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Report No: PAD1883

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT PAPER

ON A

PROPOSED ADDITIONAL LOAN

IN THE AMOUNT OF US\$45 MILLION

AND RESTRUCTURING

TO THE

ARGENTINE REPUBLIC

FOR AN

UNLEASHING PRODUCTIVE INNOVATION PROJECT

June 13, 2016

Trade & Competitiveness Global Practice
Latin American and Caribbean Region

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CURRENCY EQUIVALENTS

(Exchange Rate Effective May 3, 2016)

Currency Unit = Argentine Peso
ARS 1 = US\$0.0705674
US\$1 = ARS 14.1708

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
ANPCYT	National Agency for the Promotion of Science and Technology (<i>Agencia Nacional de Promoción Científica y Tecnológica</i>)
ANR-TEC	Non-Reimbursable Grants for Technology Projects (<i>Aportes No Reembolsables Tecnología</i>)
CONEAU	National Commission for the Evaluation and Accreditation of Universities (<i>Comisión Nacional de Evaluación y Acreditación Universitaria</i>)
CPS	Country Partnership Strategy
CONICET	National Scientific and Technical Research Council (<i>Consejo Nacional de Investigaciones Científicas y Técnicas</i>)
DIGFE	General Directorate for Projects with External Financing (<i>Dirección General de Proyectos con Financiamiento Externo</i>)
DFE	Deal Flow Facilitator
DO	Development Objectives
FM	Financial Management
GoA	Government of Argentina
ICT	Information and Communications Technology
IP	Implementation Progress
MINCyT	Ministry of Science Technology and Productive Innovation (<i>Ministerio de Ciencia, Tecnología e Innovación Productiva</i>)
PDO	Project Development Objectives
RCT	Randomized Control Trial
R&D	Research and Development
SMEs	Small and Medium Enterprises
UGSA	Unit for Social and Environmental Management (<i>Unidad de Gestión Socio Ambiental</i>)

Vice President:	Jorge Familiar
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Practice Manager:	Marialisa Motta
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ARGENTINA
ADDITIONAL FINANCING TO THE
UNLEASHING PRODUCTIVE INNOVATION PROJECT

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ADDITIONAL FINANCING DATA SHEET

Argentina

Unleashing Productive Innovation Project - AF (P159747)

LATIN AMERICA AND CARIBBEAN

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Basic Information – Parent									
Parent Project ID:	P106752	Original EA Category:	B - Partial Assessment						
Current Closing Date:	30-Jul-2016								
Basic Information – Additional Financing (AF)									
Project ID:	P159747	Additional Financing Type (from AUS):	Scale Up						
Regional Vice President:	Jorge Familiar Calderon	Proposed EA Category:							
Country Director:	Jesko S. Hentschel	Expected Effectiveness Date:	05-Dec-2016						
Senior Global Practice Director:	Anabel Gonzalez	Expected Closing Date:	25-Sep-2018						
Practice Manager/Manager:	Marialisa Motta	Report No:	PAD1883						
Team Leader(s):	Cristian Quijada Torres								
Borrower									
Organization Name	Contact	Title	Telephone	Email					
Ministry of Treasury and Public Finances	Martin Soto	Undersecretary of International Relations		marsoto@mecon.gov.ar					
Project Financing Data - Parent (Unleashing Productive Innovation -P106752) (in USD Million)									
Key Dates									
Project	Ln/Cr/TF	Status	Approval Date	Signing Date	Effectiveness Date	Original Closing Date	Revised Closing Date		
P106752	IBRD-75990	Effective	25-Sep-2008	06-Aug-2009	21-Aug-2009	30-Sep-2014	30-Jul-2016		
Disbursements									
Project	Ln/Cr/TF	Status	Currency	Original	Revised	Cancelled	Disburse	Undisbu	%

							d	rased	Disbur sed
P106752	IBRD-75990	Effective	USD	150.00	150.00	0.00	150.00	0.00	100.00
Project Financing Data - Additional Financing AR Unleashing Productive Innovation - AF (P159747)(in USD Million)									
<input checked="" type="checkbox"/>	Loan	<input type="checkbox"/>	Grant	<input type="checkbox"/>	IDA Grant				
<input type="checkbox"/>	Credit	<input type="checkbox"/>	Guarantee	<input type="checkbox"/>	Other				
Total Project Cost:		45.00			Total Bank Financing:		45.00		
Financing Gap:		0.00							
Financing Source – Additional Financing (AF)								Amount	
Borrower								0.00	
International Bank for Reconstruction and Development								45.00	
Financing Gap								0.00	
Total								45.00	
Policy Waivers									
Does the project depart from the CAS in content or in other significant respects?							No		
Explanation									
Does the project require any policy waiver(s)?							No		
Explanation									
Team Composition									
Bank Staff									
Name	Role	Title	Specialization	Unit					
Cristian Quijada Torres	Team Leader	Senior Private Sector Development Specialist		GTC04					
Julio Sanjines Gonzales	Procurement Specialist	Senior Procurement Specialist		GGO04					
Paula Agostina Di Crocco	Financial Management Specialist	Consultant		GGO22					

Ana Paula Cusolito	Team Member	Senior Economist	Monitoring and Evaluation	GTCIE
Bob Hodgson	Team Member	Consultant		GTC04
Cara Zappala	Team Member	Operations Officer		GTC04
Elba Lydia Gaggero	Environmental Specialist	Senior Environmental Specialist	Safeguards	GEN04
Fabiola Altimari Montiel	Counsel	Senior Counsel		LEGLE
L. Keta Ruiz	Team Member	Senior Operations Officer	Monitoring and Evaluation	GTCOS
Maria Pia Cravero	Counsel	Junior Counsel		LEGLE
Micky O. Ananth	Team Member	Program Assistant		GTC04
Victor Ordonez	Team Member	Senior Finance Officer		WFALN

Extended Team

Name	Title	Location

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
Argentina	Buenos Aires	Ciudad Autonoma de Buenos Aires		X	

Institutional Data

Parent (Unleashing Productive Innovation -P106752)

Practice Area (Lead)

Trade & Competitiveness

Contributing Practice Areas

Cross Cutting Topics

- Climate Change
- Fragile, Conflict & Violence
- Gender
- Jobs
- Public Private Partnership

Sectors / Climate Change				
Sector (Maximum 5 and total % must equal 100)				
Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Industry and trade	General industry and trade sector	55		
Education	Tertiary education	15		
Public Administration, Law, and Justice	Public administration- Industry and trade	15		
Information and communications	Information technology	15		
Total		100		
Themes				
Theme (Maximum 5 and total % must equal 100)				
Major theme	Theme	%		
Trade and integration	Technology diffusion	43		
Trade and integration	Export development and competitiveness	42		
Human development	Education for the knowledge economy	15		
Total		100		
Additional Financing AR Unleashing Productive Innovation - AF (P159747)				
Practice Area (Lead)				
Trade & Competitiveness				
Contributing Practice Areas				
Cross Cutting Topics				
[] Climate Change				
[] Fragile, Conflict & Violence				
[] Gender				
[] Jobs				
[...] Public Private Partnership				
Sectors / Climate Change				

Sector (Maximum 5 and total % must equal 100)				
Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Education	Tertiary education	20		
Industry and trade	General industry and trade sector	60		
Public Administration, Law, and Justice	Public administration-Industry and trade	20		
Total		100		
<input checked="" type="checkbox"/> I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.				
Themes				
Theme (Maximum 5 and total % must equal 100)				
Major theme	Theme	%		
Human development	Education for the knowledge economy	20		
Financial and private sector development	Micro, Small and Medium Enterprise support	60		
Financial and private sector development	Other Private Sector Development	20		
Total		100		

I. Introduction

1. This Project Paper seeks the approval of the Board of Executive Directors to provide an additional loan in the amount of US\$45 million to the Argentina Unleashing Productive Innovation Project (P106752).
2. The proposed additional loan would help finance the costs associated with the scale up of a well performing project, which would include expanding successfully implemented activities and adding impact evaluation activities.
3. Under the Additional Financing (AF), the Project will maintain the current institutional arrangements and overall implementation, fiduciary, and safeguards mechanisms, with minor adjustments based on lessons learned from experience implementing the current loan. No additional safeguards policies will be triggered, and there will be no changes in the environmental B category. The overall risk has been rated Moderate given the macroeconomic context in which the AF will be implemented in the next two years.
4. Activities that the additional loan would help scaling-up include: the support for the creation of new technology based companies, research consortia, innovation projects among Small and Medium Enterprises (SMEs), and impact evaluations. Expected results from the additional financing include; the creation of 15 additional start-ups; leveraging additional US\$7 million private sector financing for innovation; the development of 30 more technology-based products and services; increased capacity from different actors in the innovation system to engage in technology transfer and commercialization activities; and more accurate information being produced on the impact of project activities that will inform policy making.
5. This Project Paper also reflects: (i) an extension of the Closing Date of the original loan to December 31, 2016; (ii) the extension of the Project implementation period to September 25, 2018, corresponding to the Closing date of the Additional Financing; and (iii) a restructuring consisting in minor changes to project activities and related changes to the Results Framework.

II. Background and Rationale for Additional Financing

Sector Background

6. Promoting innovation and technology upgrading continues to be an important piece of any strategy to promote export-diversification, increase value-added and create skilled jobs. These issues are still very much relevant in Argentina, and they are part of the Government's priorities as articulated in the "Plan Argentina Innovadora 2020". Indicators from the latest Global Competitiveness Report illustrate some of the challenges Argentina still faces in innovation, among them low overall research and development (R&D) spending (0.58 percent of GDP in 2012, compared to 1.15 percent in Brazil), especially with regards to the share coming from private companies.
7. The Minister for Science, Technology and Productive Innovation under the new Government signaled a strong endorsement of innovation for the country, which includes continued support for

the nascent collaboration in applied R&D projects between researchers and companies, the creation of new technology based start-ups and the increased transferring of knowledge to the productive sector and society at large. A strong push to reach the interior of the country with these policies (“federalización de la innovación tecnológica”) has also renewed emphasis and prioritization.

8. The Project is consistent with the current World Bank Group’s Country Partnership Strategy (CPS) for Argentina (FY 2015-2018), discussed by the Board of Executive Directors on September 9, 2014 (Report No. 81361-AR). Particularly, CPS Pillar I, *Sustaining Employment Creation in Firms and Farms*, focuses on improving firm productivity, fostering private sector investment, and creating the conditions for innovation and improved access to technology to enhance firm-level productivity growth. The proposed AF is also aligned with the World Bank Group’s twin goals of ending extreme poverty and boosting shared prosperity as it supports promoting innovation and technology upgrading as a strategy to enhance firms’ productivity, which in turn can increase growth and job creation in these firms.

Project Background

9. The Project supports the Government’s high level objective of sustaining growth by promoting export-diversification and an increase in value-added in production. Specifically, the Project Development Objective is to expand Argentina’s capacity to generate productive innovation in knowledge-based areas by: (a) facilitating the creation of new knowledge-based companies; (b) developing specialized human capital; (c) supporting productive research innovation activities and their technology commercialization in the areas of biotechnology, nanotechnology and information and communication technology; (d) upgrading the research infrastructure in the areas of science, technology and productive innovation; and (e) strengthening the policy framework governing science, technology, and productive innovation.
10. The Project was approved by the Board on September 25, 2008, and became effective in September 2009. The Project is being implemented by the National Agency for the Promotion of Science and Technology (ANPCYT) under the Ministry of Science Technology and Productive Innovation (MINCYT). Overall implementation of the Project has been satisfactory with both Implementation Progress (IP) and Development Objectives (DO) consistently rated Moderately Satisfactory or higher for the past 12 months. Project environmental compliance and financial management have been consistently satisfactory. The Project was restructured on four occasions: December 2009, February 2012, February 2014 and July 2015. The last three restructurings have included adjustments to the program as a consequence of lessons learned during project implementation and the identification of specific new opportunities that could be financed under the loan, in line with the overall objectives of the Project. These changes included the cancellation of a Venture Capital Fund early on in the Project (due to unfavorable conditions for its establishment), the support for the establishment of the Science and Technology Pole in Buenos Aires (which brought together the three main national entities working on innovation: MINCYT, ANPCYT and the National Council of Scientific and Technical Research - CONICET), and the support to move CONICET to a new level of technology transfer and commercialization.
11. To date, 100 percent of the proceeds of the original loan (US\$150 million) have been disbursed and most components are completing implementation and have reached or are on track to reach their objectives as measured by the monitoring indicators, as reflected in the following table.

PDO Indicators: Argentina Unleashing Productive Innovation

Indicator	Results	Final Year
Increase in number of technology manager graduates	Target	400
	Achieved (cumulative)	182
Increase in graduates from ICT related careers	Target	1000
	Achieved (cumulative)	2215
Number of research consortia created	Target	10
	Achieved (cumulative)	26
Number of upgraded research laboratories and technology centers	Target	30
	Achieved (cumulative)	49
Number of universities that successfully updated/ established norms on international property rights	Target	8
	Achieved (cumulative)	7

12. In addition, evidence collected during the project’s implementation has shown additional outcomes not captured in the Results Framework. For example, the Project has leveraged more than US\$25 million in funds from companies, laboratories, universities and other research institutions for investments in applied research and technology commercialization. Twenty-five new technology companies have been established with project support. More than 1,000 students have graduated in ICT careers as a consequence of the Project. At least 10 new products, services and protocols have been launched as a direct result of project support: for example, one of the research consortia supported by the Project has been able to launch in the Argentinian market a biosimilar drug that is used for treating certain types of cancer. This drug has already reached more than 1,000 patients in the country, at a significantly lower cost than drugs previously available.

Rationale for Additional Financing

13. The main rationale for seeking AF for the Unleashing Productive Innovation Program is to support the Government of Argentina (GoA) to sustain and expand its successful efforts in promoting innovation and technology commercialization over time. The experience in countries that have been able to build robust productive innovation systems shows that sustained efforts are key to generating a critical mass of entrepreneurs, technologies and companies. Continued availability of public interventions to support the different stages of commercialization of new technologies is key in this effort.

14. MINCyT wants to keep the momentum achieved with the current Project, taking advantage of the administrative structure in place and lessons learned implementing the Project over the last six years. The AF would support MINCyT’s expansion of these activities through retroactive and

additional financing of part of the stock of ongoing subprojects, as well as through new calls for proposals for the activities that can finance subprojects within the AF implementation period. The AF would continue support for human capital development, technology commercialization, tech entrepreneurship, SME innovation and technology upgrading and strengthening of capacities to design and implement policies and programs to support productive innovation in Argentina.

15. Expanding activities related to assessments and evaluations of the current loan as well as of new activities under the AF will be key to help improve MINCYT's policy making capabilities. New reforms and policy changes are being considered in relevant areas which would strengthen and could amplify government programs. Financing more rigorous evaluations (experimental and non-experimental), will allow the Bank to contribute to that analysis and help inform government decisions on what reforms to implement, activities to adjust and complementary programs to initiate.
16. Specifically, the AF will fund retrospective evaluations of the following activities financed by the Project: research consortia, technology based start-ups, and SME matching grants for innovation. Tracer studies will be conducted to evaluate the ICT scholarship program, as well as the technology manager graduate program. In addition, the AF will attempt to implement a randomized control trial evaluation of the matching grants for SME innovation activity. The AF will also evaluate the impact that the research consortia activity has had on their respective sectors (biotechnology, ICT and nanotechnology) with regards to other joint collaborative types of R&D activities being initiated, greater number of commercialization being promoted, among others. Among the main questions these AF supported evaluation activities will attempt to address are:
 - a. How much additional funding has the Project been able to leverage (from companies, universities, laboratories and others)?
 - b. How much innovation has the Project supported? (How many new products, services or processes?)
 - c. How much employment has the Project been able to generate (and what kind of employment)?
 - d. What has been the impact of project activities that have supported human capital development?
17. Other more process related evaluations that will be pursued with the AF include, for example, an assessment of the quality of the graduate level program on technology commercialization established with the original loan, and an assessment of how well public research infrastructure is being used for multidisciplinary research and development.
18. Alternatives to additional financing: Processing a new loan was discussed with MINCYT as an alternative to the AF. However, there was agreement among both parts that AF would respond more quickly to the need of sustaining and expanding financing of the activities already in place. In addition, the AF allows continuity of the implementation structure in place at ANCPyT. The impact evaluations supported by the AF are also expected to contribute to the design of new operations.

19. The proposed Additional Financing complies with OP10.00 Investment Project Financing to the extent that (i) the project has been rated moderately satisfactory for Development Objectives and Implementation Progress for a minimum of 12 months; and (ii) there is substantial compliance with key loan covenants, including audit and financial reporting requirements.

Implementation Arrangements

20. Financial management (FM) and disbursements arrangements for the AF will follow the arrangements already in place for the original Project. The ANPCyT under the MINCyT will continue to be responsible for the project's financial management and disbursement functions. FM arrangements in place at ANPCyT continue to comply with Bank requirements as evidenced by annual financial audit reports and Bank FM supervision. The last FM supervision mission carried out in November 2015 determined that project FM performance continues to be satisfactory. There are no overdue audit or financial reports. FM monitoring will continue through implementation support missions, review of external audit reports and interim financial reports and ad hoc support as needed. The Bank will continue disbursing on the basis of advances through a Designated Account (DA). For the AF, the Project will start to implement the UEPEX software; which is an in-house information tool developed by the federal government of Argentina; its use is mandatory for multilateral-financed operations and is acceptable to the Bank for project accounting and financial reporting purposes.
21. All works, goods, non-consulting services and consultant services required for the project activities and to be financed out of the proceeds of the AF shall be procured in accordance with the requirements set forth or referred to in: i) Guidelines: Procurement of Goods, Works and Non-consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers, dated January 2011 and revised in July 2014; and ii) Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers, dated January 2011 and revised in July 2014.
22. The ANPCyT and its Environmental Unit (UGSA) has developed a good track record of implementing projects financed by the World Bank and the IDB. The UGSA performed a close supervision of sub-project implementation by means of systematic and periodic site audits. No adverse impacts or issues that were not previously identified as of potential occurrence have appeared during the Parent loan implementation; risk and impacts associated to sub-projects funded by the Parent loan have been successfully managed with the safeguards instruments developed for the Project. As a result of UGSA's performance and the proper application of safeguards instruments, the Parent loan environmental compliance has been consistently rated to be satisfactory. Given the proven adequacy of the instrument, the Project's original Environmental Management Plan, complemented by practical guides and improvement procedures, will continue to be applied to this Additional Financing (P159747).
23. With regards to Gender, the Project will monitor more closely the results achieved among women beneficiaries, reporting disaggregated data on gender for all possible activities in the semi-annual reports to the Bank. The project will also fund studies to explore how to increase women's participation in the innovation system.
24. With regards to Citizen Engagement, as part of the effort to evaluate project activities, satisfaction surveys will be sent to all project beneficiaries when they conclude their activities, to measure

quality of project implementation and give an opportunity to beneficiaries to provide any additional feedback on project activities. Feedback of these surveys will be reported in the Results Framework with a specific indicator. The Agency will incorporate this feedback in their semi-annual reports to the Bank, as well as any actions taken to address concerns raised through these surveys. In addition, the AF will be financing the strengthening of MINCyT and ANPCyT's capacity to centralize and disclose to the public at large, through an online portal, information about its programs, beneficiaries, resources allocated and results achieved.

III. Proposed Changes

Summary of Proposed Changes	
Change in the Results Framework. Revision of some indicators are proposed with the goal of capturing more outcomes and impacts rather than outputs. This includes dropping indicators that are no longer deemed relevant. A few minor modifications to the original Project description are introduced to better reflect the nature of support provided by the Project. The updated Project description is included in Schedule 1 to the Additional Financing Loan Agreement, and the Project description of the Original Loan Agreement is modified accordingly.	
Extension of the Closing Date of the Original Loan, to accommodate for finalization of activities related to CONICET-TECNOLOGIAS.	
Change in Implementing Agency	Yes [] No [X]
Change in Project's Development Objectives	Yes [] No [X]
Change in Results Framework	Yes [X] No []
Change in Safeguard Policies Triggered	Yes [] No [X]
Change of EA category	Yes [] No [X]
Other Changes to Safeguards	Yes [] No [X]
Change in Legal Covenants	Yes [] No [X]
Change in Loan Closing Date(s)	Yes [X] No []
Cancellations Proposed	Yes [] No [X]
Change in Disbursement Arrangements	Yes [] No [X]
Reallocation between Disbursement Categories	Yes [] No [X]
Change in Disbursement Estimates	Yes [X] No []
Change to Components and Cost	Yes [X] No []
Change in Institutional Arrangements	Yes [] No [X]
Change in Financial Management	Yes [] No [X]
Change in Procurement	Yes [] No [X]
Change in Implementation Schedule	Yes [X] No []
Other Change(s)	Yes [] No [X]

Development Objective/Results

Project's Development Objectives

Original PDO

The Objective of the Project is to expand the Borrower's capacity to generate productive innovation in knowledge-based areas by: (a) facilitating the creation of new knowledge-based companies; (b) developing specialized human capital; (c) supporting productive research innovation activities and their technology commercialization in the areas of biotechnology, nanotechnology and information and communication technology; (d) upgrading the research infrastructure in the areas of science, technology and productive innovation; and (e) strengthening the policy framework governing science, technology, and productive innovation.

Change in Results Framework

Explanation:

The Results Framework was revised to adjust existing indicators or introduce new ones that capture more outcomes and impacts rather than outputs. Specific indicators for Citizen Engagement have been added. Four indicators were moved from PDO level to intermediate, given that they focused more on intermediate results at this stage of project implementation (see PDO indicators MARKED FOR DELETION). A few intermediate indicators have been dropped from the Project Results Framework (MARKED FOR DELETION in the Intermediate Results Indicators section), since they were either disaggregation of intermediate indicators or are indicators that capture outputs that will be tracked through the semi-annual reports sent to the World Bank. One indicator for Component 4 (Number of upgraded research laboratories and technology centers) has overachieved its goal (target of 30, actual number: 49). While Component 4 will not receive additional funds, its indicator is being kept in the Results Framework for tracking of overall Project performance.

Compliance

Covenants - Additional Financing (AR Unleashing Productive Innovation - AF - P159747)

Source of Funds	Finance Agreement Reference	Description of Covenants	Date Due	Recurrent	Frequency	Action
AF	Section IV.B.1 of Schedule 2	Withdrawal Conditions; Withdrawal Period		<input checked="" type="checkbox"/>		

No withdrawal shall be made for payments made prior to the date of this Agreement, except that withdrawals up to an aggregate amount not to exceed USD 9,000,000 may be made for payments made prior to this date but on or after September 1, 2015, for Eligible Expenditures provided that the pertinent obligations and/or conditions set forth in this Agreement, in respect of the relevant Eligible Expenditure, have been complied with or met.

Conditions

Source Of Fund	Name	Type
IBRD	Article IV, 4.01	Effectiveness

Description of Condition

The Borrower has adopted the Operational Manual in a manner acceptable to the Bank.

Risk									
Risk Category	Rating (H, S, M, L)								
1. Political and Governance	Low								
2. Macroeconomic	Moderate								
3. Sector Strategies and Policies	Low								
4. Technical Design of Project or Program	Low								
5. Institutional Capacity for Implementation and Sustainability	Moderate								
6. Fiduciary	Low								
7. Environment and Social	Low								
8. Stakeholders	Low								
9. Other									
OVERALL	Moderate								
Finance									
Loan Closing Date - Additional Financing (AR Unleashing Productive Innovation - AF - P159747)									
Source of Funds	Proposed Additional Financing Loan Closing Date								
International Bank for Reconstruction and Development	25-Sep-2018								
Loan Closing Date(s) - Parent (Unleashing Productive Innovation - P106752)									
Explanation: The Closing Date of the original loan is extended to December 31, 2016, so that activities related to CONICET-TECNOLOGIAS can be fully implemented.									
Ln/Cr/TF	Status	Original Closing Date	Current Closing Date	Proposed Closing Date	Previous Closing Date(s)				
IBRD-75990	Effective	30-Sep-2014	30-Jul-2016	31-Dec-2016	30-Sep-2015, 30-Jul-2016				
Change in Disbursement Estimates (including all sources of Financing)									
Explanation: The expected disbursements estimates are adjusted to reflect the proposed Additional Financing.									
Expected Disbursements (in USD Million)(including all Sources of Financing)									
Fiscal Year	2017	2018	2019						
Annual	18.00	22.00	5.00						
Cumulative	18.00	40.00	45.00						
Allocations - Additional Financing (AR Unleashing Productive Innovation - AF - P159747)									

Source of Fund	Currency	Category of Expenditure	Allocation	Disbursement %(Type Total)
			Proposed	Proposed
IBRD	USD	Scholarships Under Part. 1(B)	2,400,000.00	100.00
IBRD	USD	Goods, minor works, Non-consulting services, consultants' services, Training and/or Operating Costs under Graduate Program Subprojects and/or Technology Transfer Program Subprojects, and Scholarships under Part 1(A)&(C)	3,100,000.00	100.00
IBRD	USD	Goods, consultants' services, Training and/or Operating Costs under Knowledge-based sub-projects	10,000,000.00	100.00
IBRD	USD	Goods, minor works, Non-consulting services, consultants' services, Training and/or Operating Costs under Technology Subprojects, and Scholarships under Part 3	25,000,000.00	100.00
IBRD	USD	Goods, Non-consulting services, consultants' services, Training and/or Operating costs under Part 5	4,387,500.00	100.00
IBRD	USD	Front End Fee	112,500.00	100.00
		Total:	45,000,000.00	

Components

Change to Components and Cost

Explanation:

The AF will provide additional support to four of the original five components. The activities that will receive additional financing have been chosen based on the following criteria: (i) activities that can be completed during the time available for implementation of the AF; (ii) overall positive results of the

activities seen during implementation of the current loan; (iii) alignment with current priorities for the new government.

More detailed information per component:

Component 1: Developing Human Resources for Productive Innovation

This component consists of the following sub-components:

- (a) the provision of Graduate Program Grants for the establishment or strengthening of graduate programs on technology brokering and management in Eligible Institutions in Argentina (including the facilitation of Fellowships, and the provision of Scholarships to graduate students: (i) to enroll in graduate programs on technology brokering and management; and (ii) to facilitate internships to carry out practical training on technology brokering and management, all in Eligible Institutions);
- (b) the carrying out of a scholarship program consisting of, inter alia, the provision of Scholarships to undergraduate students who are currently enrolled or will be enrolled in undergraduate information and communication technology programs, including the enrollment in any other program of similar nature acceptable to the Bank, all in Eligible Institutions; and
- (c) the provision of Technology Transfer Program Grants to support technology transfer activities, aiming at solving technology problems and capitalizing on local and regional socio-economic development opportunities (including the provision of Scholarships to Eligible Professionals, all in Eligible Institutions).

Within the framework provided in paragraphs (a)-(b) above, this component will continue to support the development of technology managers. With the degree (a graduate level specialization) well established in the education system (the course has been accredited by the National Commission for the Evaluation and Accreditation of Universities, CONEAU, in its Spanish acronym), the focus will now be on improving the overall quality of the program. This will be achieved by financing additional international internships for recent graduates from the program and by incorporating into the curriculum intensive English lessons. This component will also continue the support for the technology transfer projects at universities (D-TEC), with the possibility of expanding the potential beneficiaries of such technology transfer to public institutions with a well-defined technological issue or need. Finally, this component will continue to provide support for scholarships to encourage completion of undergraduate studies in ICT fields, as well as for increasing the institutional capacity within CONICET (including CONICET-TECNOLOGIAS) to improve its technology transfer and commercialization activities.

Component 2: Support for Knowledge-Based Companies

This component will continue to provide financing to cover Knowledge-Based Grants to develop business plans, investment plans and/or technology prototypes of Eligible Entities, including any other type of knowledge-based activity to support the development of Eligible Entities.

Based on lessons learned during the implementation of the current loan, the AF will not provide financing for Deal Flow Facilitators. Deal Flow Facilitators will no longer be the “gate keepers” to the instrument, allowing the potential proposals to apply directly to project funds and hire freely existing service providers for the support needed to develop their proposals. In addition, the timelines will be shortened for project implementation, and additional and more intensive support will be provided to accelerate the development of the projects.

Component 3: Sectoral Funds

This component will continue to support the provision of Technology Grants to carry out public-private, public-public and/or private-private collaborative research and technology commercialization, and innovation activities by individual firms mainly in the areas of biotechnology, information and communications technology, and nanotechnology through, inter alia, the carrying out of minor works (remodeling), the acquisition and utilization of equipment, the provision of Scholarships to graduate students and the facilitation of Fellowships, the provision of technical assistance (which will generate new knowledge, adapt or transfer knowledge, and/or result in the development of new products or production processes with high potential impact on Argentina's productive sector).

Changes to this component design, based on lessons learned during implementation of the current loan, include emphasizing more heavily during project selection of research consortia previous experience in doing R&D in association with other companies or institutions. In addition, one of the new calls for proposals intended for the innovation grants for individual firms will be focused on the new companies being created through Component 2 support, which will enhance synergies among project activities. The AF will also support a randomized control trial (RCT) for the innovation grants for SMEs, which should help with having a more rigorous evaluation of the impacts of this type of instrument in Argentina. Sectoral focus (biotechnology, nanotechnology and ICT) under the AF will continue to be the same for these two instruments (consortia and individual firms). However, for the ANR-TEC instrument, more sectors are likely to be included to boost take-up rates and make more likely the possibility of implementing an RCT.

Component 4: Upgrading Research Infrastructure

This component will not receive additional financing, since new projects under it could not be completed within the time allowed for implementation of the AF loan.

Component 5: Strengthening the Policy and Institutional Framework for Innovation and Project Management

This component will continue to support the following activities:

- (a) Strengthening of the policy-making, and monitoring and evaluation capacity of MINCyT through, inter alia: (i) the expansion of the number and reliability of science, technology and innovation indicators; (ii) the support of MINCyT's analytical work on regional and national innovation systems, and on selected sectoral issues; (iii) the carrying out of impact evaluations of Borrower's policies and programs concerning science, technology and innovation; and (iv) the carrying out of analytical studies and technical assessments on selected areas as approved by the Bank.
- (b) Provision of support to technology transfer offices at selected universities through, inter alia, the identification and implementation of international best practice models for the management and commercialization of intellectual property rights.
- (c) Carrying out of surveys to gather information with respect to the national and provincials innovation systems in Argentina.
- (d) Carrying out of Project dissemination activities.
- (e) Strengthening of the operational capacity of ANPCyT (including the DIGFE's capacity), through, inter alia: (i) the strengthening of UGSA to further upgrade its capacity to carry out its socio-environmental

functions; and (ii) the provision of technical assistance to carry out the evaluations of Subproject proposals and Scholarship proposals, and to monitor and supervise the implementation of the Project, including the provision of training required therefor.

The carrying out of an independent evaluation of the progress made under the Technology Subprojects (described under Part 5(d) of the Original Loan Agreement) will be eliminated from the Project description as the purpose of this activity is already captured with the carrying out of other activities under the Project.

This component aims to strengthen the policy framework governing science, technology, and productive innovation. This will be specially enhanced under the AF through the impact evaluations studies and assessments that are being planned, including the one for Component 3 (innovation grants for SMEs). Some of the additional evaluations, studies and assessments to be undertaken are:

1. Estimating the volume of transactions and success rates under the different activities supported by the Project on technology commercialization
2. Estimating private sector financing being leveraged through project instruments
3. Tracer studies for human capital supported by the Project to look at employability, earnings, relevance of curricula, among other issues (ICT students, GTEC career graduates)
4. Benchmarking/Evaluation of graduate level technology manager program's curriculum
5. Evaluation of current usage of public lab infrastructure, for multidisciplinary research and usage by private firms and provision of recommendations for improvement if needed.
6. Innovation surveys for manufacturing and agribusiness sectors

Current Component Name	Proposed Component Name	Current Cost (US\$M)	Proposed Cost (US\$M)	Action
Developing human resources for productive innovation	no change	25.00	30.50	Revised
Support for knowledge-based companies	no change	14.00	24.00	Revised
Sectoral funds	no change	46.00	71.00	Revised
Upgrading of research infrastructure	no change	52.00	52.00	No change
Strengthening the policy and institutional framework for Innovation and Project Management	no change	12.10	16.50	Revised
	Total:	149.10	194.00	

Other Change(s)

Change in Implementation Schedule

Explanation:

The proposed Additional Financing will extend the implementation period of the Project to September 25, 2018.

IV. Appraisal Summary

Economic and Financial Analysis

Explanation:

The economic analysis of this AF estimates the expected net present value (NPV) and economic rate of return (ERR) of the AF's interventions. A sensitivity analysis that assesses the impact of changes in key parameters and underlying assumptions on the returns of the project accompanies the cost-benefit analysis. All details are presented in Annex 2.

Development Impact. As the AF is scaling up four of the five components of the original Project, the same economic rationale of the original Project applies to the AF. Therefore, the impact of the AF on growth in terms of expected benefits from productive innovation are also derived from enhanced total factor productivity. The economic analysis quantifies the AF's incremental benefits of filling a segment of the human capital gap of ICT graduates and of experts that ease the coordination and information asymmetries of knowledge and information between researchers and the private sector. It also assesses the AF's incremental benefits of financing technology start-ups and consortia and firms in biotechnology, nanotechnology and ICT that otherwise would not secure funding and therefore would not develop and produce the new products or technology innovations that they intend to provide. The NPV for the three components of the AF amenable to cost-benefit analysis calculations (that correspond to US\$29.8 million or 66 percent of the total AF) is estimated at US\$65.9 million at an eight percent discount rate, with a 23 percent ERR. Details on these estimates by component are provided in Annex 2.

Public rationale. The rationale for public sector financing is the same as for the original Project and stems from numerous market failures that can hinder or delay investments in R&D and innovation more broadly and that lead to a mismatch between social and private returns. More specifically, these market failures are due to: (i) the partial intangibility of the assets involved in innovation; (ii) information failures; (iii) long-time horizon until maturity; (iv) non-appropriable nature of knowledge; and (v) network failures among researchers, institutions and the private sector, meaning that individuals and institutions perceive a higher risk than benefit to collaboration due to the fungibility of knowledge. (Further details in Annex 2).

World Bank value added. As a partner in the development of Argentina's capacity to generate productive innovation in knowledge-based areas through the original Project, the Bank is well positioned to continue helping advance these initial efforts by the Government. The Bank will continue to bring in international best practices and expertise for the continued growth of the still developing productive innovation ecosystem. The AF will continue to be closely coordinated with the Inter-American Development Bank (IDB) to ensure complementarities during its implementation. The IDB has been supporting Science and Innovation in Argentina for many years, and their support has included both basic science and more applied R&D. Many of the activities introduced by the World Bank's loan back in 2009 were innovative for Argentina in their goals and design. The success of some of these activities, for example the Sectoral Funds, has led the IDB to use that instrument to support other sectors such as clean energy. With a significant part of the IDB support going to basic science, the activities supported by the World Bank loan, including the ones proposed for scale up under the AF, complement well the ones supported by the IDB, which combined add up to a comprehensive support for the development of Argentina's innovation ecosystem.

Technical Analysis

Explanation:

The design of the original loan was built around addressing the above-mentioned market failures by a combination of activities that were structured around five components. The AF will continue supporting four of the five components of the original loan. These have been chosen because of their good implementation record and overall perceived positive impact during the original loan and because of the ability to implement these activities within the timeframe of the AF. Component 4 of the original loan, more specifically the intervention PRIETEC, which had an excellent implementation and overall very positive feedback from beneficiaries, will not be supported with this AF strictly because of time considerations, since projects under this intervention typically take longer to implement than the available time period for this project.

Lessons learned during implementation of the current loan will be used to adjust some of the activities in the AF. For example, the requirement for technology start-up projects to come to the project with a specific and certified Deal Flow Facilitator (DFF) will not be extended to the new calls for proposals under Component 2 of the AF. The Agency (ANPCyT) and the Bank learned that DFFs did not perform according to expectations, and the exclusivity given to them to bring proposals for project consideration is no longer warranted. Project proposals under this component will be allowed to come without a DFF. Synergies between project activities that had begun to take place during the current operation will be further supported for the AF. For example, graduates from the technology management program (G-TEC) had begun providing support to some of the other subprojects in Component 1 (D-TEC). This will be enhanced through additional improvement of the quality of the G-TEC graduates. Companies created with the support of Component 2 during the current operation will be the object of a specific call for proposal under Component 3 of the AF, with the aim of providing immediate and additional support for scaling up and consolidation of technology platforms, to enhance their probability of survival and growth.

Social Analysis

Explanation:

The original project did not trigger any of the Bank's social safeguards as the project activities, which are linked to science and technology and innovation research, were not expected to have any negative social impacts. Furthermore, the original project has had positive social impacts by enhancing the competitiveness of Argentina's industry and generating new and better paying employment. Indeed, we see that a significant number of grantees have graduated in ICT careers (more than 2,000) with both private and public benefits that this brings along. The original project preparation included extensive consultations with a large number of stakeholders (universities, research centers, chambers of commerce, etc.). During implementation, as part of the monitoring of projects and activities being financed by the Project, the beneficiaries were asked for their views on the Project regarding how easy it was to participate in the call for proposals, in the procurement process, etc. This has also been a common practice when the Bank supervision team visits beneficiaries as part of the supervision missions. However no systematic feedback mechanism was established for this type of information during the implementation of the original loan. The intention with the AF loan is to change this and create a simple yet effective system of seeking and incorporating beneficiary feedback into the Project.

As part of the revision to the results framework, the team has added indicators that will report on beneficiary satisfaction and how that information is integrated into management decision making.

Although new sub-project specific locations would be selected during Project implementation, it is expected that the majority of sub-projects would take place in urban, suburban or industrial zones where research centers as well as commercial, service and production activities are usually established. In all

cases sub-projects will be implemented in private, already converted land (premises of the beneficiaries of the funding). Thus, the Indigenous Peoples Policy is not triggered because no indigenous groups are present in, or have collective attachment to the sites where the Project will be implemented. In all cases, as the sub-projects are being or will be implemented within the premises of the beneficiaries of the funding, no potential involuntary use of land or expropriations are foreseen for the AF (i.e., the same condition as the original loan).

Environmental Analysis

Explanation:

The Additional Financing will be supporting the same type of interventions that were/are being implemented under the original loan, focusing on expanding successfully implemented activities. Based on the nature of the activities and works to be carried out under the Project AF and the assessed types and magnitude of the associated risks and adverse impacts, this Project (as was the case with the original loan) triggers the World Bank Environmental Assessment OP/BP 4.01 and is classified as Category B according to such Policy.

No large scale, significant or irreversible potential negative impacts were anticipated for the parent Project, and neither for its AF. Potential adverse socio-environmental implications of the AF are related to its Components 2 and 3. Potential impacts depend on the characteristics of the different proposals that will apply for funding (component 3) and on the characteristics of the sub-projects currently under implementation (components 2 and 3); however, given that these components basically involve Research and Development (R&D), risks and potential impacts are mostly related to common occupational health and safety (OHS) aspects (such as handling of hazardous materials and waste, storage/use of flammable substances, storage of pressurized gases, etc.), other aspects of the indoor environment (such as biosafety) and ethics in experimentation (for example, ethical treatment of lab animals for experimentation). These risks and potential impacts are not assessed to be significant; legal compliance in connection with OHS, including biosafety, and ethical experimentation complemented by, when necessary, the application of recognized guidelines and good practices will lead to the prevention or mitigation of such risks and potential impacts during the implementation of this AF, as was the case for the parent loan.

Given the proven adequacy of the instrument for the management of safeguards that was in place for the Argentina Unleashing Productive Innovation (P106752), the original's Project Environmental Management Manual¹ will continue to be applied to this Additional Financing (P159747).

Risk

Explanation:

The Argentine economy is going through a transition period as the new administration is undertaking a series of reforms to open up the economy for trade, increase competition, improve the business environment, gradually eliminate the primary fiscal deficit, reduce inflation, realign relative prices and pave the way for higher investment and higher growth. During this period of transition, firms may concentrate on short term challenges and slow down their investment in innovation and R&D. Such a

¹ The Environmental Management Plan was republished on the ANPCyT's website on May 3, 2016 (<http://www.agencia.mincyt.gob.ar/frontend/agencia/post/560>). It was published on the Bank's website on June 10, 2016. ANPCyT refers to this document as the *Plan de Gestión Socio-Ambiental*.

possibility might impact negatively the project performance in the short term. As a result, the overall Project risk rating is raised from Low to Moderate.

V. World Bank Grievance Redress

25. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/GRS>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

Annex 1: Revised Results Framework and Monitoring Indicators

Project Name:	AR Unleashing Productive Innovation - AF (P159747)	Project Stage:	Additional Financing	Status:	DRAFT
Team Leader(s):	Cristian Quijada Torres	Requesting Unit:	LCC7C	Created by:	L. Keta Ruiz on 05-Apr-2016
Product Line:	IBRD/IDA	Responsible Unit:	GTC04	Modified by:	Cristian Quijada Torres on 14-May-2016
Country:	Argentina	Approval FY:	2017		
Region:	LATIN AMERICA AND CARIBBEAN	Lending Instrument:	Investment Project Financing		
Parent Project ID:	P106752	Parent Project Name:	Unleashing Productive Innovation (P106752)		

Project Development Objectives

Original Project Development Objective - Parent:

The Objective of the Project is to expand the Borrower's capacity to generate productive innovation in knowledge-based areas by: (a) facilitating the creation of new knowledge-based companies; (b) developing specialized human capital; (c) supporting productive research innovation activities and their technology commercialization in the areas of biotechnology, nanotechnology and information and communication technology; (d) upgrading the research infrastructure in the areas of science, technology and productive innovation; and (e) strengthening the policy framework governing science, technology, and productive innovation.

Proposed Project Development Objective - Additional Financing (AF):

No changes

Results

Core sector indicators are considered: Yes

Results reporting level: Project Level

Project Development Objective Indicators

Status	Indicator Name	Core	Unit of Measure		Baseline	Actual(Current)	End Target
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Marked for Deletion	Increase in the number of technology broker and technology manager students	<input type="checkbox"/>	Number	Value	0.00	182.00	400.00
				Date	31-Dec-2008	31-Dec-2015	31-Jul-2016
				Comment			
New	Percentage of firms, labs and/or research consortia supported by the Project that introduced to existing or new markets new/improved products/protocols/services	<input type="checkbox"/>	Percentage	Value	0.00	30.00	40.00
				Date	13-May-2016	13-May-2016	25-Sep-2018
				Comment			
New	Disclosures made by CONICET Researchers	<input type="checkbox"/>	Number	Value	0.00	0.00	25.00
				Date	13-May-2016	13-May-2016	25-Sep-2018
				Comment			
New	Number of technology based start-ups that formally register as companies	<input type="checkbox"/>	Number	Value	0.00	15.00	30.00
				Date	13-May-2016	13-May-2016	25-Sep-2018
				Comment			
New	Attraction of External Funding for tech start-ups	<input type="checkbox"/>	Number	Value	0.00	0.00	10.00
				Date	13-May-2016	13-May-2016	25-Sep-2018
				Comment			
Marked for Deletion	Increase in number of graduates in ICT-related careers	<input type="checkbox"/>	Number	Value		2215.00	1000.00
				Date	31-Dec-2008	30-Jun-2013	31-Jul-2016
				Comment			
Marked for Deletion	Number of consortia (public-private/ private-private) in operation	<input type="checkbox"/>	Number	Value		25.00	10.00
				Date	31-Dec-2008	30-Jun-2015	30-Sep-2015
				Comment			
Marked for Deletion	Number of upgraded research/technology centers	<input type="checkbox"/>	Number	Value		49.00	30.00
				Date	31-Dec-2008	30-Jun-2015	30-Sep-2015

	and technology training institutes	<input type="checkbox"/>		Comment			
Revised	Number of universities that successfully updated/established institutional changes or norms on international property rights according to international best practices	<input type="checkbox"/>	Text	Value	0	7	8
				Date	31-Dec-2008	30-Jun-2015	25-Sep-2018
				Comment			

Intermediate Results Indicators

Status	Indicator Name	Core	Unit of Measure		Baseline	Actual(Current)	End Target
No Change	Number of strengthened or established graduate programs for technology brokers	<input type="checkbox"/>	Text	Value	0	6	6
				Date	31-Dec-2008	30-Jun-2013	30-Sep-2015
				Comment			
New	Increase in number of technology broker and technology manager graduates	<input type="checkbox"/>	Number	Value	0.00	158.00	400.00
				Date	31-Dec-2008	13-May-2016	25-Sep-2018
				Comment			
New	Overall additional Investment catalyzed/leveraged through project activities (USD million)	<input type="checkbox"/>	Amount(USD)	Value	0.00	25	32
				Date	31-Dec-2008	14-May-2016	25-Sep-2018
				Comment			
New	Percentage of Research Centers who implement tool to monitor and facilitate usage of shared research equipment (Of Centers that receive training)	<input type="checkbox"/>	Percentage	Value	0.00	0.00	50.00
				Date	14-May-2016	14-May-2016	25-Sep-2018
				Comment			
New	Percentage of beneficiaries who express positive perception on ANPCyT's activities during project	<input type="checkbox"/>	Percentage	Value	0.00	0.00	70.00
				Date	14-May-2016	14-May-2016	25-Sep-2018
				Comment			

	implementation	<input type="checkbox"/>					
New	Beneficiary satisfaction surveys implemented and utilized for policy making	<input type="checkbox"/>	Yes/No	Value	No		Yes
				Date	14-May-2016		25-Sep-2018
				Comment			
New	Number of upgraded research laboratories and technology centers	<input type="checkbox"/>	Number	Value	0.00	49.00	30.00
				Date	31-Dec-2008	14-May-2016	30-Jul-2016
				Comment			
New	Number of Research Consortia created for the Project	<input type="checkbox"/>	Number	Value	0.00	25.00	27.00
				Date	31-Dec-2008	14-May-2016	25-Sep-2018
				Comment			
Revised	Number of technology transfer subprojects (DTEC) that have completed proposed action plan	<input type="checkbox"/>	Number	Value	0.00	14.00	20.00
				Date	01-Feb-2014	30-Jun-2015	25-Sep-2018
				Comment			
Revised	Training of CONICET tech transfer personnel abroad	<input type="checkbox"/>	Number	Value	0.00	6	20.00
				Date	01-Aug-2015	05-May-2016	25-Sep-2018
				Comment			
Revised	Training of CONICET Researchers in technology transfer and commercialization	<input type="checkbox"/>	Number	Value	0.00	60	150.00
				Date	01-Aug-2015	05-May-2016	25-Sep-2018
				Comment			
Marked for Deletion	Increase in number of students in ITC- related careers	<input type="checkbox"/>	Number	Value	0.00	4066.00	6300.00
				Date	31-Dec-2008	31-Dec-2013	31-Jul-2016
				Comment			
Revised	Number of business plans prepared (2.2)	<input type="checkbox"/>	Number	Value	0.00	12.00	45.00
				Date	31-Dec-2008	30-Jun-2015	25-Sep-2018

				Comment			
Marked for Deletion	Number of public-private consortia in bio-technology in operation	<input type="checkbox"/>	Number	Value	0.00	13.00	4.00
				Date	31-Dec-2008	30-Jun-2015	30-Sep-2015
				Comment			
Marked for Deletion	Number of consortia in nanotechnology with some private collaboration	<input type="checkbox"/>	Number	Value	0.00	9.00	2.00
				Date	31-Dec-2008	30-Jun-2015	30-Sep-2015
				Comment			
Marked for Deletion	Number of public-private or private-private consortia in ICT	<input type="checkbox"/>	Number	Value	0.00	4.00	4.00
				Date	31-Dec-2008	30-Jun-2015	30-Sep-2015
				Comment			
Marked for Deletion	Additional human capital trained in biotechnology	<input type="checkbox"/>	Text	Value	0	81	60
				Date	31-Dec-2008	30-Jun-2015	31-Jul-2016
				Comment			
Marked for Deletion	Additional human capital trained in nanotechnology.	<input type="checkbox"/>	Number	Value	0.00	107.00	100.00
				Date	31-Dec-2008	30-Jun-2015	31-Jul-2016
				Comment			
Marked for Deletion	Additional human capital trained in ICT.	<input type="checkbox"/>	Number	Value	0.00	99.00	90.00
				Date	31-Dec-2012	30-Jun-2015	31-Jul-2016
				Comment			
Revised	CONICET Tech Transfer Unit	<input type="checkbox"/>	Yes/No	Value	No	No	Yes
				Date		30-Jun-2015	25-Sep-2018
				Comment			
No Change	Satisfactory establishment of the international advisory committee to the ministry	<input type="checkbox"/>	Text	Value		Achieved	Committee in operation
				Date		30-Jun-2015	31-Jul-2016

				Comment			
Revised	Increase in the number of independent evaluations of STI programs	<input type="checkbox"/>	Number	Value	0.00	5.00	7
				Date	31-Dec-2008	30-Jun-2015	25-Sep-2018
				Comment			
Marked for Deletion	Increase in the number of methodologies established to improve or create new national STI indicators	<input type="checkbox"/>	Text	Value	0	22	20
				Date	31-Dec-2008	30-Jun-2015	31-Jul-2016
				Comment			
Marked for Deletion	Number of reports/studies completed	<input type="checkbox"/>	Number	Value	0.00	55.00	50.00
				Date	31-Dec-2008	30-Jun-2015	31-Jul-2016
				Comment			
Revised	Number of staff in technology transfer offices at universities trained on intellectual property rights	<input type="checkbox"/>	Text	Value	0	103	140
				Date	31-Dec-2008	30-Jun-2015	25-Sep-2018
				Comment			

Annex 2: Economic and Financial Analysis

1. This Annex presents the results of the economic analysis for this AF which answers the questions (i) what the AF's development impact is, including a cost-benefit analysis; (ii) whether public sector provision or financing is the appropriate vehicle; and (iii) what the World Bank's value added is. The economic analysis also includes the results' sensitivity to changes in key variables and parameters. As the project entities (MINCyT and ANPCYT) do not operate on a commercial basis, no financial analysis was carried out for these entities.

Development Impact

2. As the AF is scaling up four of the five components of the original Project, the same economic rationale of the original Project applies to the AF. Therefore, the impact of the AF on growth in terms of expected benefits from productive innovation are also derived from enhanced total factor productivity. Estimating these benefits in monetary terms, however, could be quite challenging due to measurement and attribution problems, uncertainties and externalities inherent to the innovation process. One option is to use econometric analyses that try to capture total factor productivity at the establishment level for Argentinean firms that have and have not participated in the project interventions under analysis. This approach, however, requires an extensive data base of performance of these firms beyond the completion of their participation in the program which is not possible at this time for the programs financed by the original loan.
3. An alternative to the method above, which is the one that we use for the economic analysis of this AF, is to do a quantification of benefits and costs based on the specific project interventions and their derived results indicators. For quantifiable benefits, this analysis uses a standard cost-benefit model to estimate the expected net present value (NPV) and economic rate of return (ERR) of the AF's interventions. The cost-benefit analysis is then applied to each of the project components that are amenable to quantification of benefits (Components 1, 2 and 3). The cost-benefit analysis is not estimated for Component 4. Although this component will provide significant benefits stemming from strengthening the STI policy-making and implementation capacity of the MINCyT and ANPCyT, these are not amenable to quantification. While the cost-benefit methodology has the advantage of providing specific estimates, these should be taken with caution as their relative precision depend on the underlying assumptions. Therefore a sensitivity analysis that assesses the impact of changes in these assumptions on the returns of the Project accompanies the cost-benefit analysis.
4. While the economic justification for the AF usually entails just an update of the original analysis, the economic analysis of the original project included some broad estimations of the expected returns. These were based on empirical evidence that indicates that for medium-income level countries, such as Argentina, the average return of productive innovation is around 55 percent. As the original Project did not include a specific estimation of the net benefits of the Project nor of the ERR, this Annex presents a quantitative economic analysis for the AF based on the evidence thus far from the original project and other similar projects. The NPV for the three Components of the AF amenable to cost-benefit analysis calculations (that correspond to US\$29.8 million or 66 percent of the total AF) is estimated at US\$65.9 million at an 8 percent discount rate, with a 23 percent ERR. Details on these estimates by component are provided below including sensitivity analysis of shifts in key parameters.

Component 1: Developing Human Resources for Productive Innovation

5. As was the case for the original Project, the AF for this component will continue to help fill critical gaps in human capital in Argentina. It will continue to support training experts that can ease the flow of knowledge and information between researchers and the private sector and address problems of coordination and information asymmetries. The AF will also continue to support generating incentives for students to join and complete ICT degrees, helping close the existing gap between the demand and supply of ICT skills. This is necessary as private sector firms underinvest in the expansion of ICT human capital since they cannot fully appropriate the returns to those investments due to labor mobility and market financing for education is not developed preventing many students from completing their degrees.
6. The economic analysis for this component aims to assess the AF's incremental benefits of filling a segment of the human capital gap of ICT graduates and of experts that ease the coordination and information asymmetries of knowledge and information researchers and the private sector. Although the benefits from improving the overall quality of the program that helps develop technology managers or that support technology transfer projects at universities could be significant, these are difficult to quantify. Therefore incremental benefits are measured for the sub-component that provides for scholarships to encourage completion of undergraduate studies in ICT fields (the largest portion of this component, US\$2.3 million of the US\$4.5 million of AF). These benefits are measured relative to a "no-project" counterfactual scenario where it is assumed that without the AF, the drop-out rate in computer science students would result in only 48-52 percent of the students that entered the second half of the degree program will complete it.² For this estimation, we use the returns to holding a degree in ICT fields versus those to those that have not completed their university studies.³
7. The following assumptions are used for the quantification of benefits and costs for this sub-component: (i) private returns to holding a degree are measured with average salary statistics from the INDEC survey; (ii) labor participation of project beneficiaries is between the ages of 25-65 (benefits that will accrue beyond the two-year life of the AF); (iii) a discount rate of eight percent; (iv) opportunity cost to university students for pursuing their degrees are based on average salaries from the INDEC Survey for those that opt for not completing their ICT studies; and (v) salary increases of three percent per annum to account for salary gains due to increased productivity. These assumptions do not fully capture the externalities that having a larger human capital with ICT skills entails and the benefits estimated based on them should be viewed as a lower bound on the scale of potential overall benefits for this sub-component.
8. Given the above assumptions, the Net Present Value (NPV) for this subcomponent is US\$2.9 million and the ERR is 13 percent. While this broad estimate of whether the likely magnitude of direct AF benefits surpass its costs and that the returns are five percentage points higher than the discount rate, a sensitivity analysis of shifts in key parameters still yield positive results. For example, a two percentage point decrease in annual salary increases (from three to one percent per annum) reduces the ERR to 11 percent; if the drop-out rate is reduced from 50 percent to 30

² Project Appraisal Document for the Argentina Unleashing Productive Innovation. Report No: 45165-AR.

³ National Institute of Statistics and Censuses (INDEC) – Permanent Household Survey - Microdata second trimester of 2015 – Database for Individual (ICT sector).

percent, the ERR is reduced to 10 percent. These variations of the expected returns for this sub-component highlight the importance of carrying out good assessments of the benefits of these programs as, e.g., if the market imperfections that were causing the high drop-out rates have been overcome by other policies, spending public funds on these scholarships would not be justified. This is why the AF will also finance tracer studies of scholarship recipients that will allow a better assessment of the economic returns of the Project and adjustments to policies as needed.

Component 2: Support for Knowledge-Based Companies

9. The AF for this component will continue to support the development of market financing for technology start-ups. The AF will continue to help “kick start” financing of technology start-ups as market failures due to problems such as information asymmetries and intangible assets hinder the financing of these start-ups.
10. The economic analysis for this component aims to assess the AF’s incremental benefits of financing technology start-ups that otherwise would not secure funding and therefore would not provide the new products or technology innovations that they intend to provide. The incremental benefits for this component financed by the AF (cost of US\$10 million) are derived from the profits to be generated by the startup firms over their lifespan. For the estimation of profits of the start-ups to be financed by the AF, we could have ideally used the performance of the start-ups financed by the original loan. As most of these start-ups are still in early stages of development. For example, of the 94 start-ups that were funded through the original loan, only four have reached the final product stage.⁴ We therefore use the expected returns of 21 start-ups that were funded through the original Project as presented in their business plans.⁵
11. The following assumptions are used for the quantification of benefits and costs for this component: (i) expected revenues of the start-ups as projected in their business plans; (ii) 20 year horizon (benefits will accrue beyond the two-year life of the AF); (iii) a discount rate of eight percent; and (iv) 75 percent survive and succeed in commercializing their products.⁶ These assumptions do not fully capture the externalities that having new products or innovations entails and therefore the derived benefits should be viewed as a lower bound on the scale of potential overall benefits for this component.
12. Given the above assumptions, the Net Present Value (NPV) for this component is US\$39.6 million and the ERR is 48 percent. These are substantial results but as they depend on the quality of the revenue and cost projections in the business plans, a sensitivity analysis of shifts in key parameters was carried out and still yielded positive results. For example, if only 70 percent of the start-ups survive and commercialize their products, the NPV is reduced to US\$21.3 million and the ERR drops to 29 percent; even if 65 percent survive and commercialize their products, the NPV drops to US\$3.2 million and the ERR is reduced to 11 percent. Again, as was the case for component 1, these variations of the expected returns for this component highlight the importance of carrying out

⁴ ANPCYT-MINCYT, External Evaluation of Instruments of the "Program to Promote Productive and Social Innovation." March 2016.

⁵ ANPCYT, Spreadsheet of EMPRETECNO Summary of cash flows for 21 start-ups.

⁶ This commercialization and survival rate for start-ups is based on an impact evaluation of a similar start-up program (“El impacto del programa “Buenos Aires Emprande” en la creación de empresas innovadoras” by Ruffo *et al*, February 2015).

good assessments of the benefits of these programs for which the AF will finance impact studies of these start-ups to inform policy adjustments as needed.

Component 3: Sectoral Funds

13. The AF will continue to help expand Argentina's capacity in biotechnology, nanotechnology and ICT. These are crucial general purpose technologies that can have positive spillovers throughout the economy and contribute to Argentina's exports directly and indirectly. The economic analysis for this component aims to assess the AF's incremental benefits of the two proposed interventions supporting innovation projects in (i) public-private and public-public research consortia, and (ii) individual firms.
14. The incremental benefits for this component financed by the AF (at a cost of US\$10 million for the first sub-component directed at consortia and US\$7.5 million for the second sub-component directed at individual firms) are derived from the commercialization of new products, quality improvements to existing products and processes or technological improvements that generate financial returns to the beneficiary consortia and firms. One option for the estimation of the benefits derived from the projects under this component to be financed by the AF, could be to use the evidence from the performance of those financed by the original loan (27 consortia and 178 individual firms). An initial assessment, through a survey of a sample of completed projects for individual firms financed by the original loan indicates that these projects increased the profitability of 60 percent of the beneficiary firms.⁷ Although a significant percentage of the projects financed at the start of the original loan have been completed, as the commercial benefits could take a few years to yield financial returns, we do not have sufficient evidence of their benefits. Therefore, as part of the AF, an assessment of the returns of these programs will be undertaken.
15. The incremental benefits for the sub-component that financed projects by consortia are estimated based the expected returns of a typical consortium funded through a similar program.⁸ The following assumptions are used for the quantification of benefits and costs for this component: (i) expected revenue from the new product/innovation; (ii) 20 year horizon (benefits will accrue beyond the 2-year life of the AF); (iii) a discount rate of eight percent; (iv) 70 percent success rate.⁹ As in the case of Component 2, these assumptions do not fully capture the externalities that having new products or innovations entails and therefore the estimated benefits should be viewed as a lower bound on the scale of potential overall benefits for this sub-component.
16. Based on the above assumptions, the Net Present Value (NPV) for this sub-component is US\$9.0 million and the ERR is 16 percent. As these results depend on the certainty of the revenue and cost projections, a sensitivity analysis of shifts in key parameters was carried out and still yielded

⁷ ANPCYT-MINCYT, External Evaluation of Instruments of the "Program to Promote Productive and Social Innovation." March 2016.

⁸ Estimates based on a recently completed project for biotechnology from ANPCYT-MINCYT, Analysis of Direct and Indirect Economic Benefits of Projects Financed with Sectoral Investment Funds (FITS). January 2016.

⁹ This success rate is used based on evidence from programs that encourage cooperation between firms and research institutes as consortia to address both financial and technical constraints, such as lack of human resources, lack of own specialized research infrastructure and lack of technical knowledge (evidence from the FNDCT in Brazil in Evaluating the Impact of Technology Development Funds in Emerging Economies: Evidence from Latin-America. IDB, 2008).

positive results. For example, if the success rate is only 60 percent, the NPV is reduced to US\$2.5 million and the ERR drops to 11 percent. Again, as was the case for component 1, these variations of the expected returns for this component highlight the importance of carrying out good assessments of the benefits of these programs for which the AF will finance impact studies of these consortia to inform policy adjustments as needed.

17. For calculating the cost-benefit of the sub-component directed at individual firms in biotechnology, nanotechnology and ICT, the incremental benefits are estimated based on expected returns of a typical firm funded through a similar program.¹⁰ The following assumptions are used for the quantification of benefits and costs for this component: (i) expected revenue from the new product/innovation; (ii) 20 year horizon (benefits will accrue beyond the 2-year life of the AF); (iii) a discount rate of eight percent; (iv) 60 percent success rate.¹¹ For this sub-component also these assumptions do not fully capture the externalities that having new products or innovations entails and therefore the estimated benefits should be viewed as a lower bound on the scale of potential overall benefits for this sub-component.
18. Based on the above assumptions, the Net Present Value (NPV) for this sub-component is US\$14.5 million and the ERR is 19 percent. If the success rate is only 50 percent, the NPV is reduced to US\$8.0 million and the ERR drops to 15 percent.

Rationale for Public Sector Intervention

19. The rationale for public sector financing for the AF is also the same as for the original Project, i.e., based on the numerous market failures that can hinder or retard investments in innovation and that lead to a mismatch between social and private returns. These market failures stem from: (i) the partial intangibility of the assets involved in innovation such as education or training in the use of new technologies preventing the use of collateral to finance them; (ii) information failures that originates from the fact that knowledge is usually produced at high cost and is not appropriable; (iii) long-time horizon until maturity; (iv) non-appropriable nature of knowledge as there is a low possibility of retaining its economic benefit (e.g., imitation by others that did not invest in its development); and (v) network failures among researchers, institutions and the private sector, meaning that individuals and institutions perceive a higher risk than benefit to collaboration due to the fungibility of knowledge.
20. Furthermore, evidence from the earlier rounds of the Argentina FONTAR-ANR Program, financed by the Inter-American Development Bank (IDB) (and that uses the same modality of support to individual firms as Component 3) indicates that new innovators have made a substantial increase in their private investment in R&D.¹² This means that public funding for innovation (in this case through matching grants), could be quite effective for new innovators.

¹⁰ Estimates based on a project for ICT from Grant Program of FONTAR: An Assessment of its Social Benefits through Case Studies. Chudnovsky *et al*, March 2006.

¹¹ This success rate is larger than the one for start-ups but slightly lower than for consortia is used based on the fact that 60percent of the firms of this program that were surveyed experienced an increase in profitability. ANPCYT-MINCYT, External Evaluation of Instruments of the "Program to Promote Productive and Social Innovation." March 2016.

¹² IDB, 2008. Using a difference-in-difference methodology finds that the impact of the funding through the program on R&D intensity (gross of public subsidy) is of 0.18 percent (at a 5 percent significance).

Value Added by the World Bank

21. As a partner in the development of Argentina's capacity to generate productive innovation in knowledge-based areas through the original Project, the Bank is well positioned to continue helping advance these initial efforts by the Government. The Bank will continue to bring in international best practices and expertise for the continued growth of the still developing productive innovation ecosystem. The AF will continue to be closely coordinated with the IDB to ensure complementarities during its implementation.