# The Impact of the Minimum Wage on the Destruction and Creation of Products[1]

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# Outline

- Motivation
- Data
- Methodology
- Main results & robustness

# Motivation

- Extensive literature on the impact of minimum wages
  - Wages, employment, young, poverty, inequality, etc.
- Not much evidence of impact using firm-level data
  - Mayneris et al. (2017): productivity and survival, China
  - Draca et al. (2011): wages and profitability, entry rates, UK
  - Riley and Rosazza (2017): productivity, UK

# Motivation

- Low impact on employment (survival and profitability)
  - Firms may increase productivity
    - Investment in new technologies (more capital-intensive, Mayneris et al.,2017)
    - Best workers selection (Autor et al., 2007), training and management (Riley and Rosazza, 2017)
  - Firms may raise prices:
    - Aaronson (2001); Wadsworth (2010)

# Motivation

- In this paper we study how changes in the minimum wage are associated with changes in firms' mix of products.
  - This can be a potential mechanism for mitigating the negative impact of the increase in labor costs
- Relatively recent literature indicates that
  - Multi-product firms are important (Bernard, Redding & Schott, 2010) $\rightarrow$ US: 39% firms, 87% Output
  - Changes in product mix may be an important source of productivity increases (Bernard, Redding & Schott, 2009; Nocke & Yeaple, 2014; Eckel & Neary, 2010) $\rightarrow$ "firms become more productive because they concentrate in their core competence"

# Motivation

- What are the main drivers of products creation and destruction?
  - Trade liberalization: Nocke & Yeaple (2014), Qiu & Zhou (2013), De Loecker (2011), Goldberg et al. (2010), Eckel & Neary (2010)
  - Competitive pressure: Mayer, et al. (2014, 2016)
  - Business cycle: Bernard & Okubo (2016)

# This paper

- Link between two strands of the literature
  - Impact of changes in the minimum wage
  - Determinant of products creation and destruction (and productivity)
- "Quasi-experiment": large and predetermined increases in minimum wage 1998-2000 in Chile
- Information of products by firms
- Main result: increases in minimum wage increase destruction and reduce creation of unskilled-labor intensive products

# Data

- Annual Survey of Manufacturing (ENIA): 1996-2001
  - Consistent information for about 4,000 plants per year
  - Firm characteristics: employment, wage bill, value-added, etc.
- Information of products: sales & quantity
  - Products classification: similar to ISIC rev. 2, 7-digit level

# Data

Data Description: Plants and Products

| Year | Plants | Products | Products per Plant | ISIC 6 digits | ISIC 5 digits |
|---|---|---|---|---|---|
| 1996 | 4541 | 1742 | 2.61 | 546 | 246 |
| 1997 | 4310 | 1697 | 2.54 | 555 | 248 |
| 1998 | 3939 | 1656 | 2.38 | 542 | 247 |
| 1999 | 3659 | 1641 | 2.23 | 543 | 244 |
| 2000 | 3611 | 1741 | 2.07 | 553 | 245 |

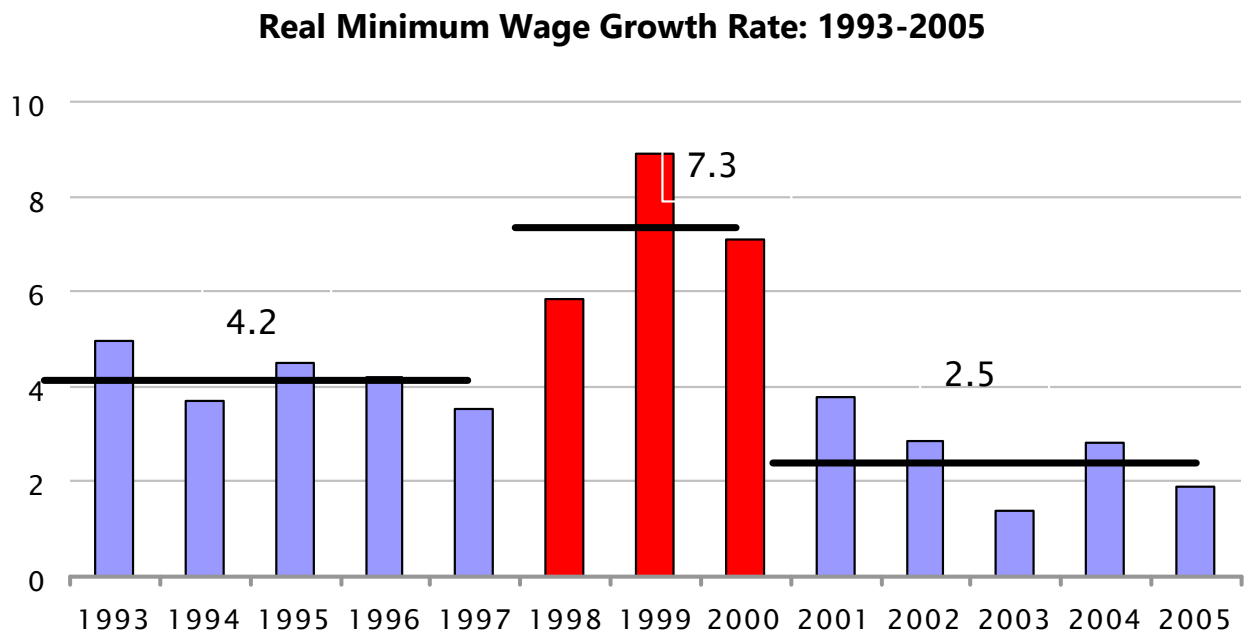
# Data

Average Product Destruction and Creation Rates by Year

| Year | Drop | Add | Drop | Add |
|---|---|---|---|---|
| | Total Sample | | Survivors(t,t+1) | |
| 1996 | 0.18 | . | 0.09 | . |
| 1997 | 0.20 | 0.16 | 0.08 | 0.10 |
| 1998 | 0.26 | 0.11 | 0.13 | 0.06 |
| 1999 | 0.21 | 0.17 | 0.10 | 0.11 |
| 2000 | . | 0.17 | . | 0.10 |
| Average | 0.21 | 0.15 | 0.10 | 0.09 |

- 1/2 and 2/5 of the entry and exit rate are related to the entry and exit of plants, respectively
- Max exit rate and min entry rate in 1998

# Data




Source: Authors Elaboration based on Beyer (2008)

# Methodology

$$\begin{aligned}\Pr\left(Drop_{pft}=1\right) &= \alpha_{pf}+\alpha_{jt}+\delta_1 MW_{t-1}EXP_{p0}+X\beta_{ft}+\varepsilon_{pft}\\ \Pr\left(Add_{pft}=1\right) &= \alpha_{pf}+\alpha_{jt}+\delta_1 MW_{t-1}EXP_{p0}+X\beta_{ft}+\varepsilon_{pft}\end{aligned}$$

- $\alpha_{pf}$ firm-product fixed effects, $\alpha_{jt}$ industry-year fixed effects
- $MW_{t-1}$ log minimum wage (lagged)
- $EXP_{p0}$ Initial product exposure $= \log[\frac{Blue-collar\ wage\ bill}{White-collar\ wage\ bill}]$
  - Bernard et al. (2006). Exposure of US firms to Chinese competition
  - Captures both differences in wages and unskilled workers intensity

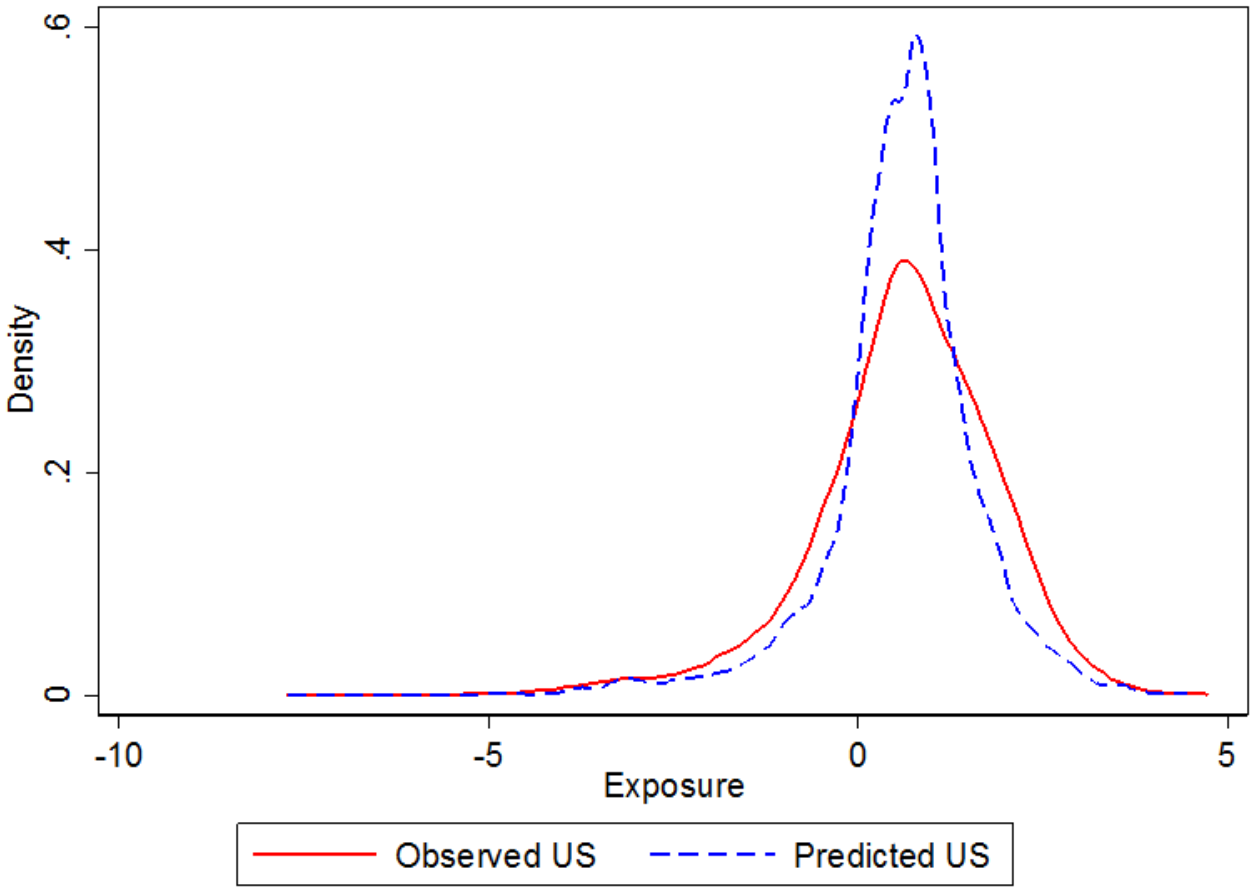
# Methodology: Product exposure

- Exposure ($\omega$) is unobserved for multi-product firms
  - For a 2-product firm $f$, the firm wage-bill ratio is $\omega_f = \omega_{1f}\alpha_{1f} + \omega_{2f}\alpha_{2f}$, where $\alpha_{if}$ is a weight. If $\alpha_{1f} \longrightarrow 1$, then $\omega_f \longrightarrow \omega_{1f}$
- Assuming similar technologies, we use information for single-product ($sp$) firms (Ma et al., 2014; De Loecker, et al., 2016)
- For every product $p$ produced by a multi-product ($mp$) firm we asume $\omega_{pf}^{mp} = \overline{\omega}_p^{sp}$ where $\overline{\omega}_p^{sp}$ is the average wage-bill ratio for product $p$ obtained from the sample of $sp$ firms producing $p$.

# Methodology: Product exposure

- Exposure
  - Using $\overline{\omega}_p^{sp}$ at the 7-digit level we can only obtain *EXP* for 41% of the observations, so use $\overline{\omega}_p^{sp}$ for single-product firms defined at 6 and 5-digit to identify *EXP* for 94% of the observations.
  - Continuous variable (*EXP*) and dummy =1 if $\omega > \omega_{66}$ (*Q3EXP*)
- Several robustness tests for *EXP*
  - Product definition at the 6-digit level
  - Median
  - Minimum number of single product firms producing $p$
  - Skill ratio U/S

# Methodology: Product level exposure distribution



## Basic Model

| VARIABLES | (1) Drop | (2) Add | (3) Drop | (4) Add |
|---|---|---|---|---|
| Q3EXP x MW | 0.501*** | -0.332*** | | |
| | [0.100] | [0.063] | | |
| EXP x MW | | | 0.222*** | -0.075** |
| | | | [0.059] | [0.037] |
| Observations | 36,511 | 33,230 | 36,511 | 33,230 |
| R-squared | 0.478 | 0.462 | 0.478 | 0.461 |

Exp is the log of the unskill/ skill wage bill ratio at the product level using product level data from single product firms. Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

## Basic Model

| VARIABLES | (5) Drop | (6) Add | (7) Drop | (8) Add |
|---|---|---|---|---|
| Q3EXP x MW | 0.490*** | -0.336*** | | |
| | [0.099] | [0.063] | | |
| 50-99 | -0.060** | -0.023 | -0.060** | -0.023 |
| | [0.023] | [0.016] | [0.023] | [0.016] |
| 100-199 | -0.101*** | -0.068*** | -0.101*** | -0.069*** |
| | [0.035] | [0.024] | [0.035] | [0.024] |
| 200+ | -0.101** | -0.114*** | -0.101** | -0.114*** |
| | [0.047] | [0.032] | [0.048] | [0.032] |
| Y/ L | -0.031*** | -0.021*** | -0.031*** | -0.021*** |
| | [0.011] | [0.007] | [0.011] | [0.007] |
| EXP x MW | | | 0.217*** | -0.079** |
| | | | [0.059] | [0.037] |
| Observations | 36,511 | 33,230 | 36,511 | 33,230 |
| R-squared | 0.480 | 0.463 | 0.479 | 0.462 |

Exp is the log of the unskill/ skill wage bill ratio at the product level using product level data from single product firms. Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

# Surviving Plants

Surviving Plants

| VARIABLES | (1) Drop | (2) Add | (3) Drop | (4) Add |
|---|---|---|---|---|
| Q3EXP x MW | 0.311*** | -0.275*** | | |
| | [0.074] | [0.054] | | |
| EXP x MW | | | 0.109** | -0.078** |
| | | | [0.045] | [0.031] |
| Observations | 30,713 | 28,327 | 30,713 | 28,327 |
| R-squared | 0.479 | 0.474 | 0.479 | 0.473 |

Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

# Results: How important? 10% increase in minimum wage

- Total Sample

| | Var in p.p. | Mean |
|---|---|---|
| Drop | +4.9 | 22% |
| Add | -3.3 | 15% |

- Surviving Plants

| | Var in p.p. | Mean |
|---|---|---|
| Drop | +3.1 | 9.5% |
| Add | -2.7 | 9.7% |

# Exported product mix

Product Drop and Add in International Markets

| VARIABLES | (1) Drop X | (2) Add X | (3) Drop X | (4) Add X |
|---|---|---|---|---|
| Q3EXP x MW | -0.004 | 0.054 | | |
| | [0.068] | [0.039] | | |
| EXP x MW | | | -0.031 | 0.016 |
| | | | [0.038] | [0.028] |
| Observations | 36,511 | 33,230 | 36,511 | 33,230 |
| R-squared | 0.347 | 0.363 | 0.347 | 0.363 |

Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

If exporters export their most productive products, they are less likely to be affected by the minimum wage.

# Business cycle effects

Interactions with Sectorial GDP Growth

| VARIABLES | (1) Drop | (2) Add | (3) Drop | (4) Add |
|---|---|---|---|---|
| Q3EXP x MW | 0.409*** | -0.327*** | | |
| | [0.102] | [0.063] | | |
| Q3EXP x dGDP Sector | -0.283*** | -0.129* | | |
| | [0.095] | [0.075] | | |
| EXP x MW | | | 0.215*** | -0.069* |
| | | | [0.061] | [0.038] |
| EXP x dGDP Sector | | | -0.017 | -0.093** |
| | | | [0.057] | [0.043] |
| Observations | 36,511 | 33,230 | 36,511 | 33,230 |
| R-squared | 0.478 | 0.462 | 0.478 | 0.461 |

Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Asian crisis, Bernard and Orunko (2016) →increased add and drop in recessions

# Product scope effects

Interactions with Product Scope

| VARIABLES | (1) Drop | (2) Add | (3) Drop | (4) Add |
|---|---|---|---|---|
| Q3EXP x MW | 0.487*** | -0.287*** | | |
| | [0.109] | [0.060] | | |
| Distance to scope xMW | 0.063** | -0.078*** | 0.064** | -0.079*** |
| | [0.026] | [0.010] | [0.026] | [0.010] |
| EXP x MW | | | 0.229*** | -0.091** |
| | | | [0.066] | [0.037] |
| Observations | 28,217 | 24,453 | 28,217 | 24,453 |
| R-squared | 0.480 | 0.465 | 0.480 | 0.464 |

Distance to scope is the log difference in absolute value between the product code and the plant average product code. Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

$\triangle MW \Longrightarrow$ Drop (Add) more (less) products away from scope

# Core Products

Impact on Core Products

| VARIABLES | (1) Drop | (2) Add | (3) Drop | (4) Add |
|---|---|---|---|---|
| Q3EXP x MW | 0.351*** | -0.223*** | | |
| | [0.066] | [0.038] | | |
| EXP x MW | | | 0.099*** | -0.066*** |
| | | | [0.038] | [0.022] |
| Observations | 36,511 | 33,230 | 36,511 | 33,230 |
| R-squared | 0.442 | 0.452 | 0.441 | 0.452 |

A core product is a product with sales representing at least 75% of the plant total sales. Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

# Placebo

Assigning EXP values randomly across products

| VARIABLES | (1) Drop | (2) Add | (3) Drop | (4) Add |
|---|---|---|---|---|
| Q3EXP x MW | 0.022 | 0.051 | | |
| | [0.088] | [0.054] | | |
| EXP x MW | | | -0.058 | 0.030 |
| | | | [0.044] | [0.026] |
| Observations | 33,272 | 30,550 | 33,272 | 30,550 |
| R-squared | 0.473 | 0.467 | 0.473 | 0.467 |

Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Assigning *EXP* randomly across products

# Bite of the minimum wage

Exposure Variable Defined as Bite of minimum wage from CASEN 1996

| VARIABLES | (1) Drop | (2) Add | (3) Drop | (4) Add | (5) Drop | (6) Add | (7) Drop | (8) Add |
|---|---|---|---|---|---|---|---|---|
| Bite 1.2 x MW | 0.700*** | -0.209* | | | 0.636*** | -0.278*** | | |
| | [0.201] | [0.111] | | | [0.133] | [0.080] | | |
| Bite x MW | | | 0.431** | -0.060 | | | 0.362*** | -0.143** |
| | | | [0.175] | [0.100] | | | [0.106] | [0.071] |
| Observations | 39,539 | 36,142 | 39,539 | 36,142 | 33,344 | 30,838 | 33,344 | 30,838 |
| R-squared | 0.450 | 0.433 | 0.449 | 0.433 | 0.428 | 0.431 | 0.427 | 0.431 |

Bite is the fraction of workers earning up to 1.2 and 1minimum wages at the ISIC2-3digit level in logs, respectively. Whole sample (columns 1-4), Survivors (columns 5-8). Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

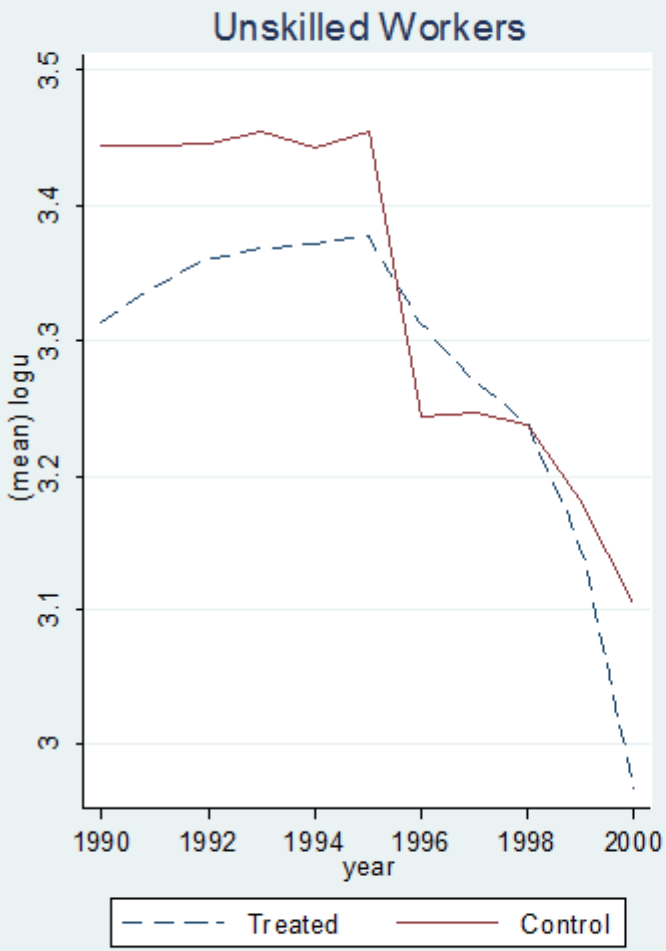
# Products defined by 6 digit ISIC level

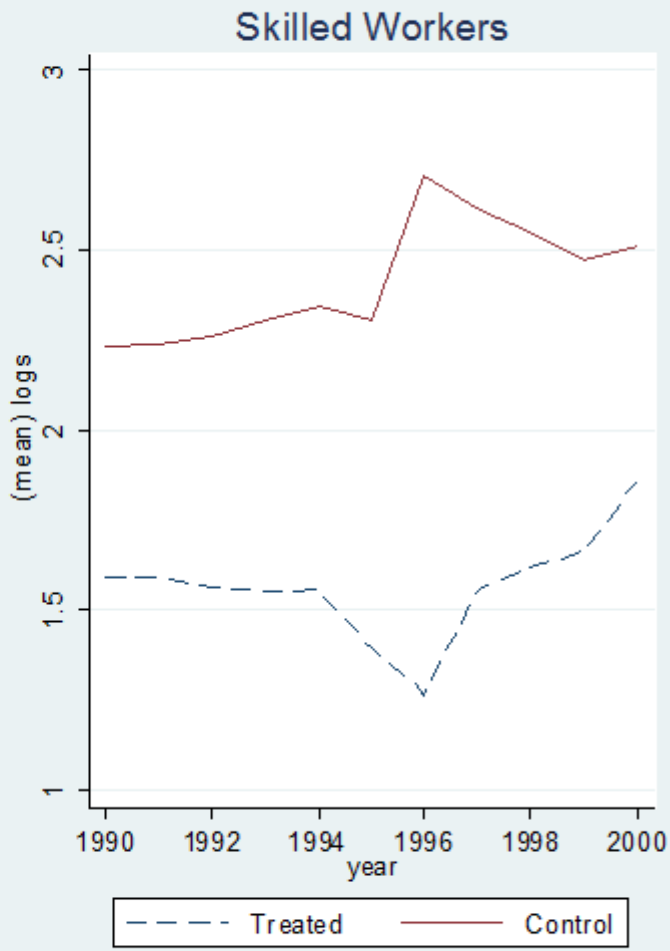
Product Destruction and Creation Defined at the 6-digit ISIC Level

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| VARIABLES | Drop | Add | Drop | Add |
| Q3EXP x MW | 0.245** | -0.153** | | |
| | [0.102] | [0.065] | | |
| EXP x MW | | | 0.115** | -0.020 |
| | | | [0.057] | [0.038] |
| Observations | 29,058 | 26,765 | 29,058 | 26,765 |
| R-squared | 0.452 | 0.438 | 0.452 | 0.438 |

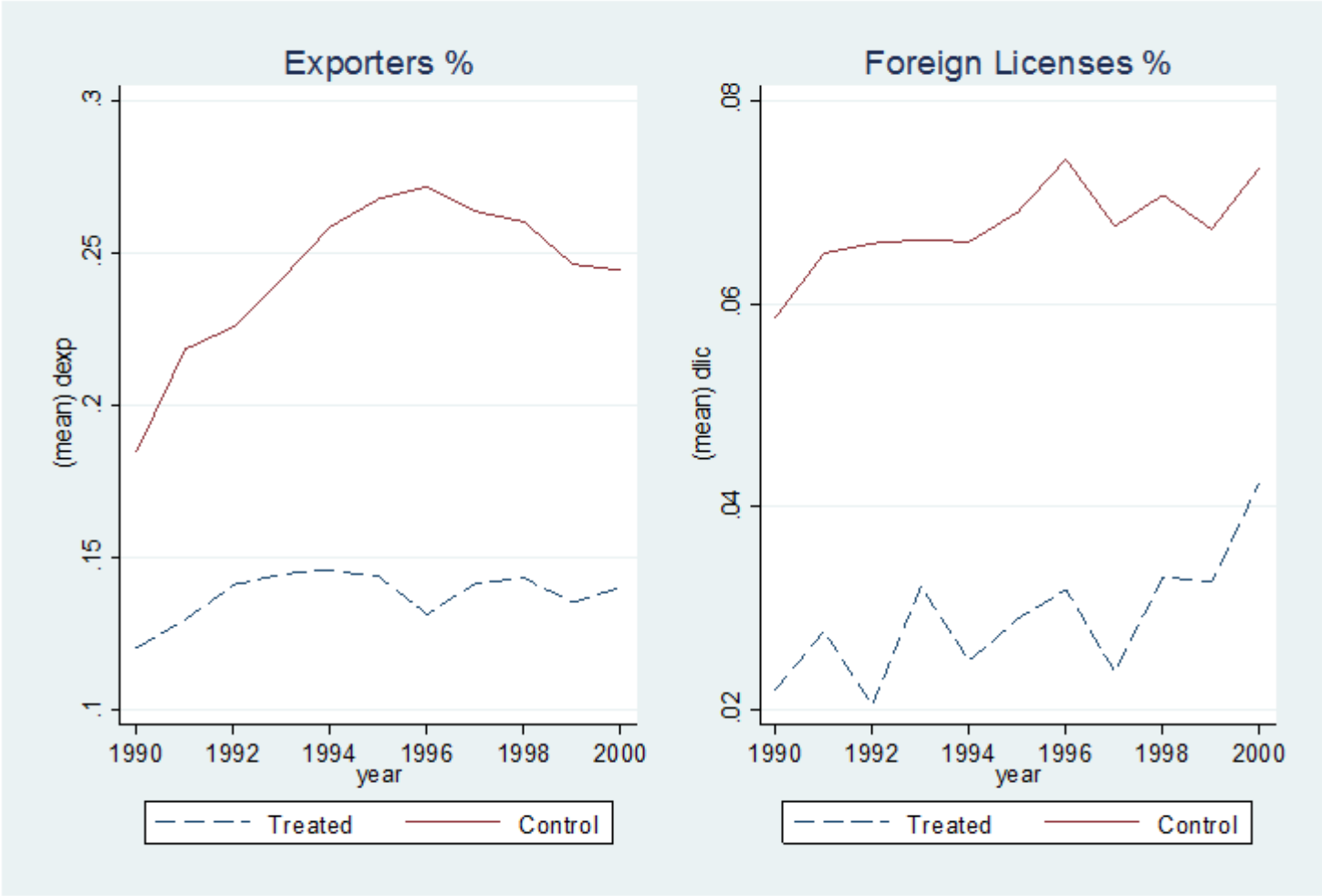
Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects. *** p<0.01, ** p<0.05, * p<0.1

# Previous trends Unskilled and Skilled Workers

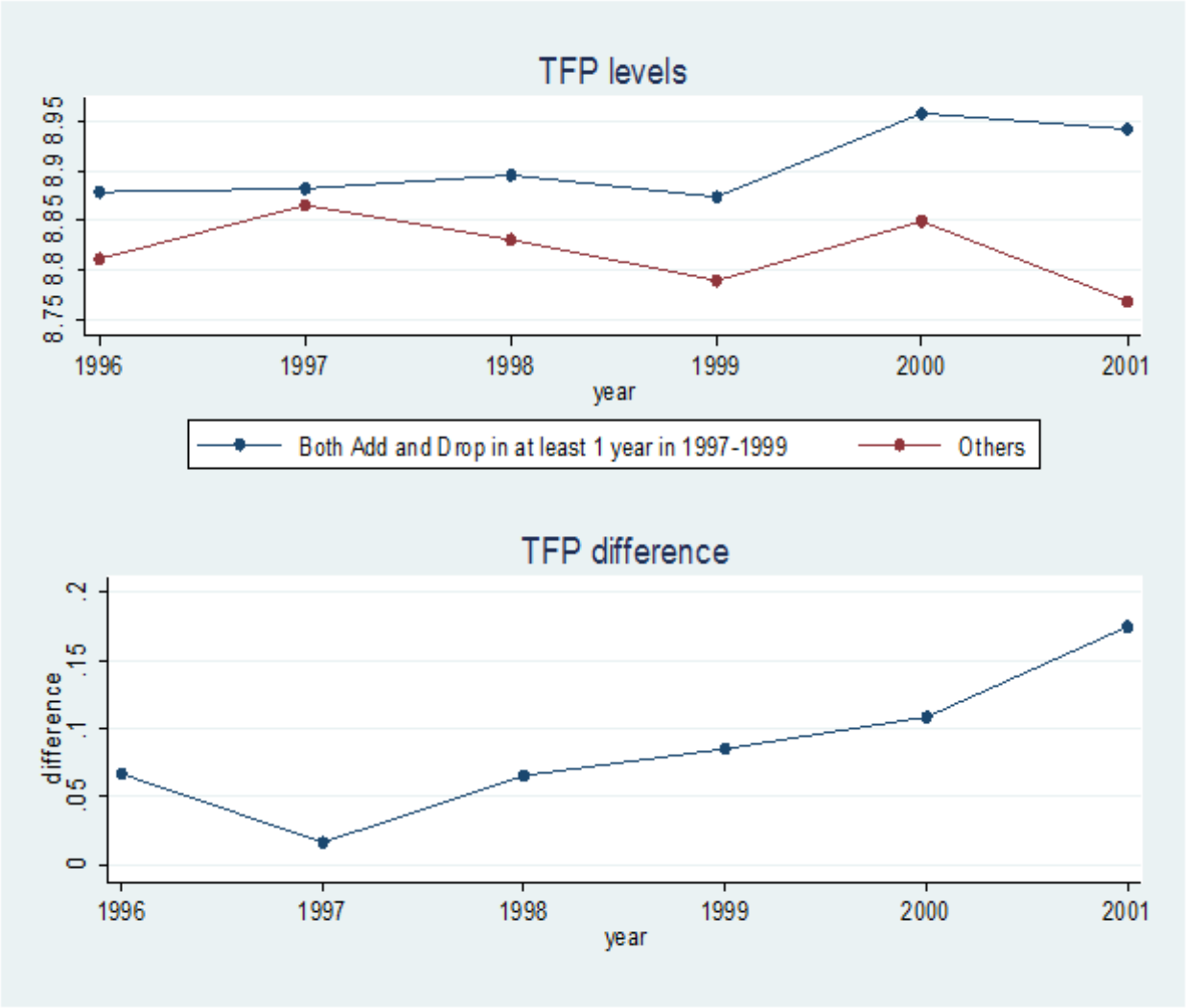


# Previous trends Exporting and Licenses



# Productivity Effects?



# Conclusion

- MW increases the probability of exit of unskilled intensive products
- MW decreases the probability of entry of unskilled intensive products

# Data

Average Product Destruction and Creation Rates by Sector

| Sector | Drop | Add | Drop | Add |
|---|---|---|---|---|
| | Total Sample | | Survivors (t,t+1) | |
| Food and Beverage | 0.16 | 0.12 | 0.05 | 0.06 |
| Textile | 0.22 | 0.13 | 0.08 | 0.08 |
| Wood | 0.29 | 0.22 | 0.15 | 0.16 |
| Pulp and Paper | 0.20 | 0.16 | 0.10 | 0.08 |
| Chemicals | 0.20 | 0.15 | 0.12 | 0.10 |
| Non-metallic | 0.22 | 0.15 | 0.07 | 0.07 |
| Metallic | 0.22 | 0.27 | 0.16 | 0.21 |
| Machinery | 0.22 | 0.16 | 0.12 | 0.10 |
| Other Industries | 0.19 | 0.14 | 0.08 | 0.08 |
| Average | 0.21 | 0.15 | 0.10 | 0.09 |