable share of CSEM firms, namely 54%, reported at least one *scientific publication* as a result of their innovation process in the period 2009-2011, about 89% of them (17 out of 19 firms) up to 5 publications (Table 5). This is a remarkable achievement for firms that are mostly quite small.

About 74% of CSEM firms reported at least one *patent application* as (intermediary) output of their innovation process. This share is considerably higher than in the reference group (49%). 82% of them (23 out of 28) showed up to 10 patent applications.

With respect to final innovation output, 87% of the CSEM firms reported the introduction of *product innovations*, the respective figure in the reference group was 77%, a discernible difference in favour of the CSEM firms. This difference is small as to the introduction of process innovations (56% versus 52%).

The *market-oriented* innovation output is measured by the sum of the sales share of *new* products and *significantly modified* existing firms (lower part of Table 5). Unfortunately, data for only 20 firms are available.³ A look on the more detailed figures shows that the CSEM firms have either no or few (up to 10%) sales of new products or sales shares that are higher than 50%. This is probably a hint that either there is no new product or one new product that dominates the sales, something that is not astonishing given the smallness of most of the CSEM firms. We get a different picture with respect to modified products. The CSEM firms seem to be considerable less interest in introducing modified products than the reference

³ A further problem is that we do not have any information about the lag between the introduction of a product innovation and the begin of the generation of revenues from this innovation.

Table 5: Research outcomes and innovation output

	CSEM firms		Innovation Survey 2011 (*)
<i>Indicator</i>	Number of Firms	Percentage	Percentage
Publications (yes)	21	53.8	-
Number of publications:			
1	3	15.8	-
2	3	15.8	-
3	2	10.5	-
4	1	5.3	-
5	8	42.0	-
20	1	5.3	-
90	1	5.3	-
Patent applications (yes)	29	74.4	48.8
Number of patent applications:			
1	9	32.0	
3	3	10.7	
3	4	14.3	
4	2	7.1	
5	3	10.7	
8	1	3.6	
9	1	3.6	
30	1	3.6	
50	1	3.6	
60	1	3.6	
70	1	3.6	
100	1	3.6	
Product innovations (yes)	34	87.2	77.3
Process innovations (yes)	22	56.4	52.2
Sales share of - <i>new products</i> (**)			
0%	5	25.0	20.4
Up to 10%	6	30.0	36.2
10%-50%	3	15.0	37.5
> 50%	6	30.0	5.9
- <i>considerably modified products</i> : (**)			
0%	10	50.0	21.3
Up to 10%	3	15.0	28.3
10%-50%	7	35.0	43.3
> 50%	0	0.0	7.1

(*): Machinery, electronics/optical products, medical instruments, watches/clocks (N=322);

(**): Only 20 firms answered this question.

firms: 50% of the CSEM firms reported no sales of this category of products and no CSEM firm reported sales shares for modified products that were higher than 50%.

On the whole, we get the picture of mostly smaller, quite innovative firms – both in terms of innovation input and innovation output – that operate in market “niches” with few competitors, low product pressure and high quality and technological competition.

3. Firm cooperation with CSEM

3.1 Firms’ projects with CSEM

Profile of the CSEM

According to the CSEM webpage, technology transfer is at the heart of the CSEM’s mission. The institution’s goal is to add value to the results of scientific and technological research and to enhance innovation activity in the markets, using the newest technologies combined with own expertise. This is done in several ways:

- Through the transfer of know-how from research to usable technologies, a work that is funded directly by the Swiss Federal Government. Resulting from these activities are *technology platforms* – sets of competences, know-how, experience and infrastructures in given technology domains.
- Through the foundation of start-ups with innovative products: the CSEM has created 29 start-ups in the last 10 years.
- Through the provision of innovation support to customers by applying the developed *technology platforms* to real industrial challenges, thus helping to incorporate the newest technologies in the products of customers.

In the context of this study we are interested primarily in this last category of collaborative projects with business customers. Besides consulting, two kinds of activities are more important, *contracted R&D* and *small series production of* high-tech components or devices.

With respect to contracted R&D the following services are provided by the CSEM according to our customers' needs: feasibility studies; concept design; prototype or full product developments; IP licensing; and any combination of the above.

As to small series production the fields that are mainly concerned are microsystems with small production series and development process for the watch industry, microfluidic systems, packaging and interconnect technologies and microelectronics. CSEM also serves customers for very small scale production in the nano-field, such as nanostructuration and surface functionalization and nanotools for science and biology.

Characteristics of the projects

Table 6 shows the information on the characteristics of the projects that were realized by the CSEM firms that have been considered in this study in the period 2009-2011. About 75% of the involved firms had only one project in this period. The project volumes varied considerably: 61% of the projects amounted up to 100'000 CHF, about 15% were in the range between 100'000 CHF and 200'000 CHF, the rest of them came to more than 200'000 CHF. These are considerable amounts as compared with the R&D budgets described in Table 4. Most projects were realized by the end of 2010 (for 28 out of 39 firms), the earliest of them already at the end of the year 2007.⁴ Thus, there has been enough time before the end of the project and our survey for firms to be able to report some impact.

Table 6: Cooperation characteristics

	CSEM firms	
	Number of Firms	Percentage
<i>Number of projects per firm:</i>		
1	29	74.4
More than 1	10	25.6
<i>Project volume in 1000 CHF:</i>		
Up to 50	12	30.8
51-100	12	30.8
101-150	4	10.3
151-200	2	5.1
201-250	2	5.1
More than 250	7	17.9
<i>End date of project:</i>		
2011	4	10.3
2010	13	33.3
2009	8	20.5
2008	13	33.3
2007	1	2.6

Source: Internal CSEM records.

3.2 Contribution of CSEM cooperation to firm behaviour and performance

The firms reported in the second part of our questionnaire their assessment of the impact of the CSEM project(s), in which they have been engaged, on several performance and behavioural variables; in case of more than 1 project the reported assessment referred to the overall impact.

⁴ In fact, 14 firms have had projects outside the reference period, but most of the 2008 projects were finished in the second half of this year, so that the discrepancy is small.

With respect to performance we concentrate here on the *innovation performance* that could be *directly* influenced by the collaborative projects. More indirect effects that could be traced back also to drivers other than the CSEM projects could not be detected easily (for example effects on labour productivity). For this reason questions in this direction have been avoided.

Impact on resources

R&D expenditures:

51% of the firms reported an increase of R&D expenditures due to the CSEM project (lower part of Table 7). This result could be interpreted as a hint that the collaboration with the CSEM caused a *behavioural* change, namely an increase of R&D expenditures beneath the amount for the project itself (for the case this expenditure had been classified as R&D expenditure). Of course it cannot be excluded that the firms assessed the increase only in terms of the additional external R&D expenditures for the CSEM project. Also in this case we obtain the clear hint that the amount for the project has been an *additional* expenditure and not a *substitute* for decreased in-house R&D. Given that R&D expenditures are an investment in future growth, we conclude that for half of the CSEM clients the cooperation with CSEM led to additional R&D effort, thus possibly to an enhancement of firms' future innovation output and economic performance.

Employment:

About 26% of the firms declared that the employment (number of employees in full-time equivalents) has grown as a consequence of the CSEM cooperation project(s). For most of the firms no such employment change could be detected. With the exception of an increase of the R&D personnel employment increases due to the cooperation with the CSEM would occur in production or marketing and would be related with changes in these domains. These would be an indirect consequence of the cooperation. In this sense this result may reflect the impact on performance in terms of additional sales, for which additional personnel might be needed.

Human capital:

About 31% of the firms increased the number of employees with tertiary-level education as a result of the CSEM cooperation. This is a remarkable effect of up-grating of firms' human capital that could be utilized for an improvement of innovation and economic performance.

Impact on outcomes

Scientific publications, patent applications

More than 50% of the firms that reported scientific publications (57%; 12 out of 21 firms) and patent applications (52%; 15 out of 29 firms) declared that publications and patents were generated in cooperation with the CSEM (upper part of Table 7). This means that a

considerable part of the firms' publications and patents were made possible through the CSEM projects.

Introduction of product and process innovations

The effect with respect to the propensity for *product innovations* is the most remarkable effect that was reported by the firms. 62% of the firms that introduced product innovations in the reference period stated that the CSEM project(s) clearly contributed to the realization of these innovations. This effect is considerably smaller for *process innovations*: only about 23% of the firms with process innovations could detect a contribution of the CSEM project(s) to the realization of these innovations. Thus, the CSEM activities appear to enhance significantly the introduction of new innovative productions.

Table 7: Contribution of the CSEM

<i>Indicator</i>	CSEM firms	
	Number of Firms	Percentage
Publications	12	57.1
Patent applications	15	51.8
Product innovations	21	61.8
Process innovations	5	22.7
Sales share of:		
- <i>new products</i> (*)	8	38.1
- <i>considerably modified products</i> (*)	3	14.3
R&D expenditures:		
Increase	20	51.2
No change	18	46.2
Decrease	1	2.6
Employment:		
Increase	10	25.6
No change	27	69.2
Decrease	2	5.1
Number of tertiary-educated employees:		
Increase	12	30.8
No change	27	69.2
Decrease	0	0.0

(*): Only 21 firms answered this question.

Sales share of innovative products

The firms were also asked whether a part of the sales of innovative firms came from innovative products that have been developed in cooperation with CSEM. 38% of the firms with sales of *new products* (8 out of 21 firms) reported that part of these sales is closely associated with the CSEM activities. This is an indication for a discernible contribution also

to market success. The respective share for *considerably modified products* was 14% (3 out of 21 firms); this share is low because also the share of firms with non-zero sales of this category of products is low (see Table 5).

4. Concluding remarks

The study covered only a short period of the long history of the CSEM. But the results show that also in this short period a discernible contribution of the CSEM cooperation projects on the behaviour and the innovation performance of CSEM clients can be detected.

In sum, with respect to the profile of the CSEM client enterprises we get the picture of mostly smaller, quite innovative firms – both in terms of innovation input and innovation output – that operate in market “niches” with few competitors, low price pressure and high intensity of quality and technological competition. These firms are concentrated in the fields of machinery, medical instruments, electronics and watches and have an above-average endowment with human capital.

The cooperation projects with the CSEM seem to enhance considerably not only the overall innovation performance of the client enterprises in terms of R&D expenditure, scientific publications, patent applications, propensity for product innovations and sales shares of new products but also – to a lesser extent – in terms of employment and human capital.

References

- Aghion P., Bloom N., Blundell R., Griffith R. and P. Howitt (2005): Competition and Innovation: An Inverted-U Relationship, *Quarterly Journal of Economics*, 120, 701-728.
- Arvanitis, S. (2008): Innovation and Labour Productivity in the Swiss Manufacturing Sector: An Analysis Based on Firm panel Data, in C. van Beers, A. Kleinknecht, R. Ortt and R. Verburg (eds.), *Determinants of Innovative Behaviour: A Firm's Internal Practices and Its External Environment*, Palgrave, London, pp. 188-216.
- Arvanitis, S. und J. von Arx (2004b): Innovation und Wettbewerb – Eine Analyse aufgrund von schweizerischen Unternehmensdaten, *KOF-Arbeitspapiere/Working Papers Nr. 84*, März, Zurich.
- Cohen, W.M (1995): Empirical Studies of Innovative Activity, in P. Stoneman (ed.), *Handbook of Innovation and Technological Change*, Blackwell, Oxford.
- Kleinknecht, A., van Montfort, K. and E. Brower (2002): The Non-trivial Choice between Innovation Indicators, *Economics of Innovation and New Technology*, 11(2), 109-
- Peneder, M and M.Woerter (2012): Competition, R&D and Innovation: Testing the Inverted-U Relationship in a Simultaneous System, Manuscript, Zurich/Vienna.

QUESTIONNAIRE

Survey 2012

Impact of the activities of CSEM on the performance of cooperating enterprises

- All information provided will be handled **strictly confidentially**.
- Unless otherwise specified, answers relate to **locations in Switzerland** only.
- If anything is unclear, please consult the explanatory notes.
- Please place a cross in the relevant field (☒) or enter the appropriate figure.
- The return address is printed on the final page.

Please return the questionnaire by:

30th March 2012

(Please return the questionnaire even if you are unable to answer all the questions, or can only supply estimates.)

1. Information about your firm and the market environment

1.1 Please indicate in which **industry** your firm has its main activities:
(Please tick relevant box)

- | | | | |
|-------------------------------|--------------------------|-----------------------------------|--------------------------|
| - Food/Beverages/Tobacco | <input type="checkbox"/> | - Medical Instruments | <input type="checkbox"/> |
| | 4 | | 18 |
| - Textiles/Clothing | <input type="checkbox"/> | - Watches/Clocks | <input type="checkbox"/> |
| | | | 19 |
| - Wood | <input type="checkbox"/> | - Vehicles | <input type="checkbox"/> |
| | | | |
| - Paper | <input type="checkbox"/> | - Other Manufacturing | <input type="checkbox"/> |
| | 7 | | |
| - Printing | <input type="checkbox"/> | - Energy | <input type="checkbox"/> |
| | | | 22 |
| - Chemicals | <input type="checkbox"/> | - Water/Environnement | <input type="checkbox"/> |
| | | | |
| - Pharmaceuticals | <input type="checkbox"/> | - Construction | <input type="checkbox"/> |
| | 10 | | |
| - Rubber/Plastics | <input type="checkbox"/> | - Transportation | <input type="checkbox"/> |
| | | | |
| - Non-metalic Minerals | <input type="checkbox"/> | - Telecommunications | <input type="checkbox"/> |
| | | | 26 |
| - Basic Metals | <input type="checkbox"/> | - Publishing/Media | <input type="checkbox"/> |
| | 13 | | |
| - Machinery & Equipment | <input type="checkbox"/> | - Information Technology/Services | <input type="checkbox"/> |
| | | | |
| - Electrical Equipment | <input type="checkbox"/> | - Technical Commercial Services | <input type="checkbox"/> |
| | | | |
| - Electronic/Optical Products | <input type="checkbox"/> | - Other Commercial Services | <input type="checkbox"/> |
| | | | 30 |
| - Repair/Installation | <input type="checkbox"/> | | |
| | 17 | | |

1.2 **Year of establishment** of your firm:

--	--	--	--

31

1.3 Your firm is owned (majority) by a **foreign firm**:

Yes	No
<input type="checkbox"/>	<input type="checkbox"/>

35

a) If **no**: does your firm belong to a group?

Yes	No
<input type="checkbox"/>	<input type="checkbox"/>

36

1.4 **Number of employees** in Switzerland at the end of 2010 (incl. apprentices; please convert the figures for part-time employees to full-time equivalents):

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37

1.5 The share of employees of the following **personnel categories** at the end of 2010 amounts to approximately (please convert the figures for part time employees to full-time equivalents):

- Academics (personnel with a university degree)	<input type="text"/>	<input type="text"/>	<input type="text"/>	%
				44
- Personnel with education higher than a degree of vocational education	<input type="text"/>	<input type="text"/>	<input type="text"/>	%
- Personnel with a degree of vocational education (Berufslehre; apprentissage)	<input type="text"/>	<input type="text"/>	<input type="text"/>	%
- Semi-skilled workers and unskilled workers	<input type="text"/>	<input type="text"/>	<input type="text"/>	%
- Apprentices	<input type="text"/>	<input type="text"/>	<input type="text"/>	%
				56
Total	<input type="text"/>	<input type="text"/>	<input type="text"/>	%
	1	0	0	

1.6 **Turnover** (net of value added tax) of the firm at the location of Switzerland 2010:

Fr.

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--	--	--	--

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57

1.7 Does your firm **export** goods/services?

Yes	No
<input type="checkbox"/>	<input type="checkbox"/>

68

a) If **yes**, sales share of **exports** 2010:

			%
--	--	--	---

69

1.8 Sales share of **personnel costs** 2010:

				%
--	--	--	--	---

72

1.9 Sales share of expenditure for **intermediate inputs** (goods and services) (net of value added tax) 2010:

				%
--	--	--	--	---

75

Explanation:

Expenditures for purchases of intermediate inputs: Goods (materials, semi-finished products, etc.), banking and insurance services, telecommunication, rent for buildings, etc., **but not for investment goods.**

1.10 **Gross investment expenditures** (net of value added tax) 2010:

Fr.

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78

1.11 Mid-term development of **demand** in your **main sales market**:

	strong decrease						strong increase		
	-2	-1	0	+1	+2				
- period 2009-2011	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				89
- period 2012-2014	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

1.12 Number of domestic and foreign **principal competitors** in your **main sales market**:

- 0 - 5	<input type="checkbox"/>	91
- 6 - 10	<input type="checkbox"/>	
- 11 - 15	<input type="checkbox"/>	
- 16 - 50	<input type="checkbox"/>	
- more than 50	<input type="checkbox"/>	

1.13 Assessment of the **intensity of competition** in your **main sales market**:

	very weak	1	2	3	4	5	very strong	
- Price competition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
- Non-price competition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		93

(e.g. product differentiation, frequent introduction of new products, technical advancement, services, flexibility to customer demands)

2. Innovation activities

Explanation:

- 1) A **product innovation** is the market introduction of a **new** or **significantly improved** good or service with respect to its usage potential, user friendliness, components or sub-systems. Product innovations must be new to your enterprise, but they do not need to be new to the market.
- 2) A **process innovation** is the implementation of a **new** or **significantly improved** production process, distribution method, or supporting activity. Exclude pure organizational innovations. Process innovations must be new to your enterprise, but they do not need to be new to the market.

2.1 Did your firm introduce any of the below in the period 2009-2011:

	Yes	No
- Product innovation ¹	<input type="checkbox"/>	<input type="checkbox"/> 94
- Process innovation ²	<input type="checkbox"/>	<input type="checkbox"/>

→ If 'no' in both questions, please proceed to **section 3.**

2.2 If your firm introduced innovations in the period 2009-2011, did the **cooperation project(s) with CSEM** contribute to the realization of:

	Yes	No
- Product innovation ¹	<input type="checkbox"/>	<input type="checkbox"/> 96
- Process innovation ²	<input type="checkbox"/>	<input type="checkbox"/>

2.3 Please give the share of your total turnover in 2010 resulting from:

	Share of total turnover	Share which was fully or partly developed in cooperation with the CSEM project(s) in percentage points (PP)								
- New products introduced since the beginning of 2009	<table border="1"><tr><td></td><td></td><td></td><td>%</td></tr></table> 98				%	→ <table border="1"><tr><td></td><td></td><td></td><td>PP</td></tr></table> 101				PP
			%							
			PP							
- Significantly improved products introduced since the beginning of 2009	<table border="1"><tr><td></td><td></td><td></td><td>%</td></tr></table> 104				%	→ <table border="1"><tr><td></td><td></td><td></td><td>PP</td></tr></table> 107				PP
			%							
			PP							
- Products that remained unchanged or were only marginally modified since the beginning of 2009	<table border="1"><tr><td></td><td></td><td></td><td>%</td></tr></table> 110				%					
			%							

Total

1	0	0	%
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2.4 **Drivers** of innovation activities: What is your assessment of the following statements:

- not at all 1 2 3 4 fully 5
- a) The innovations that your firm introduced in the period 2009-2011 were driven primarily by **market demand** factors (increasing demand for innovative product; keeping up with competitors) ☐ 113
- b) The innovations that your firm introduced in the period 2009-2011 were driven primarily by **technology supply** factors (availability of new technology) ☐ 114

3. Publications and patent applications

3.1 Did your research activities lead to scientific publications in the period 2009-2011?

Yes ☐ 115
No ☐

If 'yes':

a) How many publications?

about 116

b) How many of them were published in cooperation with the CSEM project(s)?

about 119

3.2 Did your research activities lead to patent applications in the period 2009-2011?

Yes ☐ 122
No ☐

If 'yes':

a) How many patent applications?

about 123

b) How many of them came out in cooperation with the CSEM project(s)?

about 126

4. R&D activities

4.1 Did your firm engage in the following activities in the period 2009-2011:

Yes No
- In-house R&D ☐ ☐ 129
- External (contracted) R&D ☐ ☐

4.2 Did your firm perform R&D in the period 2009-2011:

- Continuously ☐ 131
- Occasionally ☐

4.3 Does your firm have a R&D department?

Yes ☐ 132
No ☐

4.4 Please estimate the amount of total (in-house + external) R&D expenditures over the three years 2009-2011:

Fr. 133

Percentage of this amount for external R&D:

% 144

4.5 Did your firm engage in R&D cooperation projects (e.g. joint ventures, technology agreements) other than external (contracted) R&D projects?

Yes ☐ 147
No ☐

4.6 Did the CSEM cooperation project(s) have an influence on your R&D expenditures:

- Increase ☐ 148
- No change ☐
- Decrease ☐

5. Employment and human capital

5.1 As a consequence of the CSEM cooperation project(s) of your firm the number of employees (in full-time equivalents):

- Increased ☐ 149
- No change ☐
- Decreased ☐

5.2 As a consequence of the CSEM cooperation project(s) of your firm the number of employees with tertiary-level education (ETH/EPF; Cantonal Universities; Universities of Applied Sciences ('Fachhochschulen'/'Haute Ecole'); other tertiary-level education institution):

- Increased ☐ 150
- No change ☐
- Decreased ☐

→ If 'no' in both questions, please proceed to **section 5**.

*** **Thank you for your valuable contribution** ***

Contact person:	_____
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