



Are the Benefits from Export Support Durable? Evidence from Tunisia

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Why evaluate? What do we know?

- Shift from trade policy reforms to more targeted interventions aimed at reducing trade costs and addressing market failures that inhibit exports
- Significant resources are now devoted to trade facilitation and export promotion by country governments and international institutions
- Cross-country and micro-level evidence on export promotion:
 - On the effects on aggregate export performance: e.g., Rose (2007), Lederman et al. (2010)
 - Analysis at firm-level using quasi-experimental method : e.g., Görg et al. (2008), Volpe and Carballo (2008, 2010), Girma et al. (2009)
- Findings so far:
 - Export promotion agencies are more efficient than in past in raising exports
 - Export promotion works better with established exporters
 - Export promotion has more impact at the extensive margin within firms

This paper

What we do

- We evaluate the impact of an export support program – the FAMEX matching grant scheme – in Tunisia over the period 2004-2010 using firm-level data and quasi-experimental econometric techniques

Our contribution

- In addition to short-term effects we can estimate longer-term effects
- Longer-term effects allow to examine durability, volatility, and spillovers

What we find

- FAMEX has a stronger and more durable effect on firms' exports at the extensive margin (destination and product growth) than at the intensive margin (total export growth)
- FAMEX-driven diversification does not translate into lower export volatility
- No evidence of positive spillovers from FAMEX firms to control firms

Export promotion in Tunisia

- Tunisia's Export Development Project - of which FAMEX is part - was co-financed by the World Bank and the Ministry of Trade with the objective of fostering the export competitiveness of Tunisian firms
- The FAMEX program provided matching grants to co-finance 50% of firms' export business plans (up to TND 100,000) on a demand-driven basis
- In the application package, Tunisian firms need to state *one* objective for applying for FAMEX assistance:
 - (i) become a significant exporter (31%)
 - (ii) export to new destinations (49%)
 - (iii) export new products (20%)
- FAMEX received 1,710 applications, accepted plans from 1,060 firms
- After dropping firms with ongoing plans at the end of 2009 and services firms our sample includes
 - ➔ 455 FAMEX beneficiaries with completed programs at end of 2009

Activities financed by FAMEX

1. *Market prospection*: acquisition of information (e.g., purchase of data/market studies), firm missions to visit trade fairs and foreign exhibitions, and visits of prospective buyers
2. *Promotion*: production of information and marketing including design, production and publication of ads in various media (e.g., newspapers/magazines/TV/radio/web/brochures), sending of mailings and samples, and firm representation (stands) in trade fairs and exhibitions
3. *Product development*: product design modifications and production of samples, package design and modifications, and trademark registration
4. *Firm development*: training on organizational issues such as setting up a marketing watch, an export cell, or an export-oriented business plan
5. *Foreign subsidiary creation*: assistance for establishment of a facility abroad including legal, consulting, covering rental and salary costs for first year of establishment

	Amounts disbursed (in million USD)	Share in program total	Number of firms
Market prospection	2.665	23.9%	313
Promotion	4.113	36.9%	319
Product development	1.515	13.6%	184
Firm development	1.169	10.5%	220
Foreign subsidiary creation	1.688	15.1%	84
<i>Total</i>	<i>11.150</i>	<i>1.000</i>	

Challenges in evaluating FAMEX - 1

- Fundamental question: was the FAMEX intervention effective in promoting export competitiveness in Tunisia?
- Objective of impact evaluation: isolate causal effects of FAMEX on key export-related outcomes for Tunisian firms
 - Firm-level total exports, number of export products and export destinations, survival, diversification, export volatility
- A simple before-after comparison (comparing FAMEX firms with themselves over time) is not appropriate to evaluate the impact of FAMEX
- We need to consider the counterfactual: what would have happened to FAMEX firms in the absence of the program?

Challenges in evaluating FAMEX - 2

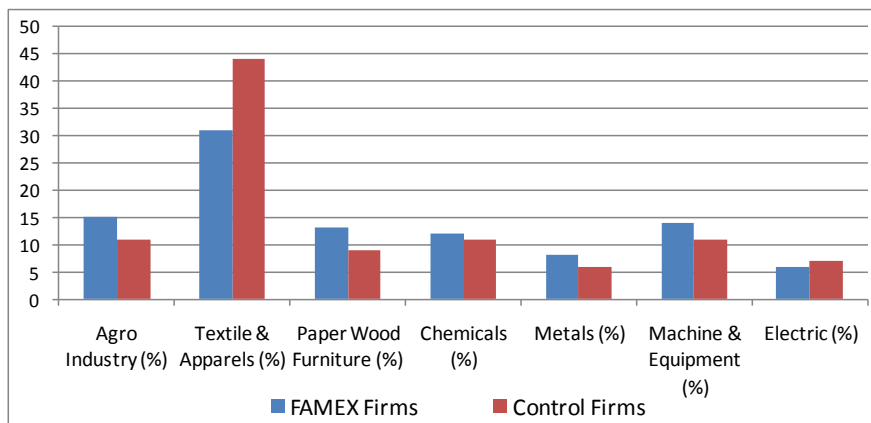
- FAMEX program did not involve a randomized choice of beneficiaries: Tunisian firms that self-selected into the program are likely to be different from other firms before treatment (e.g., more informed, with more dynamic managers)
- Need to use a method of evaluation that accounts for self-selection of firms into the FAMEX program
- Use quasi-experimental methods to evaluate impact of FAMEX by comparing outcomes of treated firms to outcomes of control firms (the counterfactual) addressing selection based on observable firm characteristics

Data sources

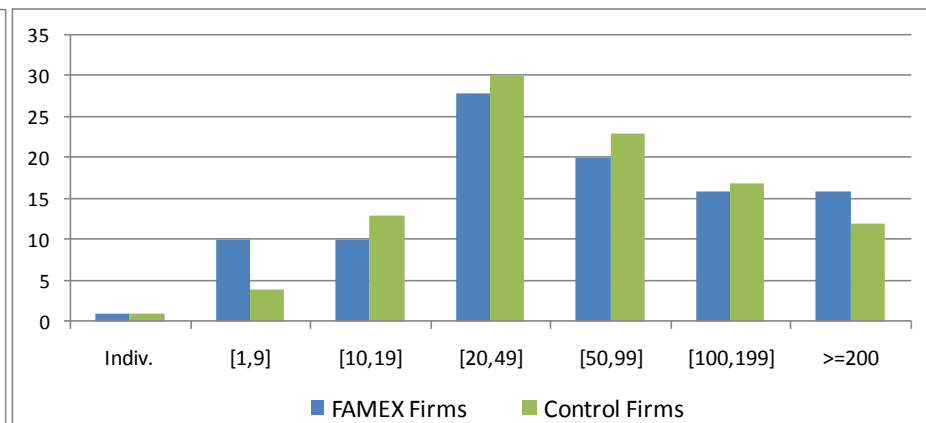
- We generate a novel firm-level dataset combining 3 data sources:
 - FAMEX program data
 - ID of beneficiary firms + data on firm characteristics, nature of project, total grant use and grant components
 - National Statistical Institute (INS) and Foreign Investment Promotion agency (API) data
 - Stratified sample of control firms for 48 cells by size, prior exporting status, and sector based on 2007 census + data on firm characteristics
 - 910 control firms from INS and 2,000 control firms from API
 - Exporter-level data from the Customs agency
 - Export transaction values by firm, year, destination, and HS10-digit for FAMEX beneficiaries and control firms for 2004-2010 period
- Final sample is an unbalanced panel of yearly detailed export activity for 2,747 exporting firms: 401 FAMEX beneficiaries and 2,346 control firms

FAMEX beneficiaries versus control group

Sectoral distribution



Size distribution



Export growth

	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2003-2010
Growth in total exports of:								
FAMEX firms	16%	27%	3%	12%	-6%	-12%	2%	42%
Control firms	24%	6%	7%	18%	3%	-16%	4%	51%
Tunisia	21%	8%	13%	25%	21%	-21%	8%	95%
Share of exports by FAMEX and control firms in Tunisia total exports	59%	60%	61%	57%	50%	49%	55%	53%

- No clear evidence of better export performance by FAMEX firms
- During recent crisis FAMEX firms perform more poorly

Evaluation method – step 1

Propensity score estimation

- Estimate the probability of FAMEX participation based on all available firm characteristics using a sample including all treated firms and all control firms
- The estimated probability for each firm – *propensity score* – is a measure of “similarity” across treatment firms and control firms

Propensity score estimation results

- Estimate a probit regression for FAMEX participation using all firm covariates:
 - Age and age squared
 - Location
 - Sector
 - Employment
 - Lagged number of export destinations and products
 - Lagged total exports
 - Dummy for initial 100% exporter
- Which firms are MORE likely to receive a FAMEX grant?
 - Smaller exporters, exporters located in Tunis, exporters of more products and serving more destinations in the past
- Which firms are LESS likely to receive a FAMEX grant?
 - Firms with larger export volumes and those exporting all their output in the past
- Sector fixed effects are insignificant: no sectoral targeting

Evaluation method – step 2

Propensity score matching–difference-in-differences estimator (PSM-DID)

- Follow Heckman, Ichimura, and Todd (1997), Blundell and Costa Dias (2009)
 - Compare *change in* outcomes for FAMEX firms to *change in* outcomes for “similar” control firms before and after FAMEX
 - Account for time-invariant unobserved firm characteristics leading to self-selection into FAMEX that could also influence outcome

$$\gamma^{PSM-DID} = \sum_{i \in T \cap S} \left[\Delta \ln(y_{it}) - \sum_{j \in C \cap S} w_{ij} \Delta \ln(y_{jt}) \right]$$

where w_{ij} are weights used to match FAMEX firms and control firms based on their propensity scores

- Problem in using the PSM-DID estimator is that Tunisian firms received FAMEX assistance in different years from 2005 to 2009 and should not be matched with control firms in any year (not necessarily in the treatment year) since calendar time can matter for performance

Evaluation method – step 2

Weighted Least Squares (WLS) regression estimator

- Follow Hirano, Imbens, and Ridder (2003)
 - WLS regressions use weights based on propensity scores: FAMEX firms have a weight of 1 and control firms have a weight of $\hat{r}_i = \hat{p}_i / (1 - \hat{p}_i)$ where \hat{p}_i is the estimated propensity score for control firm i
 - Flexibility in including covariates and year fixed effects and allowing for interactions

- Effect of FAMEX in year of treatment TY

$$\Delta \ln(y_{it}) = \ln(y_{i,t}) - \ln(y_{i,t-1}) = \alpha + \beta \tilde{D}_{it} + \mathbf{X}_{it}\boldsymbol{\gamma} + \delta_t + u_{it}$$

- Persistence of FAMEX effect on outcome growth: lagged treatment

$$\Delta \ln(y_{it}) = \ln(y_{i,t}) - \ln(y_{i,t-1}) = \alpha + \beta \tilde{D}_{i,t-k} + \mathbf{X}_{it}\boldsymbol{\gamma} + \delta_t + u_{it}$$

- Persistence of FAMEX effect on outcome levels: long-differences

$$\Delta_k \ln(y_{it}) = \ln(y_{i,t+k}) - \ln(y_{i,t-1}) = \alpha + \beta \tilde{D}_{it} + \mathbf{X}_{it}\boldsymbol{\gamma} + \delta_t + u_{it}$$

Baseline FAMEX effects - 1

- For how long do outcome growth trajectories of treatment and control firms diverge?

TY is treatment year

Difference	TY-(TY-1)	TY-(TY-1)	(TY+1)-TY	(TY+2)-(TY+1)	(TY+3)-(TY+2)	(TY+4)-(TY+3)	(TY+5)-(TY+4)
Estimator	PSM-DID	WLS reg.	WLS reg.	WLS reg.	WLS reg.	WLS reg.	WLS reg.
	(1a)	(1b)	(2)	(3)	(4)	(5)	(6)
<u>Outcome</u>							
Total exports	0.496 [2.66]**	0.511*** [3.08]	0.251 [1.55]	-0.042 [-0.26]	-0.157 [-0.83]	-0.240 [-1.06]	0.025 [0.11]
<i>R-squared</i>		0.17	0.14	0.11	0.09	0.11	0.11
Nb. destinations	0.144*** [5.52]	0.150*** [6.10]	0.086*** [3.70]	0.052** [2.10]	0.021 [0.84]	0.036 [1.11]	0.059** [2.07]
<i>R-squared</i>		0.15	0.12	0.08	0.12	0.12	0.08
Nb. products	0.145*** [4.33]	0.147*** [4.68]	0.071** [2.22]	0.049 [1.59]	0.008 [0.23]	0.060 [1.59]	0.097*** [2.58]
<i>R-squared</i>		0.15	0.13	0.13	0.12	0.13	0.13
Observations		12,263	12,214	9,803	7,401	4,975	2,607

- FAMEX has a **short-term impact on total exports** but no persistence
- FAMEX has positive **long-lasting effects on destinations and products**

Baseline FAMEX effects -2

- For how long do outcome levels differ across treatment and control firms after a temporary growth surge?

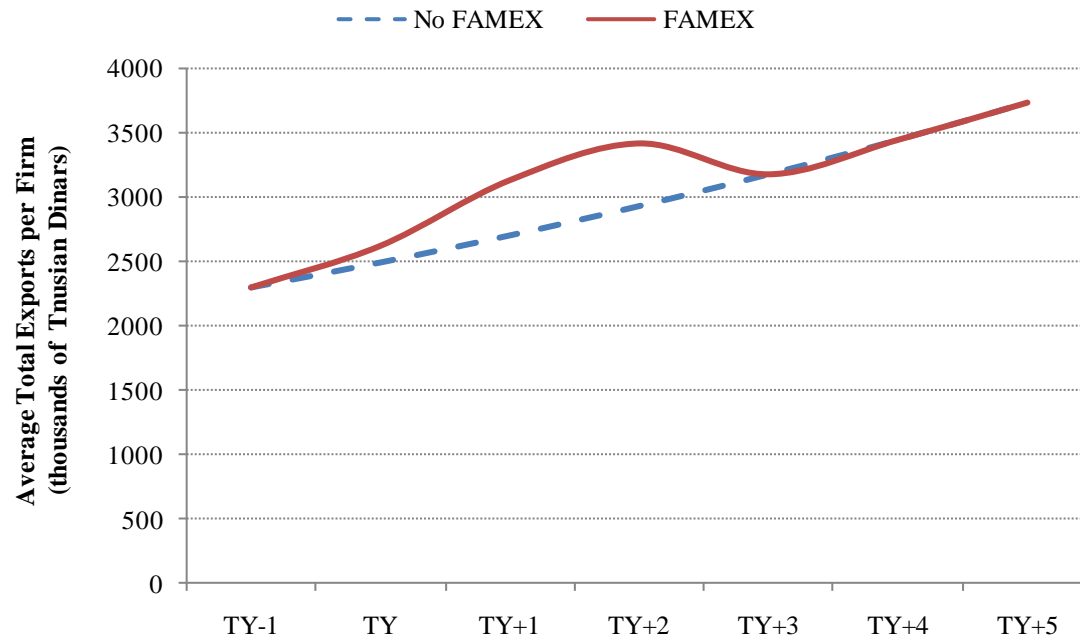
TY is treatment year

Difference	TY-(TY-1)	(TY+1)-(TY-1)	(TY+2)-(TY-1)	(TY+3)-(TY-1)	(TY+4)-(TY-1)	(TY+5)-(TY-1)
Estimator	WLS reg.	WLS reg.	WLS reg.	WLS reg.	WLS reg.	WLS reg.
	(1)	(2)	(3)	(4)	(5)	(6)
<u>Outcome</u>						
Total exports	0.511*** [3.08]	0.723*** [3.59]	0.571** [2.57]	0.272 [1.02]	0.043 [0.13]	0.200 [0.52]
<i>R-squared</i>	0.17	0.22	0.23	0.22	0.23	0.25
Nb. destinations	0.150*** [6.10]	0.191*** [6.93]	0.190*** [5.91]	0.151*** [4.18]	0.143*** [3.03]	0.177*** [3.22]
<i>R-squared</i>	0.15	0.20	0.20	0.24	0.29	0.30
Nb. products	0.147*** [4.68]	0.175*** [4.70]	0.178*** [4.42]	0.117** [2.51]	0.156*** [2.66]	0.219*** [3.37]
<i>R-squared</i>	0.15	0.20	0.23	0.26	0.27	0.30
Observations	12,263	12,124	9,664	7,238	4,839	2,524

- Cumulative effects of FAMEX on total exports disappear after 3 years
- Cumulative effects of FAMEX on destinations and products persist

Typical effects of FAMEX on total exports

- Taking an average Tunisian firm in 2004 and considering the differential effect on total export growth for FAMEX beneficiaries relative to control firms



FAMEX and risk-taking

- Individuals are more willing to take risks out of windfall gains than regular earnings (Thaler and Johnson, 1990)
- FAMEX was a matching-grant - not a pure subsidy - but did it encourage beneficiaries to take on more risk?
 - Suggestive evidence is the worse performance of FAMEX beneficiaries relative to control firms during global financial crisis years
- Estimate WLS regressions for firm-level Herfindahl and Theil indexes of export shares across product-destination cells to examine what FAMEX-induced growth at the extensive margin did to concentration
- Estimate WLS regression for coefficient of variation in total exports before-after FAMEX to examine FAMEX-linked volatility in total export sales

FAMEX, diversification and volatility

TY is treatment year

Difference Estimator	TY-(TY-1) WLS reg. (1)	(TY+1)-(TY-1) WLS reg. (2)	(TY+2)-(TY-1) WLS reg. (3)	(TY+3)-(TY-1) WLS reg. (4)	(TY+4)-(TY-1) WLS reg. (5)	(TY+5)-(TY-1) WLS reg. (6)	Before-After 2005 WLS reg. (7)
Outcome							
Herfindahl index	-0.131*** [-4.35]	-0.116*** [-2.91]	-0.151*** [-3.61]	-0.183*** [-3.93]	-0.172*** [-3.03]	-0.303*** [-4.26]	
<i>R-squared</i>	0.08	0.11	0.09	0.11	0.11	0.14	
Theil index	-0.021*** [-4.82]	-0.021*** [-3.57]	-0.027*** [-4.35]	-0.030*** [-4.33]	-0.031*** [-3.68]	-0.052*** [-4.82]	
<i>R-squared</i>	0.10	0.14	0.12	0.14	0.16	0.17	
Observations	7,743	7,308	5,627	4,059	2,629	1,326	
Coeff. variation of exports							-0.023 [0.51]
<i>R-squared</i>							0.13
Observations							1,198

- **FAMEX firms diversified significantly and persistently**
- **But this did not result in a significant reduction in total exports volatility**
- FAMEX firms may have experimented with new markets/products that failed, or diversified into riskier markets/products, or diversified into markets/products with export sales (returns) correlated with existing markets/products

FAMEX and externalities

- Estimated treatment effects can be biased by spillovers/externalities “polluting” outcomes of the control group
 - FAMEX firms’ participation in trade fairs or hiring of export-marketing consultants may be imitable or they may share that information voluntarily
- One interpretation for the lack of persistence of FAMEX effects on total exports could be that control firms catch-up
- Presence of externalities (e.g., non-appropriability of knowledge on export markets) is needed to justify government intervention
- Proxy for exposure to treated firms using lagged time-varying number of FAMEX firms by sector-region cell
 - Lagged number mitigates endogeneity problems and allows for slow diffusion of externalities

FAMEX spillover effects

- Effect of exposure to FAMEX beneficiaries on a sample of control firms only

Estimator Difference Outcome	Within reg. t-(t-1) Total exports				Within reg. t-(t-1) Nb. destinations				Within reg. t-(t-1) Nb. products			
	Sample of control firms only				Sample of control firms only				Sample of control firms only			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Exposure to FAMEX benef. t-1	-0.052* [-1.79]	-0.050 [-1.64]	-0.016 [-0.39]	-0.122 [-1.39]	-0.003 [-1.04]	-0.004 [-1.27]	0.004 [0.87]	-0.000 [-0.03]	-0.006 [-1.49]	-0.006 [-1.56]	-0.000 [-0.03]
Exposure to FAMEX benef. t-2		0.004 [0.14]	0.037 [0.85]	-0.019 [-0.18]		-0.002 [-0.75]	0.005 [1.25]	-0.005 [-0.47]		-0.001 [-0.33]	0.005 [0.83]	-0.020 [-1.44]
Exposure to FAMEX benef. t-3			0.012 [0.31]	-0.028 [-0.28]			0.005 [1.39]	-0.004 [-0.43]			0.006 [1.12]	-0.015 [-1.14]
Exposure to FAMEX benef. t-4				-0.060 [-0.76]				-0.008 [-1.11]				-0.022** [-2.05]
Number of firms	2,620	2,620	2,618	2,618	2,620	2,620	2,618	2,618	2,620	2,620	2,618	2,618
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>R-squared</i>	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Observations	12,785	12,785	10,316	7,802	12,785	12,785	10,316	7,802	12,785	12,785	10,316	7,802

- No positive spillovers from FAMEX firms to control firms
- Negative significant spillovers suggest poaching by FAMEX firms of managers or workers from control firms
- But spillovers might be identified if other dimensions were measurable (e.g., backward linkages) and the universe of Tunisian firms could be considered

FAMEX objectives and use of FAMEX support

- Objectives for requesting FAMEX assistance: 31% of firms came to become more significant exporter, 49% came to export to new destinations and 20% came to export new products
 - Estimate WLS regressions allowing FAMEX effects to differ across objectives
 - Firms coming to export to new destinations or new products exhibit significant and sustained increase in numbers of destinations and products but only temporary expansion in total exports
 - Firms coming to become more significant exporter see weaker benefits from FAMEX
- FAMEX activities: market prospection, promotion, product development, firm development, and foreign subsidiary creation
 - Estimate WLS regressions including vector with firm amounts per activity
 - Market prospection and promotion activities have a beneficial and durable effect across export outcomes

Concluding remarks

- FAMEX program has a stronger and more durable effect on Tunisian firms' exports at the extensive margin (destination and product growth) than at the intensive margin (total export growth)
 - No longer-term effects on total exports means FAMEX firms spread themselves too thin?
- FAMEX-driven diversification does not translate into lower volatility of exports
- Our significant treatment effects are not clearly favorable to public funding of export promotion
 - They indicate appropriable benefits and give no indication of positive spillovers (at least on a selected set of export-related outcomes)

FAMEX effects on export survival

- Despite vanishing effects on total exports, did FAMEX affect export survival?
- Construct survival measures for each firm in new destination markets between years a and b (same for new products)

nb of surviving dest. between a and b

$$\frac{\text{nb of surviving dest. between a and b}}{\text{nb of surviving dest. between a and b} + \text{nb of dropped dest. between a and b}}$$

Duration	TY to TY+1	TY to TY+2	TY to TY+3	TY to TY+4	TY to TY+5
Estimator	Weighted Tobit	Weighted Tobit	Weighted Tobit	Weighted Tobit	Weighted Tobit
	(1)	(2)	(3)	(4)	(5)
<u>Outcome</u>					
New destination survival rate	0.261***	0.260***	0.283**	0.220	0.419**
	[2.83]	[2.69]	[2.42]	[1.54]	[2.55]
<i>R-squared</i>	0.02	0.04	0.04	0.07	0.08
Observations	4,046	3,277	2,459	1,629	897
New HS 6d product survival rate	0.034	0.035	-0.004	0.056	0.122
	[0.52]	[0.47]	[-0.05]	[0.42]	[0.82]
<i>R-squared</i>	0.03	0.04	0.05	0.05	0.06
Observations	5,553	4,493	3,403	2,255	1,206

- FAMEX brings higher survival in new destination markets, up to 5 years after treatment

Cost-benefit assessment - 1

Estimated FAMEX benefits per firm in year of treatment

- Effect of FAMEX on total export growth = 0.511 → 66.7 percentage points (=exp(0.511-1)*100) higher growth for beneficiaries
- Average annual export growth for control firms in 2004-2008: 8.35%
- Estimated annual export growth for FAMEX firms in treatment year: 13.9% (= 8.35%*1.667)
- Average exports per firm in 2004: 2,308,000 Tunisian Dinars
- Estimated FAMEX firm exports in treatment year: 2,629,000 Tunisian Dinars (=2,308,000 *1.139)
- Estimated control firm exports in treatment year: 2,501,000 Tunisian Dinars (=2,308,000 *1.0835)
- Difference attributable to treatment: 129,000 Tunisian Dinars

Treatment cost

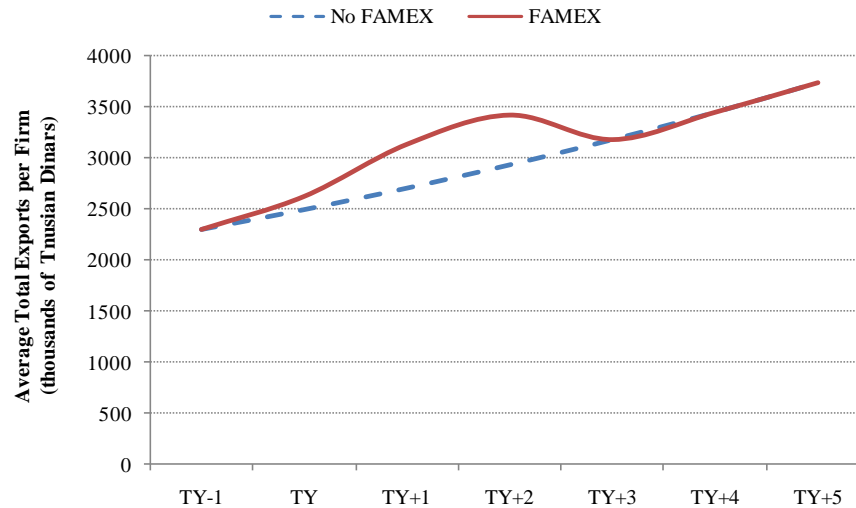
- Average grant amount disbursed per FAMEX beneficiary: 21,700 Tunisian Dinars

Return based on the effect in year of treatment

- 6 additional Tunisian Dinars of exports per 1 Tunisian Dinar of grant

Cost-benefit assessment - 2

	Baseline (BL)	TY	TY+1	TY+2	TY+3	TY+4	TY+5	
		1	2	3	<i>Non-significant coefficients</i>			
		4	5	6				
A	β Coefficient	0.511	0.723	0.571	0.272	0.043	0.200	
$B = \exp(A) - 1$	Change in total export growth (treatment effect)	0.667	1.061	0.770	0.313	0.044	0.221	
C	Cumulative total export growth, control a/	0.084	0.174	0.272	0.378	0.493	0.618	
$D = C * (1+B)$	Predicted cumulative total export growth, treated	0.139	0.358	0.481	0.496	0.515	0.755	
$E = BL * (1+C)$	Total exports, control b/	2,308	2,501	2,710	2,936	3,181	3,734	
$F = BL * (1+D)$	Total exports, treated b/ c/	2,308	2,629	3,135	3,419	3,454	4,050	
$G = F - E$	Difference in total exports due to FAMEX b/		129	426	483	273	50	316
H	Average FAMEX grant per treated b/		21.7	21.7	21.7	21.7	21.7	21.7
$I = G/H$	Return on public investment d/		5.9	19.6	22.3	12.6	2.3	14.6



Concerns: would value added or profits be preferred to total exports as metric?