Draft

Territorial Factors Affecting Innovation in the Micro-Regions of São Paulo

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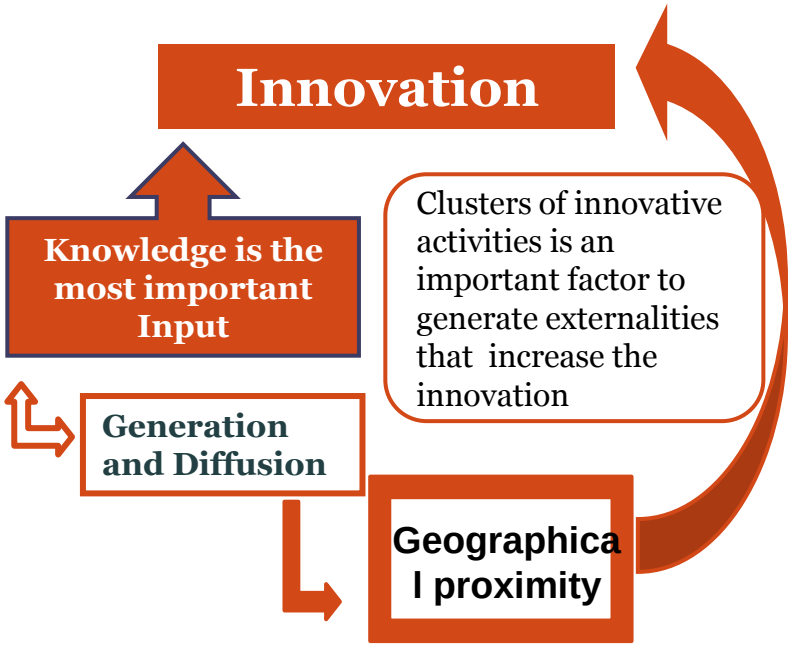
Literature Review

How geographical proximity affects innovation?

- Knowledge is the most important input for innovation.
- Knowledge is almost located in space (persons, firms, etc.)
- So proximity can facilities knowledge generation and (specifically) diffusion.
- And proximity between agents related to knowledge can foster innovative performance of regions
  - One important evidence this, is the formation of clusters.



The knowledge production and diffusion in regions that generate innovation is influenced by a set of territorial processes

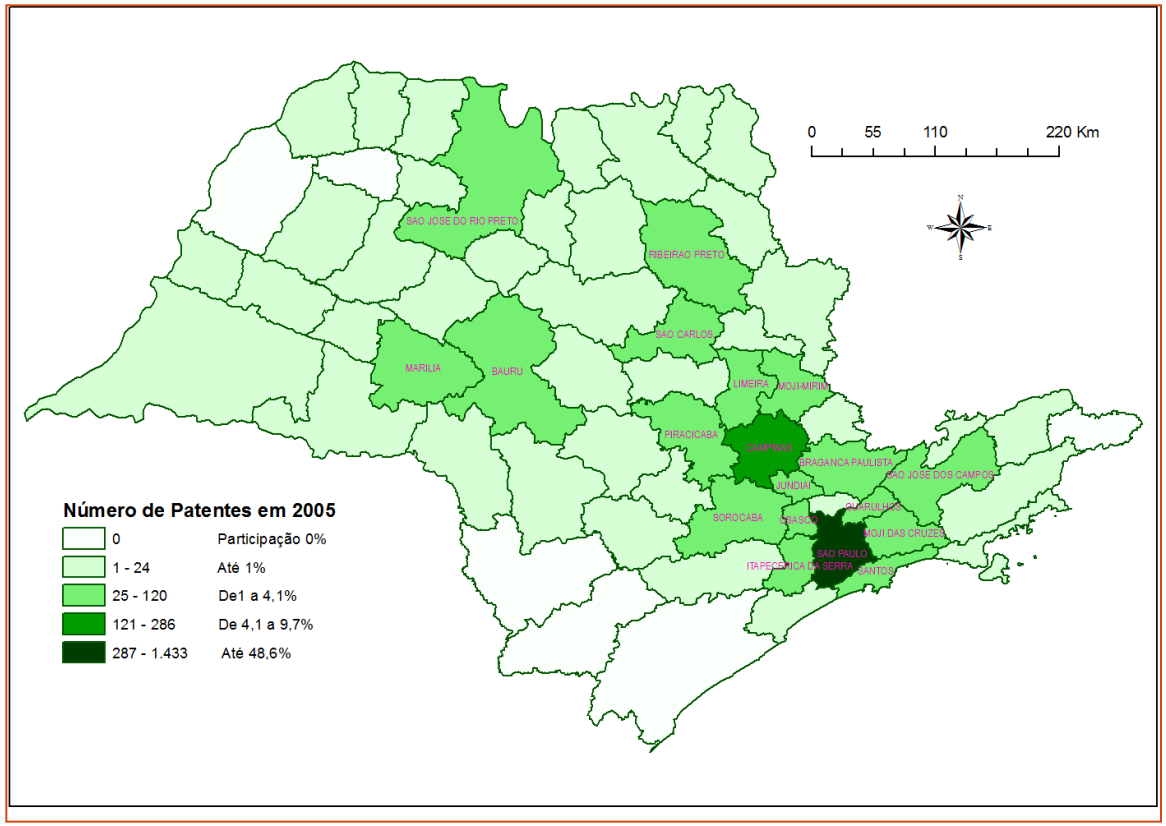
Spatial organization of innovative activities

Nelson e Winter(1982); Cohen e Levithal(1990); Audrestch e Feldmam(1996); Acs, Lissoni(2001); Gertler(2007); Jafffe(1989); Crescenzi *et al.*(2007)

The aim

- This paper examine empirically, through the Knowledge Production Function, the relationship between the spatial distribution of innovative inputs and outcome of innovation in the micro-regions of the state of São Paulo.
  - Specifically, **how factors locations can be impact the innovation in micro-region of Sao Paulo.**

Distribution of patents application in INPI in 2005 from firms, individuals or university inside micro-regions (63) of Sao Paulo.



Distribution heterogeneity:

- *Six micro-regions do not have patents*
- *Sao Paulo micro-region retains 48,6% of the Sao Paulo's state total.*
- *More than half of the micro-regions had less than 24 patents.*

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$$\ln(P_{i,t}) = \beta_0 + \beta_1 \ln(RD_{i,t-T}) + \beta_2 \ln(WRD_{i,t-T}) + \beta_3 \ln(Aglom_{i,t-T}) + \beta_4 kindex_{i,t-T}$$
$$+ \beta_5 SocialFiltro_{i,t-T} + \beta_6 \ln(IntUE_{i,t-T}) + \beta_7 \ln(P_{i,t-T}) + \beta_8 DistCapital_{i,t-T}$$

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- $P_{i,T}$ is innovation in micro-region *i* in year *t* - 2005, measured by patents *per capita* require in INPI

$$\ln(P_{i,t}) = \beta_0 + \beta_1 \ln(RD_{i,t-T}) + ...$$

RD → Efforts in Research and Development: Expends in Research and Development (R&D) *divided by number of firms in t-T: 2000. Source: PINTEC*

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Social Filter→ *Population characteristics: Capture three major aspects with principal component analysis:*

1.Sup → Education capacity of the population: % population with higher education. *Source:* INEP

2.Tecn →Structure of productive resources in science and technology:% employment on technology activities (Physics, chemises, engineer). *Source:* RAIS

3.Idade (Age)→ Demographic structure: % population aged 15-24. *Source: IBGE*

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Two Controls:

1.P(t-T) → temporal lagged innovative output: Initial patent.

2.DistCapital → Control regional differences given the proximity of the micro-region São Paulo (state capital) : Distance in km between a micro-region and state capital

RESULTS

Social Filter Component

Main components/correlation

Number of obs=63

Number of comp=3

Trace =3

Rho = 1,00

Component	Eigenvalor	Difference	Proportion	Cumulative
Comp1	1,351	0,264	0,45	0,45
Comp2	1,087	0,524	0,362	0,813
Comp3	0,563	.	0,188	1

Main components(eigenvectors)

variable	Comp1	Comp2	Comp3	Unexplained
Sup	0,462	0,717	0,522	0
Idade	0,481	-0,697	0,531	0
Tecn	0,745	0,006	-0,667	0

Two Components for Social Filter:

comp1FS: more weight *Tecn (*

comp2FS: more weight *Sup* and *Idade* (age)

Results

lnP05	1	2	3	4	5	6	7	8	9	10	11	12	13	14
lnRD	0,204*** (0,071)	0,198*** (0,072)	0,186** (0,081)	0,146** (0,071)	0,013 (0,087)	0,180** (0,082)	0,122* (0,072)	0,011 (0,088)	0,132 (0,080)	-0,00 (0,102)	-0,04 (0,081)	0,109 (0,080)	-0,00 (0,103)	-0,05 (0,096)
lnWRD	0,069 (0,087)	0,084 (0,090)	0,104 (0,097)	0,030 (0,084)	0,062 (0,092)	0,122 (0,100)	0,055 (0,084)	0,052 (0,096)	0,060 (0,093)	0,064 (0,103)	-0,03 (0,090)	0,088 (0,094)	0,051 (0,108)	-0,03 (0,102)
lnAglom		0,264 (0,397)				0,288 (0,404)	0,587 (0,384)	-0,18 (0,401)				0,604 (0,391)	-0,19 (0,415)	0,220 (0,404)
comp1SF			0,018 (0,108)			0,015 (0,109)			0,014 (0,103)	0,033 (0,105)		0,008 (0,101)	0,032 (0,107)	0,026 (0,097)
comp2SF			0,096 (0,108)			0,101 (0,109)			0,080 (0,102)	-0,01 (0,117)		0,088 (0,101)	-0,01 (0,119)	-0,02 (0,108)
kindex				-1,100** (0,428)			-1,209*** (0,441)		-1,080** (0,436)		-1,230*** (0,414)	-1,280*** (0,447)		-1,320*** (0,460)
lnIntUE					0,920* (0,505)			0,933* (0,511)		0,987 (0,594)	1,019** (0,461)		1,017 (0,604)	1,090* (0,550)
lnP00	0,358)** (0,142	0,361** (0,143)	0,337** (0,148)	0,360** (0,134)	0,307** (0,144)	0,340** (0,149)	0,368*** (0,132)	0,305** (0,145)	0,342** (0,140)	0,293* (0,154)	0,294** (0,131)	0,351** (0,138)	0,290* (0,156)	0,282* (0,142)
lnDistCapital	0,124 (0,122)	0,151 (0,129)	0,114 (0,128)	0,192 (0,118)	0,004 (0,115)	0,141 (0,134)	0,262** (0,125)	-0,01 (0,127)	0,182 (0,124)	0,014 (0,122)	0,057 (0,106)	0,251* (0,130)	-0,00 (0,134)	0,098 (0,127)
cons	-1,68* (0,858)	-4,15 (3,812)	-1,72* (0,885)	-0,90 (0,866)	-0,80 (0,837)	-4,41 (3,869)	-6,24* (3,605)	0,962 (3,915)	-0,95 (0,895)	-0,85 (0,878)	0,276 (0,844)	-6,440* (3,661)	0,981 (4,067)	-1,78 (3,823)
N. obs	53	53	53	53	44	53	53	44	53	44	44	53	44	44

As can be seen, unless the variable *IntUE* is inserted, R&D (ln*RD*) exhibit positive and significant coefficient. This result is expected and indicates that the higher the level of local R&D expenditure, the higher the patent at the local level.

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From the viewpoint of space, the spatial spillovers R&D (WRD) do not exert any statistically significant influence upon patent per capita.

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Social Filter – comp1SF or comp2FS: Not presents a significant

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lnWRD	0,069 (0,087)	0,084 (0,090)	0,104 (0,097)	0,030 (0,084)	0,062 (0,092)	0,122 (0,100)	0,055 (0,084)	0,052 (0,096)	0,060 (0,093)	0,064 (0,103)	-0,03 (0,090)	0,088 (0,094)	0,051 (0,108)	-0,03 (0,102)
lnAglom		0,264 (0,397)				0,288 (0,404)	0,587 (0,384)	-0,18 (0,401)				0,604 (0,391)	-0,19 (0,415)	0,220 (0,404)
comp1SF			0,018 (0,108)			0,015 (0,109)			0,014 (0,103)	0,033 (0,105)		0,008 (0,101)	0,032 (0,107)	0,026 (0,097)
comp2SF			0,096 (0,108)			0,101 (0,109)			0,080 (0,102)	-0,01 (0,117)		0,088 (0,101)	-0,01 (0,119)	-0,02 (0,108)
kindex				-1,100** (0,428)			-1,209*** (0,441)		-1,080** (0,436)		-1,230*** (0,414)	-1,280*** (0,447)		-1,320*** (0,460)
lnIntUE					0,920* (0,505)			0,933* (0,511)		0,987 (0,594)	1,019** (0,461)		1,017 (0,604)	1,090* (0,550)
lnP00	0,358)** (0,142	0,361** (0,143)	0,337** (0,148)	0,360** (0,134)	0,307** (0,144)	0,340** (0,149)	0,368*** (0,132)	0,305** (0,145)	0,342** (0,140)	0,293* (0,154)	0,294** (0,131)	0,351** (0,138)	0,290* (0,156)	0,282* (0,142)
lnDistCapital	0,124 (0,122)	0,151 (0,129)	0,114 (0,128)	0,192 (0,118)	0,004 (0,115)	0,141 (0,134)	0,262** (0,125)	-0,01 (0,127)	0,182 (0,124)	0,014 (0,122)	0,057 (0,106)	0,251* (0,130)	-0,00 (0,134)	0,098 (0,127)
cons	-1,68* (0,858)	-4,15 (3,812)	-1,72* (0,885)	-0,90 (0,866)	-0,80 (0,837)	-4,41 (3,869)	-6,24* (3,605)	0,962 (3,915)	-0,95 (0,895)	-0,85 (0,878)	0,276 (0,844)	-6,440* (3,661)	0,981 (4,067)	-1,78 (3,823)
N. obs	53	53	53	53	44	53	53	44	53	44	44	53	44	44

This results suggests that the diversity regions tend to have better performances innovative of the micro-region, or higher levels of patent. This can be seen as an indication that the benefits of external Jacobian type externalities are more important as generators of innovation than Marshallian externalities.

Results

lnP05	1	2	3	4	5	6	7	8	9	10	11	12	13	14
lnRD	0,204*** (0,071)	0,198*** (0,072)	0,186** (0,081)	0,146** (0,071)	0,013 (0,087)	0,180** (0,082)	0,122* (0,072)	0,011 (0,088)	0,132 (0,080)	-0,00 (0,102)	-0,04 (0,081)	0,109 (0,080)	-0,00 (0,103)	-0,05 (0,096)
lnWRD	0,069 (0,087)	0,084 (0,090)	0,104 (0,097)	0,030 (0,084)	0,062 (0,092)	0,122 (0,100)	0,055 (0,084)	0,052 (0,096)	0,060 (0,093)	0,064 (0,103)	-0,03 (0,090)	0,088 (0,094)	0,051 (0,108)	-0,03 (0,102)
lnAglom		0,264 (0,397)				0,288 (0,404)	0,587 (0,384)	-0,18 (0,401)				0,604 (0,391)	-0,19 (0,415)	0,220 (0,404)
comp1SF			0,018 (0,108)			0,015 (0,109)			0,014 (0,103)	0,033 (0,105)		0,008 (0,101)	0,032 (0,107)	0,026 (0,097)
comp2SF			0,096 (0,108)			0,101 (0,109)			0,080 (0,102)	-0,01 (0,117)		0,088 (0,101)	-0,01 (0,119)	-0,02 (0,108)
kindex				-1,100** (0,428)			-1,209*** (0,441)		-1,080** (0,436)		-1,230*** (0,414)	-1,280*** (0,447)		-1,320*** (0,460)
lnIntUE					0,920* (0,505)			0,933* (0,511)		0,987 (0,594)	1,019** (0,461)		1,017 (0,604)	1,090* (0,550)
lnP00	0,358)** (0,142	0,361** (0,143)	0,337** (0,148)	0,360** (0,134)	0,307** (0,144)	0,340** (0,149)	0,368*** (0,132)	0,305** (0,145)	0,342** (0,140)	0,293* (0,154)	0,294** (0,131)	0,351** (0,138)	0,290* (0,156)	0,282* (0,142)
lnDistCapital	0,124 (0,122)	0,151 (0,129)	0,114 (0,128)	0,192 (0,118)	0,004 (0,115)	0,141 (0,134)	0,262** (0,125)	-0,01 (0,127)	0,182 (0,124)	0,014 (0,122)	0,057 (0,106)	0,251* (0,130)	-0,00 (0,134)	0,098 (0,127)
cons	-1,68* (0,858)	-4,15 (3,812)	-1,72* (0,885)	-0,90 (0,866)	-0,80 (0,837)	-4,41 (3,869)	-6,24* (3,605)	0,962 (3,915)	-0,95 (0,895)	-0,85 (0,878)	0,276 (0,844)	-6,440* (3,661)	0,981 (4,067)	-1,78 (3,823)
N. obs	53	53	53	53	44	53	53	44	53	44	44	53	44	44

This reveals the importance of the density of interactions between the agents to generate patents. However, you should point out that this result may be linked to the fact that there may be a relationship between sectors (firms) and patents. In sectors that most patents are also those who have more interaction. Ie, sectors (and firms) where little innovation relates to patents exhibit minor interaction between firms and universities.

Results

lnP05	1	2	3	4	5	6	7	8	9	10	11	12	13	14
lnRD	0,204*** (0,071)	0,198*** (0,072)	0,186** (0,081)	0,146** (0,071)	0,013 (0,087)	0,180** (0,082)	0,122* (0,072)	0,011 (0,088)	0,132 (0,080)	-0,00 (0,102)	-0,04 (0,081)	0,109 (0,080)	-0,00 (0,103)	-0,05 (0,096)
lnWRD	0,069 (0,087)	0,084 (0,090)	0,104 (0,097)	0,030 (0,084)	0,062 (0,092)	0,122 (0,100)	0,055 (0,084)	0,052 (0,096)	0,060 (0,093)	0,064 (0,103)	-0,03 (0,090)	0,088 (0,094)	0,051 (0,108)	-0,03 (0,102)
lnAglom		0,264 (0,397)				0,288 (0,404)	0,587 (0,384)	-0,18 (0,401)				0,604 (0,391)	-0,19 (0,415)	0,220 (0,404)
comp1SF			0,018 (0,108)			0,015 (0,109)			0,014 (0,103)	0,033 (0,105)		0,008 (0,101)	0,032 (0,107)	0,026 (0,097)
comp2SF			0,096 (0,108)			0,101 (0,109)			0,080 (0,102)	-0,01 (0,117)		0,088 (0,101)	-0,01 (0,119)	-0,02 (0,108)
kindex				-1,100** (0,428)			-1,209*** (0,441)		-1,080** (0,436)		-1,230*** (0,414)	-1,280*** (0,447)		-1,320*** (0,460)
lnIntUE					0,920* (0,505)			0,933* (0,511)		0,987 (0,594)	1,019** (0,461)		1,017 (0,604)	1,090* (0,550)
lnP00	0,358)** (0,142	0,361** (0,143)	0,337** (0,148)	0,360** (0,134)	0,307** (0,144)	0,340** (0,149)	0,368*** (0,132)	0,305** (0,145)	0,342** (0,140)	0,293* (0,154)	0,294** (0,131)	0,351** (0,138)	0,290* (0,156)	0,282* (0,142)
lnDistCapital	0,124 (0,122)	0,151 (0,129)	0,114 (0,128)	0,192 (0,118)	0,004 (0,115)	0,141 (0,134)	0,262** (0,125)	-0,01 (0,127)	0,182 (0,124)	0,014 (0,122)	0,057 (0,106)	0,251* (0,130)	-0,00 (0,134)	0,098 (0,127)
cons	-1,68* (0,858)	-4,15 (3,812)	-1,72* (0,885)	-0,90 (0,866)	-0,80 (0,837)	-4,41 (3,869)	-6,24* (3,605)	0,962 (3,915)	-0,95 (0,895)	-0,85 (0,878)	0,276 (0,844)	-6,440* (3,661)	0,981 (4,067)	-1,78 (3,823)
N. obs	53	53	53	53	44	53	53	44	53	44	44	53	44	44

This result should be regarded with caution since there is a loss of significance of the variable R&D with the introduction of this variable. This loss of significance may be relates to the use of different data sources to measure this relationship, since patent data come from a source (INPI) different data R&D (PINTEC) and data of interactions of firms with research groups (CNPq) or also loss number of observation since there are zeros in some micro-regions. In this sense further tests were to be conducted in order to better understand these relationships.

Results

lnP05	1	2	3	4	5	6	7	8	9	10	11	12	13	14
lnRD	0,204*** (0,071)	0,198*** (0,072)	0,186** (0,081)	0,146** (0,071)	0,013 (0,087)	0,180** (0,082)	0,122* (0,072)	0,011 (0,088)	0,132 (0,080)	-0,00 (0,102)	-0,04 (0,081)	0,109 (0,080)	-0,00 (0,103)	-0,05 (0,096)
lnWRD	0,069 (0,087)	0,084 (0,090)	0,104 (0,097)	0,030 (0,084)	0,062 (0,092)	0,122 (0,100)	0,055 (0,084)	0,052 (0,096)	0,060 (0,093)	0,064 (0,103)	-0,03 (0,090)	0,088 (0,094)	0,051 (0,108)	-0,03 (0,102)
lnAglom		0,264 (0,397)				0,288 (0,404)	0,587 (0,384)	-0,18 (0,401)				0,604 (0,391)	-0,19 (0,415)	0,220 (0,404)
comp1SF			0,018 (0,108)			0,015 (0,109)			0,014 (0,103)	0,033 (0,105)		0,008 (0,101)	0,032 (0,107)	0,026 (0,097)
comp2SF			0,096 (0,108)			0,101 (0,109)			0,080 (0,102)	-0,01 (0,117)		0,088 (0,101)	-0,01 (0,119)	-0,02 (0,108)
kindex				-1,100** (0,428)			-1,209*** (0,441)		-1,080** (0,436)		-1,230*** (0,414)	-1,280*** (0,447)		-1,320*** (0,460)
lnIntUE					0,920* (0,505)			0,933* (0,511)		0,987 (0,594)	1,019** (0,461)		1,017 (0,604)	1,090* (0,550)
lnP00	0,358)** (0,142	0,361** (0,143)	0,337** (0,148)	0,360** (0,134)	0,307** (0,144)	0,340** (0,149)	0,368*** (0,132)	0,305** (0,145)	0,342** (0,140)	0,293* (0,154)	0,294** (0,131)	0,351** (0,138)	0,290* (0,156)	0,282* (0,142)
lnDistCapital	0,124 (0,122)	0,151 (0,129)	0,114 (0,128)	0,192 (0,118)	0,004 (0,115)	0,141 (0,134)	0,262** (0,125)	-0,01 (0,127)	0,182 (0,124)	0,014 (0,122)	0,057 (0,106)	0,251* (0,130)	-0,00 (0,134)	0,098 (0,127)
cons	-1,68* (0,858)	-4,15 (3,812)	-1,72* (0,885)	-0,90 (0,866)	-0,80 (0,837)	-4,41 (3,869)	-6,24* (3,605)	0,962 (3,915)	-0,95 (0,895)	-0,85 (0,878)	0,276 (0,844)	-6,440* (3,661)	0,981 (4,067)	-1,78 (3,823)
N. obs	53	53	53	53	44	53	53	44	53	44	44	53	44	44

Finally, the coefficient of the patent initial level variable was positive and significant. Thus, we can point out that the process of innovation of São Paulo is related to micro innovations stunted present in each region, what evidence the existence of temporal inertia innovation.

Conclusion

Conclusion

- This paper sought to put more light on this discussion in Brazil, to empirically assess the relationship between the geographical distribution of innovative inputs and results of innovation through the application of the production function of knowledge to micro-regions of São Paulo.
- These results point to the importance of the territorial differentials as generating innovative or higher the patent per capita or growth rate at the local level.
- However, additional tests must be conducted in order to better understand these relationships.

Thank you for attention!

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