



# **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 methods: 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<br>disbursed (in<br>million USD) | Share in program<br>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

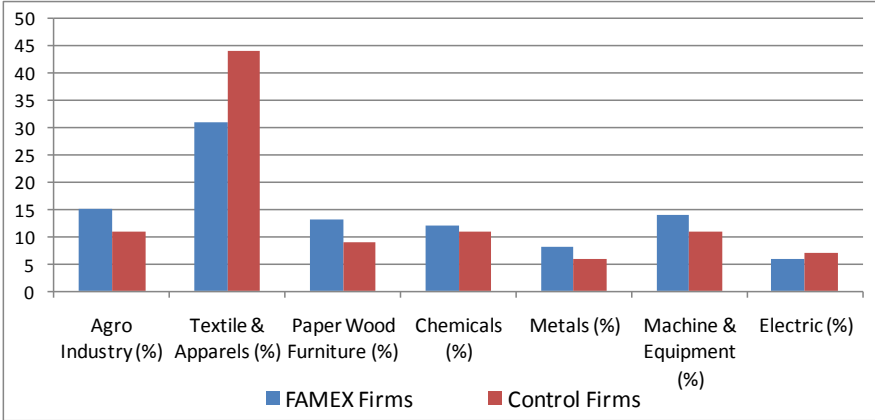
# Data sources

- 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

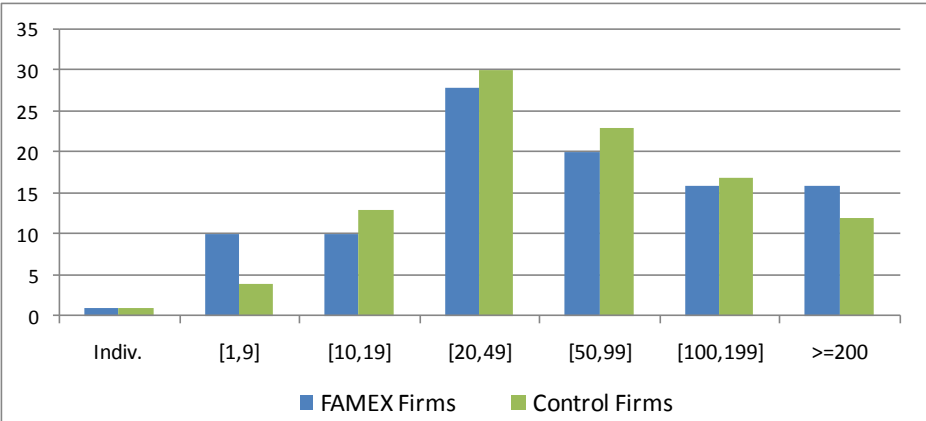


# FAMEX beneficiaries versus control group

## Sectoral distribution



## Size distribution



# 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 number of exported 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 year fixed effects and covariates and in 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<br>[2.66]**  | 0.511***<br>[3.08] | 0.251<br>[1.55]    | -0.042<br>[-0.26] | -0.157<br>[-0.83] | -0.240<br>[-1.06] | 0.025<br>[0.11]    |
| <i>R-squared</i> |                    | 0.17               | 0.14               | 0.11              | 0.09              | 0.11              | 0.11               |
| Nb. destinations | 0.144***<br>[5.52] | 0.150***<br>[6.10] | 0.086***<br>[3.70] | 0.052**<br>[2.10] | 0.021<br>[0.84]   | 0.036<br>[1.11]   | 0.059**<br>[2.07]  |
| <i>R-squared</i> |                    | 0.15               | 0.12               | 0.08              | 0.12              | 0.12              | 0.08               |
| Nb. products     | 0.145***<br>[4.33] | 0.147***<br>[4.68] | 0.071**<br>[2.22]  | 0.049<br>[1.59]   | 0.008<br>[0.23]   | 0.060<br>[1.59]   | 0.097***<br>[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?

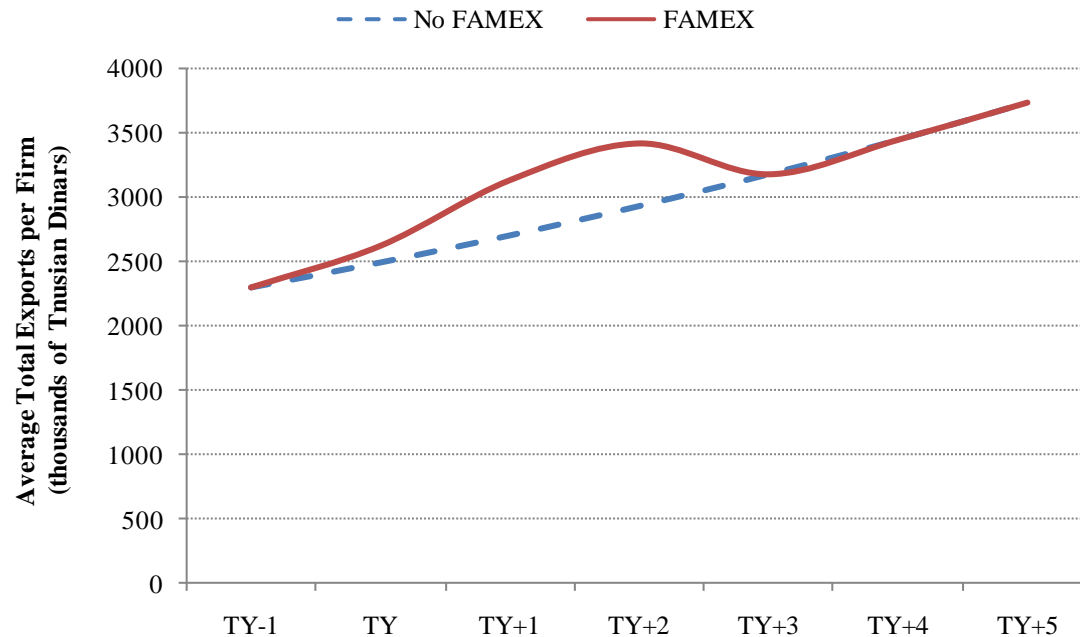
TY is treatment year

| 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***<br>[3.08] | 0.723***<br>[3.59] | 0.571**<br>[2.57]  | 0.272<br>[1.02]    | 0.043<br>[0.13]    | 0.200<br>[0.52]    |
| <i>R-squared</i> | 0.17               | 0.22               | 0.23               | 0.22               | 0.23               | 0.25               |
| Nb. destinations | 0.150***<br>[6.10] | 0.191***<br>[6.93] | 0.190***<br>[5.91] | 0.151***<br>[4.18] | 0.143***<br>[3.03] | 0.177***<br>[3.22] |
| <i>R-squared</i> | 0.15               | 0.20               | 0.20               | 0.24               | 0.29               | 0.30               |
| Nb. products     | 0.147***<br>[4.68] | 0.175***<br>[4.70] | 0.178***<br>[4.42] | 0.117**<br>[2.51]  | 0.156***<br>[2.66] | 0.219***<br>[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 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

# 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)<br>WLS reg.<br>(1) | (TY+1)-(TY-1)<br>WLS reg.<br>(2) | (TY+2)-(TY-1)<br>WLS reg.<br>(3) | (TY+3)-(TY-1)<br>WLS reg.<br>(4) | (TY+4)-(TY-1)<br>WLS reg.<br>(5) | (TY+5)-(TY-1)<br>WLS reg.<br>(6) | Before-After 2005<br>WLS reg.<br>(7) |
|-----------------------------|------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|--------------------------------------|
| <b>Outcome</b>              |                              |                                  |                                  |                                  |                                  |                                  |                                      |
| Herfindahl index            | -0.131***<br>[-4.35]         | -0.116***<br>[-2.91]             | -0.151***<br>[-3.61]             | -0.183***<br>[-3.93]             | -0.172***<br>[-3.03]             | -0.303***<br>[-4.26]             |                                      |
| <i>R-squared</i>            | 0.08                         | 0.11                             | 0.09                             | 0.11                             | 0.11                             | 0.14                             |                                      |
| Theil index                 | -0.021***<br>[-4.82]         | -0.021***<br>[-3.57]             | -0.027***<br>[-4.35]             | -0.030***<br>[-4.33]             | -0.031***<br>[-3.68]             | -0.052***<br>[-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<br>[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<br>Difference<br>Outcome | Within reg.<br>t-(t-1)<br>Total exports |                    |                   |                   | Within reg.<br>t-(t-1)<br>Nb. destinations |                   |                   |                   | Within reg.<br>t-(t-1)<br>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*<br>[-1.79] | -0.050<br>[-1.64] | -0.016<br>[-0.39] | -0.122<br>[-1.39]                          | -0.003<br>[-1.04] | -0.004<br>[-1.27] | 0.004<br>[0.87]   | -0.000<br>[-0.03]                      | -0.006<br>[-1.49] | -0.006<br>[-1.56] | -0.000<br>[-0.03]   |
| Exposure to FAMEX benef. t-2       |                                         | 0.004<br>[0.14]    | 0.037<br>[0.85]   | -0.019<br>[-0.18] |                                            | -0.002<br>[-0.75] | 0.005<br>[1.25]   | -0.005<br>[-0.47] |                                        | -0.001<br>[-0.33] | 0.005<br>[0.83]   | -0.020<br>[-1.44]   |
| Exposure to FAMEX benef. t-3       |                                         |                    | 0.012<br>[0.31]   | -0.028<br>[-0.28] |                                            |                   | 0.005<br>[1.39]   | -0.004<br>[-0.43] |                                        |                   | 0.006<br>[1.12]   | -0.015<br>[-1.14]   |
| Exposure to FAMEX benef. t-4       |                                         |                    |                   | -0.060<br>[-0.76] |                                            |                   |                   | -0.008<br>[-1.11] |                                        |                   |                   | -0.022**<br>[-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)