

# Competition Makes IT Better: Evidence on When Firms Use IT More Effectively \*

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First Draft: February 2015

Current Draft: March 2017

## Abstract

We study how technology upgrading, specifically through the adoption of information and communication technologies (IT henceforth), influences firm performance in the context of a developing country. We rely on a novel firm-level data set covering a large sample of Mexican companies with detailed information on IT. Further, we analyse if the returns to the IT investment depends on specific contextual factors that create incentives for additional firm-level changes, complementary to the IT investment. Specifically, the paper shows how the returns to IT investments are only positive for firms under the threat of increasing competition (from China), and it argues that the incentives provided by competition lead to an effective use of the new technologies. The mechanisms behind these results are driven by complementary investments in innovation and organisational changes.

JEL Classifications: E22, F14, L25, O33, D24

Keywords: IT, productivity, competition, Mexico

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\*ACKNOWLEDGEMENTS: We thank Gerardo Durand, Gerardo López, Simón Sánchez and Gabriel Romero from INEGI for their support with the data use in compliance with the confidentiality requirements set by the Mexican Laws. We also thank Indhira Vanessa Santos for helping us with the MODUTIH data and Martin Guzman for his support with Mexico's trade data. Finally, thanks to Remi Jedwab, Bob Rijkers, Pablo Cotler, and the participants of the Seminars at Universidad Iberoamericana and Banco de Mexico, the World Bank's ABCDE Conference 2015, the LACEA Labor Network 4th Annual Meeting, and the 2017 Royal Economic Society Annual Conference in Bristol for their valuable comments. All remaining errors are naturally our own.

\*This paper is a product of the Trade and Competitiveness Global Practice and DECWD. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. The author may be contacted at [liacovone@worldbank.org](mailto:liacovone@worldbank.org).

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The relation between information technology (IT) and productivity has been at the center of the attention of researchers since the early 2000s (Caroli and Reenen, 2001; Bresnahan and Hitt, 2002; Brynjolfsson and Hitt, 2003). According to Syverson (2011), IT is one of the “levers” that can be potentially used to increase firms’ productivity. However, especially for the case of developing countries, there is still limited evidence regarding the channels through which IT influences firm performance as well as what complementary factors do affect this relationship. The knowledge of these complementarities is crucial especially for policy design as it could lead to more efficient programs to boost firm-level performance.

On the other hand, recent studies have stressed that external competition shocks induce faster technical change and innovation by speeding up creative destruction and, therefore have effects on firms’ productivity (Iacovone et al., 2013; Bloom et al., 2015). A large part of this discussion has focused on rich countries competing with developing countries specialised in low-skilled intensive goods. An aspect of that kind of competitive shock, on which the literature has focused, is the impressive increase in Chinese manufacturing exports. Bloom et al. (2015) have found that competition from China has indeed induced both innovation and the adoption of new technologies and IT in OECD countries, contributing thus to their productivity growth. However, the evidence for developing countries is very limited.

The purpose of this paper is to analyse, in the context of a developing country, the effect that IT use has on firm performance, and even further to evaluate if this effect is heterogeneous depending on the level of competition faced by the firms. The main hypothesis behind this analysis is that firms facing higher competition have more incentives to make an effective use of IT in order to be able to cope with the challenges posed by the entry of new competitors. More specifically, existing literature has shown that an effective adoption of IT requires important changes within the firms and is costly in terms of organisational changes, therefore only firms that face enough competitive pressures may be willing to undertake those complementary, costly, changes. In this way, this paper also contributes to the existing knowledge on the relation between IT use and trade-induced technical change, which has been previously studied separately. Additionally, we test whether previous empirical results regarding IT use and productivity such as Stiroh (2002); Bresnahan and Hitt (2002) and Bloom et al. (2012b) hold for a developing country such as Mexico, where firms have very different structure in terms of organization and managerial practices than those in the U.S. or Europe.

Most of the studies regarding the effects of Chinese competition for Mexico have focused on aggregate effects on trade and output rather than firm-level effects (Freund and Ozden, 2009; Olarreaga et al., 2007; Jenkins et al., 2008, among others). However, according to recent empirical evidence, there is much more going on at the firm level as competition can lead to organisational changes, innovation and investment in technology as a response to the competition threat. In this sense, this paper aims at expanding this literature by shedding more light on the relation between these two variables.

The article is organised as follows. Section 1 provides a literature review of empirical studies on IT use as well as creative destruction induced by competition. In section 2, the methodology is presented. Section 3 explains the data used in the analysis as well as some descriptive statistics. Results are discussed in section 4 and conclusions in section 5.

## 1 Literature Review

This study is closely related with two different strands of literature. The first strand analyses the effects of IT adoption on productivity while the second is related to trade competition and the firm-level adjustments in response to pressures generated by import competition.

There is a great deal of studies regarding the impact of IT on productivity both at the macro and country level as well as the micro and firm-level. The first analyses were conducted during the 1980s and did not find evidence of any effect of IT on productivity, which led to the well known “the Solow paradox” (Brynjolfsson and Hitt, 1996). However, subsequent studies that could rely on improvements in the measurement of IT as well as more detailed data reached the conclusion that the previous results were not entirely correct and suggested that IT has a strong impact on productivity (Stiroh, 2002). As Draca et al. (2007) argue, causality has not yet been convincingly demonstrated, for example through a natural experiment and consequently, according to Acemoglu et al. (2014), the Solow paradox still needs to be thoroughly evaluated. Therefore, most of the recent studies analysing the effects of IT use focus on explaining the increase in U.S. aggregate productivity during the period of 1995-2005 and also try to understand the differences in terms of growth between U.S. and another OECD countries, mostly Europe (Basu et al., 2004). Among these studies are Haltiwanger et al. (2003) who find that part of the differences in productivity arise because U.S. firms engage in experimentation activities at a rate not matched by their German counterparts. In order to explain these same differences, Bloom et al. (2012b) argue that there is complementarity between IT use and specific organizational/managerial practices. That is, IT investment alone is not sufficient to enhance productivity, as better managerial and organizational practices are crucial to materialize the potential impact that IT adoption can provide.<sup>1</sup> From the financial point of view, previous work by Brynjolfsson et al. (2002) also supports this view, arguing that there are intangible assets that are complementary to IT, such as the organizational changes, that are required to become an IT-intensive firm.

Another set of studies, related to our paper, focuses on the role of skills and the changes in the labour market as a result of skill-biased technological change following Autor et al. (2003).<sup>2</sup> These studies

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<sup>1</sup>See Draca et al. (2007) for an extensive review of articles regarding IT use and productivity.

<sup>2</sup>See for example Acemoglu and Autor (2011) who provide a task-based framework in order to explain the recent trends that cannot be correctly explained within the canonical model that assumes two skill groups that produce two imperfectly

suggest that technological change and IT act as substitutes for low-skilled workers but as complements for high-skilled workers, accordingly a substantial part of the wage polarisation observed in the U.S. could be explained by IT adoption. Michaels et al. (2014) and Akerman et al. (2015) provided evidence to support this idea.

Empirically, one of the main problems that arise in the analysis of the effect of IT adoption on productivity is that IT investment is a firm's decision and it is not plausible to assume that it is independent of performance Draca et al. (2007), therefore it is crucial to find a valid instrument in order to plausibly identify the impact of IT on firm performance.

Another strand of literature related to our work are the studies analysing the effect of Chinese competition. However, most of these studies have focused on aggregate effects of Chinese competition and on whether Mexican products have been displaced by Chinese competition both in the domestic market and in the U.S. market. For example Freund and Ozden (2009) estimate a gravity model and find that China's exports growth had moderate effects on Latin America's growth as a region, but had negative impact on Mexico only in some sectors. Jenkins et al. (2008) find that as a result of Chinese competition some countries such as Argentina, Chile and Brazil won while Mexico and Central America experienced losses. Finally, Olarreaga et al. (2007) find no evidence of lost opportunities for Latin America. Furthermore, they find that there may be complementarities between these countries and China in external markets.

However, more recent studies make use of firm-level data in order to assess whether trade competition generates pressure on firms for speeding up IT use and technical change. In this framework, Bloom et al. (2015) find that Chinese competition led to higher R&D, patenting, IT and productivity in a sample of European countries, as well as contributed to the reallocation of labour towards more technologically intensive sectors. A more recent paper instead suggests a negative effect on innovation focusing on US companies Autor et al. (2016). On the other hand, Iacovone et al. (2013) analyse whether Chinese competition operates as a selection mechanism in the Mexican market, taking advantage of this exogenous shock from competition. They find heterogeneous effects on both the extensive (firm's exit) and the intensive margins. Additionally, product reallocation within plants is observed as a result of competition.

## 2 Empirical strategy

### 2.1 Modelling strategy

In order to assess the impact of IT adoption on performance we estimate the following equation:

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substitutable goods.

$$\log(\text{sales}/\text{worker})_{i,t} = \beta_0 + \beta_1 IT_{i,t} + \gamma x_{i,t} + \alpha_i + u_{i,t} \quad (1)$$

Where  $\log(\text{sales}/\text{worker})_{i,t}$  is the logarithm of sales-per-worker for firm  $i$  at time  $t$ ,  $IT_{i,t}$  is our measure of IT use for firm  $i$  at time  $t$ , and  $x_{i,t}$  is a vector of firm-level covariates such as age, firm's size and share of skills. Finally we also include  $\alpha_i$  which are firm fixed effects.

In our estimation, because of data limitation<sup>3</sup> we use as performance indicator sales-per-worker, which has been widely used in the literature as a proxy for productivity, though an imperfect one (Haltiwanger et al., 1999; Bloom et al., 2012a).

Our equation is similar to what Stiroh (2002) and Bloom et al. (2012b) estimate but, as it will be explained later, the main difference with these studies is in the IT proxies used as while they use IT-stock-capital we use computers-per-worker.

Building on this equation, we then use different specifications in order to test whether the predictions of empirical models previously applied to developed countries hold for the case of Mexico, as well as to analyse the interaction between Chinese competition and IT use with firm-level data.

## 2.2 Instrumental variables

Considering that IT is endogenous to firm performance, we use an instrumental variable approach where the first stage is defined as follows:

$$IT_{i,j,s,t} = \beta_0 + \phi ITint_j * ITHHuse_{s,t} + \beta_1 x_{i,t} + \alpha_i + v_{i,t} \quad (2)$$

Where  $IT_{i,j,s,t}$  is our measure of IT use for firm  $i$  from sector  $j$  in state  $s$  at time  $t$ ,  $ITint_j$  is the measure of IT intensity of sector  $j$  in the U.S. that will be described below, and  $ITHHuse_{s,t}$  is the share of households with computers in state  $s$  at time  $t$ .

We instrument IT adoption at the firm-level with with the interaction term  $ITint_j * ITHHuse_{s,t}$ , that is a measure of sector IT-intensity already used by Bloom et al. (2012b) and O'Mahony and Van Ark

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<sup>3</sup>We have no data available to estimate TFP because we lack detailed information on capital and intermediate inputs. The data we use are obtained from a firm survey which is focused on IT use and does not provide information regarding physical non-IT related capital stocks.

(2003), based on Stiroh (2002), interacted with a measure capturing the change in household IT-use at the state level.<sup>4</sup> The use of this second measure is broadly based on Akerman et al. (2015), who take advantage of broadband availability roll-out for Norway as a measure for IT adoption in order to overcome the endogeneity problem. To construct this state-level variable we use two alternative sources. The first one is the 2000 and 2010 Population and Housing Censuses, while the second one is the Module on Information Technology Availability and Use in Households (MODUTIH 2010 and 2013).<sup>5</sup> An advantage of our instrument is that the sectoral IT intensity is based on U.S. data, which is by definition exogenous to the decision of Mexican firms and arguably a better measure of “technological characteristics” at the industry level. Additionally, in our robustness tests, we also explore alternative ways to build our instrument. First, we consider an alternative measure of sectoral IT intensity based on the 1999 Mexico’s Economic Census in which we calculate both the share of investment in computer equipment over total investment in fixed assets, as well as the share of computer equipment assets on total fixed assets. Second, even more exogenous, we build a geographical proxy that captures geographical features at the state-level which increase the cost and difficulty of rolling over access to internet inspired by previous research work (Duflo and Pande, 2007; Manacorda and Tesei, 2016).

### 3 Data and Descriptive Statistics

#### 3.1 Firm-level IT use

Data regarding IT use were obtained from Mexico’s National Survey on Information Technologies 2009 and 2013. This survey was designed by the National Science and Technology Council (CONACYT) and conducted by the National Institute of Statistics and Geography (INEGI) to explicitly capture firm-level IT adoption and its drivers. It includes detailed information on IT use at the firm-level that, to the best of our knowledge, has not been previously used for research purposes.

We constructed a panel including firms that appeared in both surveys. Due to the sample design of this survey we were able to build a panel of 719 firms.<sup>6</sup> Additionally, firms from the commerce, mining

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<sup>4</sup>Considering that these classifications are based on ISIC rev.3.1 we used the correspondences tables between ISIC rev 3.1 and ISIC 4 and then we used the NAICS-ISIC 4 correspondence table. As there are different levels of aggregation in this process, we also tested an IT intensity variable based on the sectoral descriptions rather than the classification codes, which proved to be more highly correlated with our endogenous variable (IT use).

<sup>5</sup>Considering that for some states there are great differences between the urban and rural sectors, different versions of these indicators were analysed restricting the sample to localities with more than 15,000 inhabitants (i.e. urban locations).

<sup>6</sup>The ENTIC surveys were designed to gather information for firms with more than ten employees from the manufacturing, construction, services, electricity, mining, transportation and communications sectors according to the NAICS 2007 classification. The sample design is probabilistic and stratified by employment level. The sample is statistically representative at the

and services sectors are excluded from the sample, as we focus mostly on manufacturing goods for which we have available international trade data. Thus, we end up with a balanced panel of 701 firms.

As our main measure of IT use, we selected computers-per-worker, a measure which has been used in previous studies such as Bloom et al. (2015). As these authors argue, the main two advantages of this indicator is that it is a physical quantity measure that is recorded consistently across firms and sectors and it avoids the use of price deflators.

Additionally, to evaluate the robustness of our results we also use two additional proxies of IT use. The first one is the share of labour that uses Internet in the firm, and the second one is the share of labour with computer, which should be almost equal to computers-per-worker and is used mainly in our robustness tests. In fact, Bloom et al. (2012b) too use the share of labour with computer as a robustness test arguing that there could be measurement errors in their IT stock capital variable that could be biasing their results.

### 3.2 Trade data

Trade data were obtained from the World Integrated Trade Statistics (WITS) using the HS 1996 classification at the 6-digits level. Considering that some HS6 codes appear in more than one NAICS 4-digits code, we reclassified the ones that had more than one match using the Mexican Tariff Classification (8 digits), by including them into the NAICS sector that had the highest share of the 6-digits HS code for total Mexican imports in 2013.<sup>7</sup>

Competition is measured for the period of 2000-2008. This period was selected considering that the first year of our panel is 2008 (ENTIC 2009 gets information for the previous year). We use imports data for Mexico and the U.S. in order to measure Chinese competition, and specifically an import penetration ratio at NAICS-4-digits level as described in the equation below following previous work (Autor et al., 2016; Bloom et al, 2015; Iacovone et al., 2013).

$$Compet_{j,t} = \frac{M_{j,China,t}}{\sum_{k=1}^n M_{j,k,t}} \quad (3)$$

Where  $M_{j,China}$  is imports of country  $j$  from China,  $M_{j,k}$  is imports of country  $j$  from country  $k$ , and  $j$  can be Mexico or the U.S.

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national level by economic sector. Due to this probabilistic design it is easier to find that big firms are surveyed in both waves (2009 and 2013).

<sup>7</sup>The correspondence tables for HS 1996 and NAICS generated through this exercise are available upon request.

### 3.3 Descriptive Statistics

As mentioned before, the random sample design of the ENTIC surveys, made it possible to match only 701 firms and around 88% of them are large firms, as they are the ones that must be in both samples in order to achieve statistical representativeness. This fact has important implications regarding the interpretation of our results given that previous studies suggest that small firms are the ones more likely to exit and be negatively affected by the increasing competition (Iacovone et al., 2013). This is a potential limitation of our results to the extent that our sample is different from the representative original ENTIC sample in terms of general representativeness of our results at country level. However, as shown in Figures A1 and A2 our sample tracks well both sectoral and geographical distribution of the entire ENTIC sample. Furthermore, we note that the importance of the companies in our sample is substantial as they represent, in terms of employment, more than 55 percent of the overall ENTIC sample and, in terms of exports, more than 61 percent.

Consistent with the size of the firms in our sample, approximately 50% of the firms have a share of FDI higher than 80%. Accordingly, the mean of exports/total sales is much higher than the one observed for the whole ENTIC. Table B1 shows descriptive statistics for the main variables used in this analysis for our sample and the whole ENTIC sample.

Analysing IT use at the sectoral level, as Figure A3 shows the sectors that make more intensive use of IT measured as computers-per-worker are chemical products followed by computer equipment and electronics and beverages and tobacco. The second sector is not only an IT-use sector but an IT-producing sector. It is important to note that once we use the share of labour with Internet, the same sectors remain as the ones with most intensive IT use, but machinery also appears as an intensive user in terms of the share of labour with Internet.

As Figure A4 shows, IT-use is more intense among firms located in the Northern and Central region of the country, these tend to be the areas of the country characterized by more productive firms and overall are characterized by higher measures of well-being among the population, while the South-Eastern region that is the region characterized by highest level of poverty is also where find IT use intensity at the firm-level is the lowest.

Considering the relation between IT use and a higher level of Chinese competition, we calculated an indicator variable based on the change of the Chinese import penetration in Mexico which takes the value one for those sector for an increase in import penetration above the median and zero otherwise. Comparing IT use between these two groups, as Figure A5 shows in the period 2008-2012, firms that faced more competition from China experienced a higher increase in IT use. Therefore, these basic descriptive data are consistent

with the hypothesis that higher competition generate incentives for increases in IT use.

## 4 Results

### 4.1 IT use and Chinese competition

Following what we observed in section 3.3 and in order to further analyse the correlation between IT use and Chinese competition, we estimate a regression of IT use over Chinese competition:

$$IT_{i,j,t} = \beta_0 + \beta_1 Compet_{j,t} + \gamma x_{i,t} + \alpha_i + u_{it} \quad (4)$$

Where  $IT_{i,j,t}$  measures the IT use of firm  $i$ , from sector  $j$ , at time  $t$ ,  $Compet_{j,t}$  measures import competition from China in sector  $j$ , at time  $t$  and  $x_{i,t}$  is a vector of firm covariates that we use as control such as age, firm's size and share of skills. Finally, we also include  $\alpha_i$  firm fixed effects

As Table B2 shows, there is indeed a strong correlation between IT use and Chinese competition as the coefficients for our main two IT-use variables (computers-per-worker and share of labour with Internet) are positive and statistically significant at the 1% level in most of the specifications.

### 4.2 IT use and productivity

First of all we estimate the relation between IT use and productivity using OLS in order to assess the conditional correlation existing between these two variables, without any further consideration regarding endogeneity or the heterogeneous effect for firms facing different level of external competition from China . As Table B3 shows, for all IT use variables we observe that there appears to be a positive and significant correlation between IT use and productivity measured by sales-per-worker. These results are indeed consistent with what previous studies have found for developed countries.

As mentioned before, IT use is likely to be endogenous because of unobservable characteristics that are both positively correlated with IT use and firm performance. Therefore, we adopt the strategy discussed in Section 2.2 to instrument our IT use variable and these results are shown in Table B4. Overidentification tests as well as the F-test, evaluating the strength of our IV, do not indicate invalidate our instruments (See Table B5 for the first-stage results). As the table shows, results are consistent, in terms of their signs and significance, with the OLS coefficients but higher in terms of their magnitude (and obviously less precisely

estimated) which is likely to be the consequence of treatment effect heterogeneity (Imbens and Angrist, 1994) or of measurement error in our IT use variable.

### 4.3 IT use, Chinese competition and productivity

Previously, we presented some descriptive evidence that firms in sectors that experienced stronger competitive pressures from surging Chinese import penetration tend to be more likely to adopt IT. Further, in this Section, in order to assess whether competition is crucial in determining the returns to IT upgrading we use the same indicator variable previously described separating sectors characterized by high Chinese import penetration vs low Chinese import penetration (below median),<sup>8</sup> and estimate a split OLS regression analogous to the one presented in B3. As tables B6 and B7 show, for firms that face low competition from China, the effects of IT use on productivity are not statistically significant. On the other hand, when we focus on those firms from sectors that face higher competition from China, we notice that the correlation between IT and productivity is positive and statistically significant at the 1% level in all our specifications. That is, these results suggest that the correlation between IT use and productivity appears to be entirely driven by those sectors that experienced a stronger increase in Chinese competition.

As done previously, we then re-estimate our model instrument the potentially endogenous variable, IT use, and present the results of these IV regressions for firms in sectors characterized by low Chinese competition in Table B8 and for firms in sectors characterized by high Chinese competition in Table B9. These results from our IV regressions confirm the previous OLS results, there is no impact of IT upgrade on productivity for firms facing low competition, on the opposite firms that face high competition from China show substantial impact of IT adoption on productivity. As before, we see that the IV results, while consistent in terms of sign and significance to the OLS ones, show effects that are larger in magnitude.

Finally, we estimate a specification that uses the competition variable (share of Chinese imports over total Mexican imports) interacted with the IT use variables appropriately instrumented as before. The results of these estimates are shown in Table B10. It is important to note here that in the case of the share of labour with computers it is not possible to reject the hypothesis of weak instruments so the results for this variable should be interpreted with caution. As the table shows, once we include this interaction the IT use variables (computers-per-worker and the share of labour with Internet) are no longer statistically significant except when interacted with the Chinese import penetration ratio. This confirms that the effect of IT on sales-per-worker fully depends on the level of Chinese competition and where competition is low there is no effect of IT adoption on productivity. Evaluating for example the effect of increasing the share

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<sup>8</sup>A sector is classified as facing high competition with China if the change in the share of China on Mexico's total imports between 2008 and 2013 is above the median.

of computers-per-worker for those firms facing an average level of import competition from China suggests that an increase in 10 percentage points lead to an increase of about 8% in the firms' sales per worker.<sup>9</sup> However, if we evaluate these results for firms facing the maximum level of Chinese competition, the same change in IT use yields an increase in firms sales per worker of 35 percent.

Finally, it is important to note that the coefficient associated to China's competition has a negative sign in some specifications for all of our IT use proxies, indicating that in order to observe positive effects of Chinese competition over productivity, firms need to surpass a certain level of IT use, or in other words for certain firms with typically low IT use the effect of competition on productivity can be negative, which consistent with the previous work of Iacovone et al. (2013) on the effects of Chinese competition on Mexican firms.

## 4.4 Robustness tests

Before moving forward into a discussion of the mechanisms that could explain our results we focus first on establishing their robustness. With this objective we perform a number of robustness checks described in this Section.

First, we estimate all our equations using pooled regressions instead of fixed effects to test the sensitivity of our results to unobserved heterogeneity. Even though coefficients from the pooled regressions are slightly higher than our previous results, their sign and statistical significance do not change.<sup>10</sup>

Second, as additional robustness test, we use as measure of competition instead of the Chinese import penetration ratio in Mexico the same ratio for the U.S. The rationale behind this is that Mexican firms may not be facing pressure from Chinese competition in their domestic market but in the U.S. market. We show the results in Table B11, only focusing on our instrumental variable estimates, and while the coefficients are smaller than in our original results their signs and significance is the same as the original ones presented in Table B10.

### 4.4.1 Alternative Instrumental Variables

In order to further analyse the robustness of our results, we considered a set of alternative instrumental variables.

First, we construct our instruments for IT use at the firm level as explained in equation 2 relying on

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<sup>9</sup>This effect is under specification (2)

<sup>10</sup>Results are not shown here but are available upon request.

an interaction of IT sectoral intensities with state-level IT use among households, but our measure of sectoral IT intensity is built from the 1999 Mexico’s Economic Census instead than from U.S. data. Specifically, we calculate the share of investment in computer equipment over total investment in fixed assets as well as the share of this kind of equipment on total fixed assets. Along the same line, we rely on alternative measures of state-level IT use among households by calculating the indicator for even more urban locations by using an higher thresholds of inhabitants.

The results using these alternative proxies to build our instruments do not change much, although in some cases it is not possible to reject the hypothesis of weak identification.

Second, we construct an alternative instrumental variable that exploits the geographical difficulties associated with the roll out of internet across the Mexican territory. The use of this instrument builds on similar approaches used by Duflo and Pande (2007), who take advantage of the fact that geographical characteristics, i.e. the river’s gradients, is an important factor for dams’ placement and rely on within state variation of different rivers’ gradients as an instrument for placement of large dams to assess their impact on productivity and their distributional implications. A similar approach, was also more recently by Manacorda and Tesei (2016) who use the incidence of lightning strikes in some areas of Africa as an instrument for mobile technology adoption considering that the strikes increase the probability of infrastructure damage and negatively affects connectivity.

According to the Federal Institute of Telecommunications (IFETEL), in Mexico the main technology used to provide broadband is DSL cable, followed by Modem cable, optical fiber and microwave connections with still a very small share of satellite connections. Among them, the only one that appears not to be constrained by terrain elevations is satellite as, for example, in the case of DSL and Modem cable the connections in mountainous regions require a significantly higher amount of cable and is more expensive to roll out. Similarly, microwave connections need to be set at a certain distance and require having a “visual line of sight”, which does not allow to set them at each side of a hill or mountain and thus, their cost increase in regions with steeper slopes, mountains and valleys. Relying on this knowledge, and on detailed elevation data obtained from raster pictures of the country (GIS data), as shown in Figure A6.<sup>11</sup> After translating these images into polygons, we calculated state-level<sup>12</sup> measures of average altitude and of “ruggedness”, where the latter is proxied by a measure of altitude heterogeneity such as the the state level coefficient of variation. By construction, these new instruments are time invariant, which forces us to re-write our

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<sup>11</sup>Although in recent years highway constructions have established infrastructure in order to increase the supply of optical fiber, the use of this technology is still very low in Mexico, which makes the highways networks a not very good instrument.

<sup>12</sup>A preferable approach would have been to use the exact location of the firm or at least the municipality in order to correctly capture the difficulties associated to connecting these firms, unfortunately because of confidentiality reason INEGI only granted us access to information about the state where the firms are located.

estimating equation in first-difference. Accordingly, the first stage is defined as follows:

$$\Delta IT_{i,j,s} = \beta_0 + \phi_1 ITint_j * Average\ elevation_s + \phi_2 ITint_j * CV(municipality\ elevation)_s + \beta_1 x_i + v_i \quad (5)$$

Where  $\Delta IT_{i,j,s}$  is the change in IT use of firm  $i$  from sector  $j$  in state  $s$  between  $t_0$  and  $t_1$ ,  $ITint_j$  is IT intensity of sector  $j$  in the U.S. (similar to the one used before),  $Average\ elevation_s$  is the average elevation of state  $s$ , and  $CV(municipality\ elevation)_s$  is the coefficient of variation of the elevation among different municipalities within state  $s$ .

Our new results are presented in Table B14, which is equivalent to Table B4, and we confirm that this alternative instrumental variable lead to estimates that, while slightly smaller in their magnitude, are consistent with the previous results in terms of signs and significance. Similarly, when we estimate the equation that includes the interaction term with Chinese competition, the results shown in Table B15 are again robust to the previous ones, especially when focusing on our preferred measure of IT, computers-per-worker, while for some of the other specifications we cannot reject the hypothesis of weak instruments.

#### 4.4.2 The role of initial endowment IT increases and returns to IT use

The results presented so far indicate that IT adoption only leads to improved firm performance when firms face also intense competition. However, these results could be equally driven from an increase in the IT use as well as from an improved use of the initial firm IT stock. In order to assess this question, first of all we estimate the following equation:

$$\begin{aligned} \log(sales/worker)_{i,t} = & \beta_0 + \beta_1 IT_{i,t} + \beta_2 Compet_{j,t} + \beta_3 Compet_{j,t} * IT_{i,t} \\ & + \beta_4 InitialIT_i * Compet_{j,t} + \gamma x_{i,t} + \alpha_i + u_{i,t} \end{aligned} \quad (6)$$

Where  $\log(sales/worker)_{i,t}$  is as before the logarithm of sales-per-worker for firm  $i$  at time  $t$ ,  $IT_{i,t}$  is our measure of IT use of firm  $i$  at time  $t$ ,  $Compet_{j,t}$  is our measure of competition from China in sector  $j$ , at time  $t$ ,  $InitialIT_i$  is a measure of IT use of firm  $i$  in initial year 2008, and as before  $x_{i,t}$  is the usual vector of firm covariates while  $\alpha_i$  are the firm fixed effects. It is important to notice that, in this equation, the effect of initial IT can only be identified when interacted with the time-varying measure of competition, otherwise it is absorbed by the firm fixed effects.

The results from estimating this equation using instrumental variables are shown in Table B12 and

indicate that the coefficients of the interaction between competition and IT use are positive as in previous specifications and now much higher, but can be partially offset by the negative coefficient of the interaction between the level of initial IT and the measure of competition. In other words, these results confirm that the positive effect of IT on firm performance is indeed driven by the simultaneous increase in the IT adoption and the facing of higher competitive pressures, and not by an improved use of initial stock of IT.

Digging deeper in these results, in order to understand if the impact of the interaction between competition and IT adoption is heterogeneous across firms that had initially different IT stock, we also estimate equation 7 which includes also a triple interaction between initial IT stock, competition and IT adoption, as well as each pair interaction term, as shown below.

$$\begin{aligned} \log(\text{sales/worker})_{i,t} = & \beta_0 + \beta_1 IT_{i,t} + \beta_2 Compet_{j,t} + \beta_3 Compet_{j,t} * IT_{i,t} \\ & + \beta_4 InitialIT_i * Compet_{j,t} + \beta_5 IT_{i,t} * InitialIT_i + \beta_6 IT_{i,t} * InitialIT_i * Compet_{j,t} + \gamma x_{i,t} + \alpha_i + u_{i,t} \end{aligned} \quad (7)$$

The results, only for our main IT measure, i.e. computers-per-worker, are shown in Table B13, confirm that the positive impact of IT on performance is stronger for firms facing higher competition. Furthermore, the triple interaction has a negative sign, suggesting some degree of decreasing returns as this positive effect of the interaction of competition with IT adoption is lower for firms with initial higher stock of IT. The magnitude of the impact of a change of 10 percentage points in IT adoption for firms facing an average level of Chinese competition and with an average level initial IT stock is equal to a 7% increase in sales-per-worker. Instead, the same change in IT adoption for firms having the same initial level of IT stock but facing the maximum level of Chinese competition leads to a 44% change in sales per workers. Again, this confirms the crucial role of competition in determining the impact of IT adoption on firm performance.

## 4.5 Mechanisms behind the relation between IT, competition and performance

As previously discussed, IT alone is unlikely to increase productivity as it is crucial that firms incorporate productively these technologies into their organization. This typically requires costly reorganisation and changes in processes which can be considered as crucial complementary investments. Our results so far suggest that competition may provide the right incentives to pursue these types of organizational changes and innovation but it is crucial to provide more evidence on these mechanisms. With this objective in mind, in this section we focus on a set of variables included in the ENTIC 2013, which are directly related to organisational, product and processes innovation.

Specifically, we build two index, one for product and process innovations, and another one for

marketing and organizational innovations. The first one includes cost reductions, reduction of training costs, time-saving, labour productivity increases, access to knowledge sources, exchange of ideas, plant and production scaling, improvements in industrial design of products and processes. The organisation and marketing innovation score includes access to new markets, better communication within the firm, increasing logistics efficiency, implementation of automatised systems, improving communication with clients, a higher diversity in products delivery and more personalised products or services orders.

As Figure A7 shows, even though the average innovation score is relatively low for firms included in our sample (the score has a range of 0-10), only for firms that face high competition we see that high IT adoption positively correlates with high innovation scores. Instead, for firms facing low competition, there is either no statistically significant correlation between high IT use and high innovation scores or even worse we find a negative correlation between IT adoption and innovation scores (i.e. for marketing and organisation innovation scores). Finally, we see that the firms that present highest innovation scores are those that both invest above the average in IT adoption and also face high competitive pressures from China.

In order to formally test these results, we estimate an equation to explain the probability of innovating as a function of the change in IT use, competition and the interaction of both. We use the change in these variables between 2008 and 2012 because the Innovation Module of ENTIC was included only in the 2013 wave. The equation estimated is as follows:

$$Pr(Innovation|x_i, \Delta IT_i, \Delta Compet_j) = \beta_0 + \beta_1 \Delta IT_i + \beta_2 \Delta Compet_j + \beta_3 \Delta Compet_j * \Delta IT_i + \gamma x_i + u_i \quad (8)$$

As Table B16 shows, the impact of IT adoption (i.e. change in IT use) on the probability of a positive innovation score depends, as before, on the degree of competition faced by the firms. In other words, these results indicate that only when firms face high competitive pressures from China the adoption of IT is positively correlated with innovation processes. Similar results are obtained when we estimate a split regression of innovation scores on IT use appropriately instrumented as before for firms that show lower competition with China and firms that face higher competition pressures (Table B17). Once again for firms that do not compete with China, IT use is not associated with a higher innovation score as coefficients are not significant. The contrary is observed for firms that face higher competition pressures as a 10 percentage point increase in computers-per-worker is associated to an increase in the products and processes innovation score of almost 1 point and to an improvement of 0.6 points in the marketing and organisation scores.

## 5 Conclusion

IT use and technology adoption have been long identified as key factors capable of increasing firm-level productivity (Syverson, 2011). Even though there is a great deal of evidence for developed countries regarding this relation, it is not clear whether these predictions hold for developing countries.

In this paper we analysed the relation between IT adoption and firm performance for the case of Mexico, relying on a novel firm-level panel dataset covering the period 2008-2012. The results indicate that on average IT use positively affects productivity, and are results to the use of alternative instrumental variables. However, when we dig deeper we find that only firms that face higher competition pressure exhibit a positive impact of IT adoption on productivity. We argue that the external competitive pressures determine the right incentives for firms to make the best (productive) use of the newly deployed IT capital and complement this technology upgrade with complementary changes within the firm. To confirm this hypothesis, we focus on measures of products, process and organizational innovation and showed that only when firms face high competitive pressures IT adoption is indeed associated to these innovation measures. We interpret these results as as evidence that firms when facing higher competitive pressures have incentive to make more effective use of IT as well as to make crucial complementary investments in innovation and organizational changes leading to higher returns from the IT investments.

These findings have important implications for policy makers in developing countries trying to foster IT adoption at the firm-level in the hope of catching up and increasing the performance of their economies. Our results suggest that just subsidizing IT adoption may not lead to the desired productivity gains unless firms face the appropriate incentives that competition provides, because without the incentives provided by competition firms are unlikely to make an effective use of their brand new IT capital and invest in the necessary complementary changes that increase the returns of these technologies (i.e. organisational changes, innovation).

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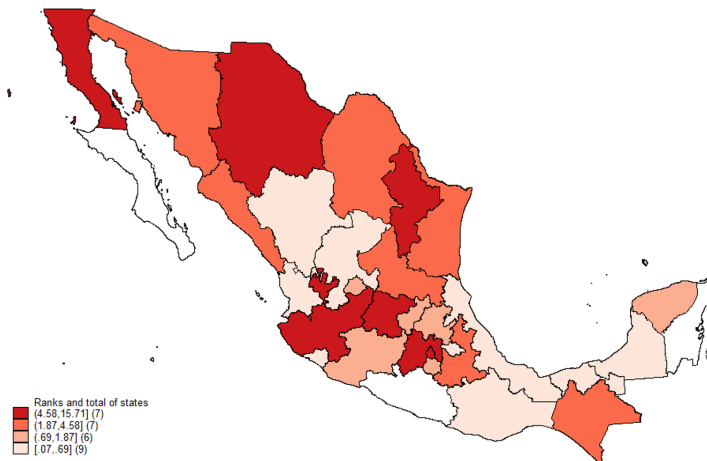
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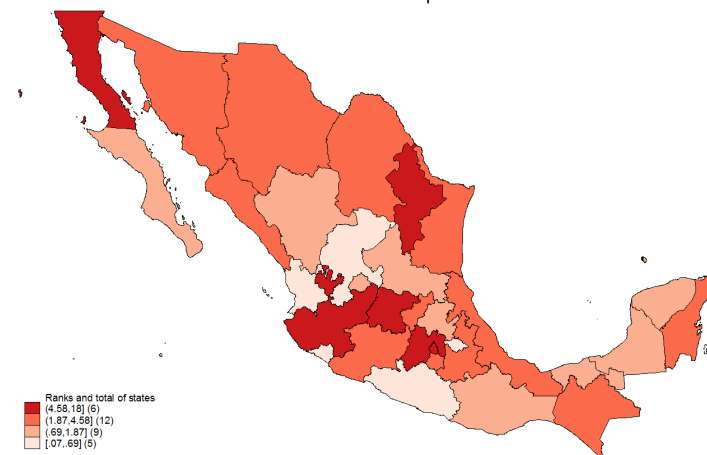
# Appendix A Figures

Figure A1: Firms in the sample at the state level

(a) *Location of firms in the sample*



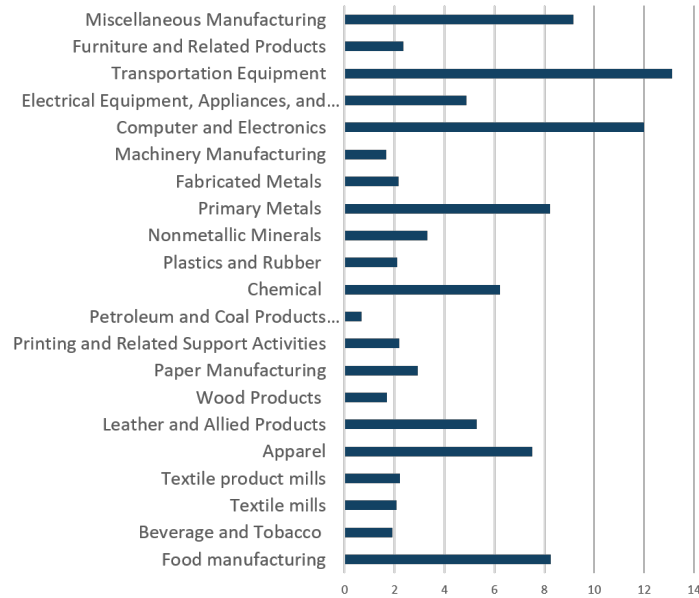
(b) *Location of firms in the whole ENTIC*



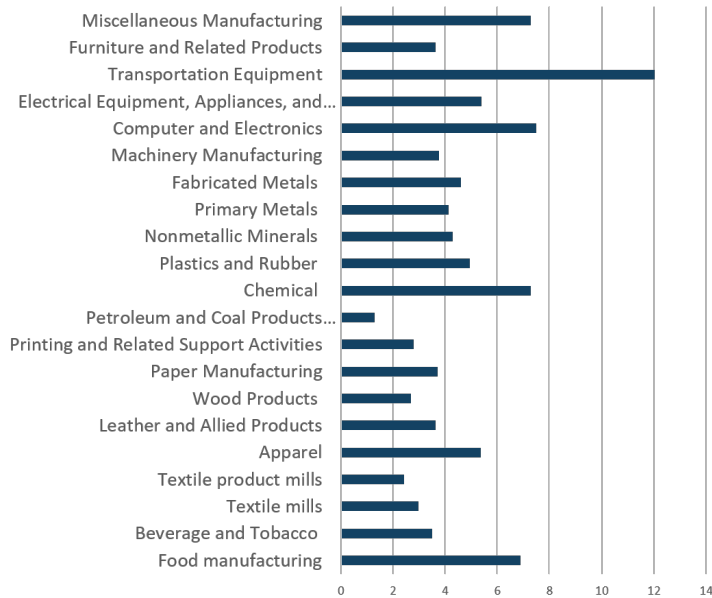
Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI.

Figure A2: Firms in the sample at the sectoral level

(a) % of firms by sector in the sample

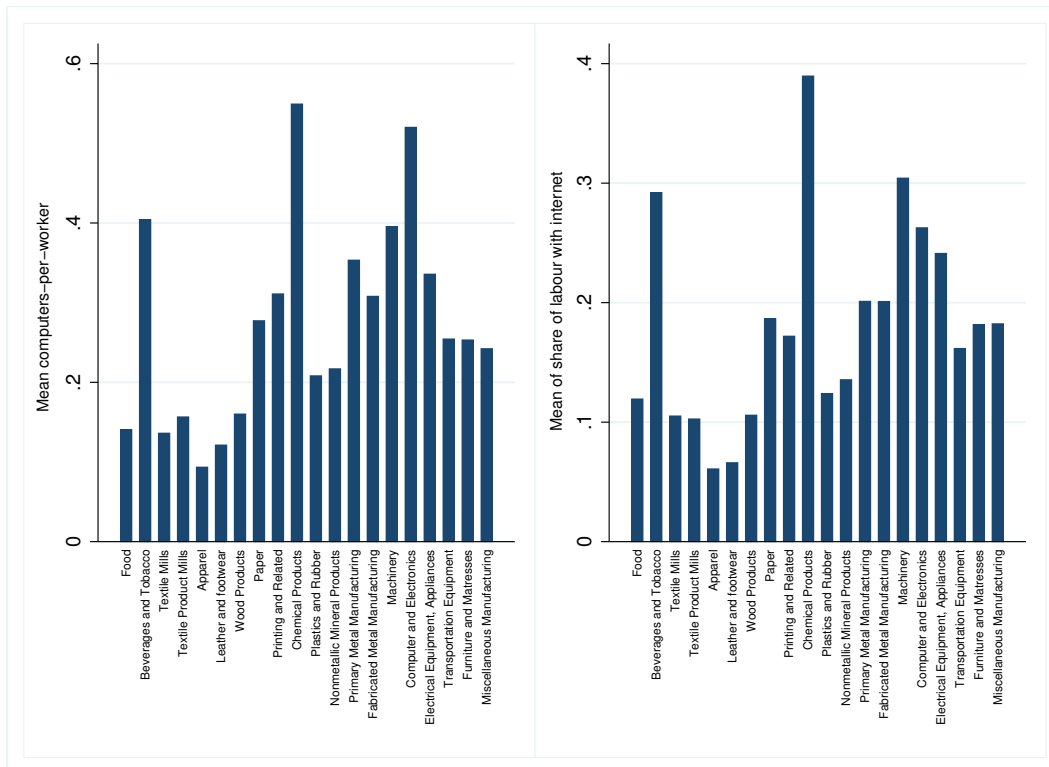


(b) % of firms by sector in the whole ENTIC



Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI.

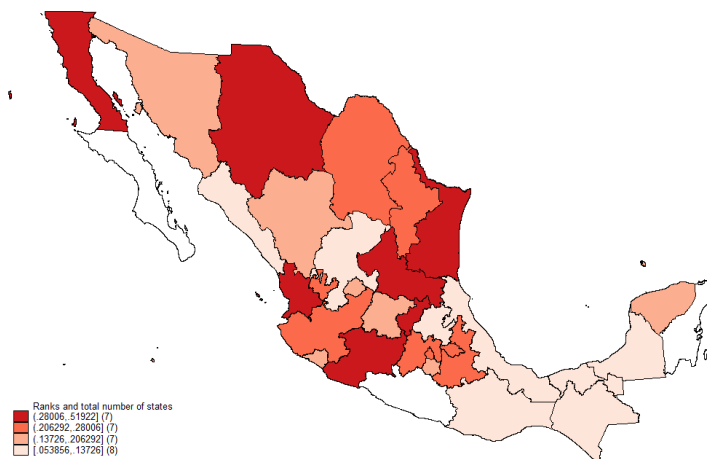
Figure A3: Mean IT use by sector



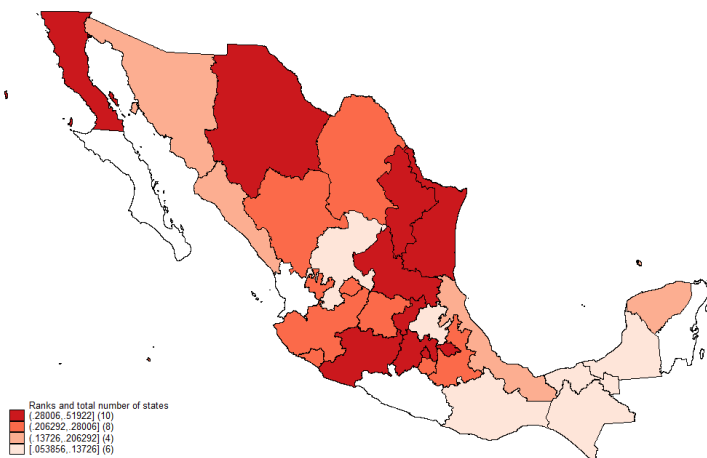
Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Figure A4: Mean computers-per-worker by state

(a) Mean computers-per-worker, 2008

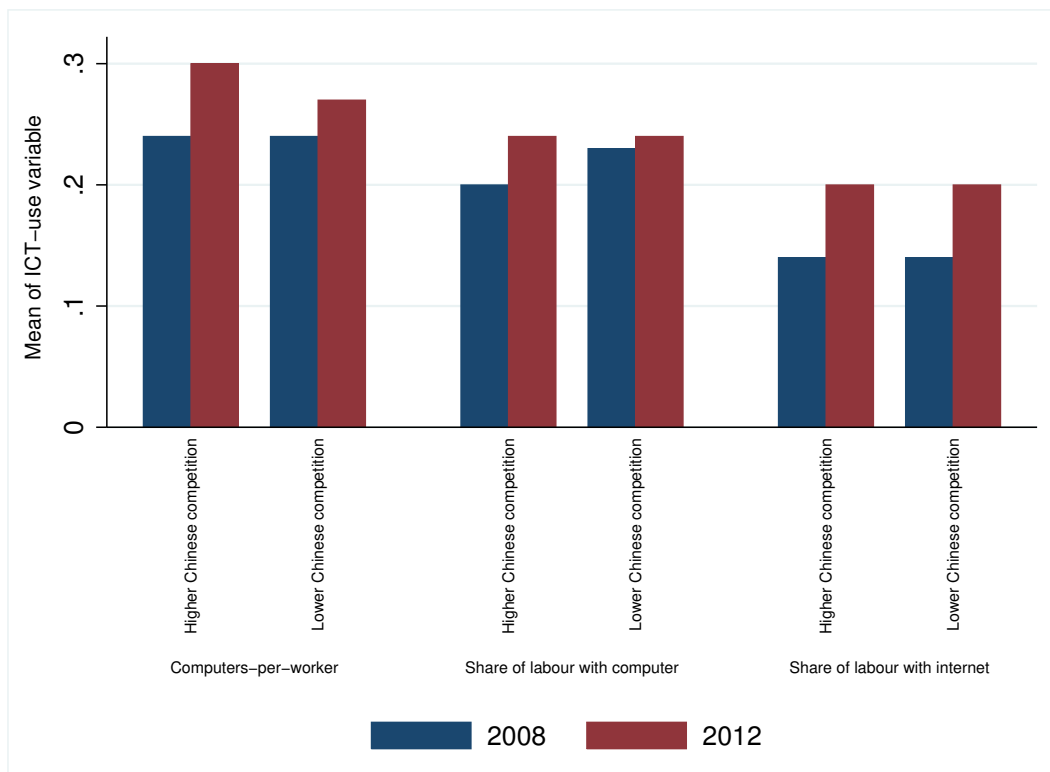


(b) Mean computers-per-worker, 2012



Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI.

Figure A5: IT use by Chinese competition level 2008-2012



<sup>1</sup> Higher competition is defined as a sector that has a change in the share of Chinese imports over Mexico's total imports above the median.

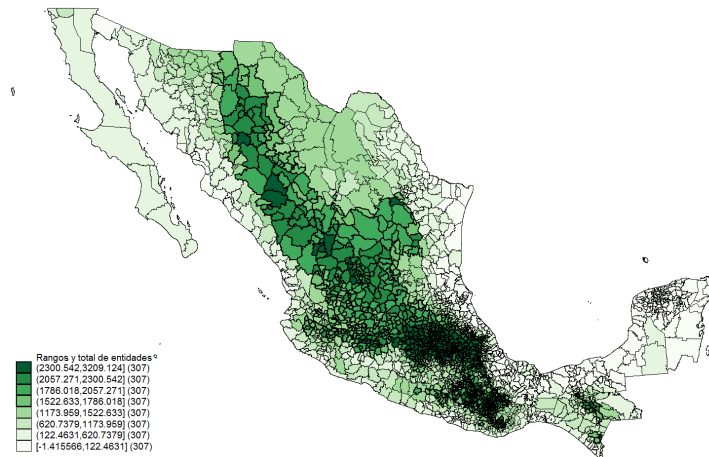
Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Figure A6: Mexico's elevations

(a) *Raster picture of Mexico's elevations*



(b) *Elevations translated into polygons (municipalities)*

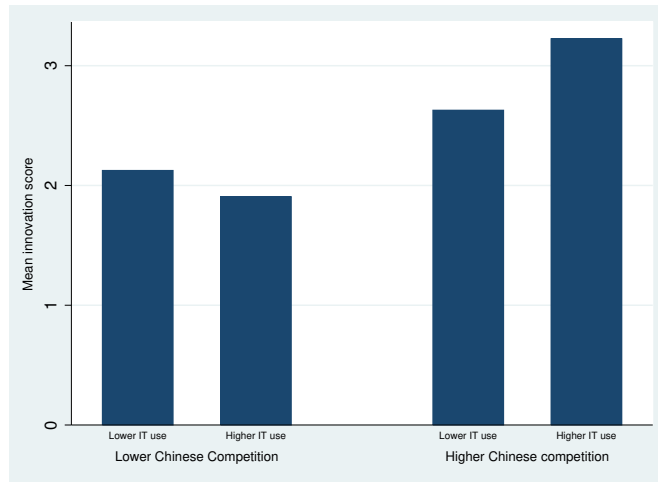


*Source:* Authors' calculations with Geographical data from INEGI.

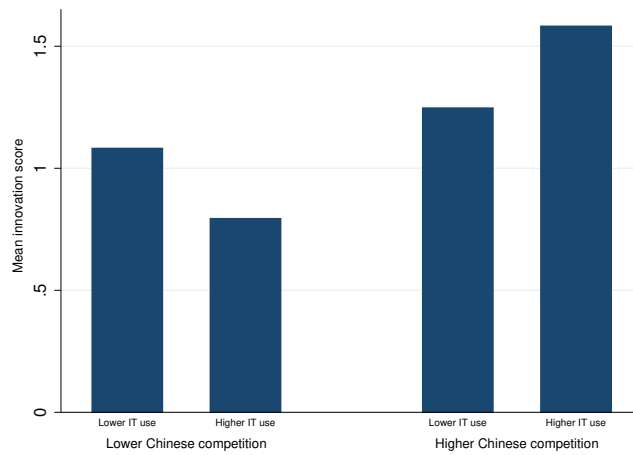
*Note:* We used ArcMap in order to translate elevations into averages for municipalities.

Figure A7: Innovation score by IT use and Chinese competition levels

(a) *Mean Products and Processes Innovation Score*



(b) *Mean Marketing and organisation Innovation Score*



Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI. The innovation scores range from 0-10. Note: Results are only shown for our main IT use variable (computers-per-worker) but for our other proxies are available upon request.

## Appendix B Tables

Table B1: Descriptive Statistics IT use, control and outcome variables

Variable	Sample						Whole					
	Mean	p50	sd	p10	p90	N	Mean	p50	sd	p10	p90	N
<b>2008</b>												
Computers-per-worker	0.24	0.19	0.22	0.06	0.50	701	0.34	0.23	0.34	0.05	0.80	4612
Share of labour with Internet	0.14	0.11	0.15	0.03	0.28	701	0.23	0.14	0.25	0.02	0.62	4658
Share of labour with computer	0.21	0.17	0.19	0.05	0.43	701	0.30	0.20	0.28	0.04	0.81	4658
Sales-per-worker	1,011.66	440.079	1,656.63	125.06	2,219.48	701	954.20	483.87	1,385.23	100.30	2,293.84	4566
Share of white-collar workers	0.22	0.19	0.18	0.05	0.44	701	0.32	0.22	0.29	0.06	0.90	4658
Exports/total sales	0.41	0.16	0.44	0.00	1.00	701	0.19	0.00	0.35	0.00	1.00	4637
Share of FDI	46.18	1.00	48.59	0.00	100.00	701	20.14	0.00	39.15	0.00	100.00	4658
<b>2012</b>												
Computers-per-worker	0.29	0.23	0.23	0.07	0.57	701	0.39	0.28	0.36	0.06	0.95	6148
Share of labour with Internet	0.20	0.15	0.19	0.04	0.41	701	0.30	0.19	0.29	0.03	0.83	6210
Share of labour with computer	0.25	0.18	0.22	0.06	0.50	701	0.34	0.23	0.30	0.04	0.93	6210
Sales-per-worker	1,011.33	476.7	1,409.18	141.42	2,486.06	701	1,018.02	446.88	1,608.47	66.00	2,471.17	6148
Share of white-collar workers	0.26	0.19	0.23	0.06	0.59	701	0.37	0.24	0.33	0.06	1.00	6210
Exports/total sales	0.39	0.15	0.43	0.00	1.00	701	0.16	0.00	0.33	0.00	0.93	6132
Share of FDI	44.17	0.00	48.90	0.00	100.00	701	17.16	0.00	36.74	0.00	100.00	6210

*Source:* Authors' calculations with data from ENTIC 2009 and 2013, INEGI

*Note:* The unit of sales-per-worker is thousand Mexican pesos of 2008.

Table B2: OLS estimates of IT use vs. Chinese competition

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Computers-per-worker						
Chinese competition	0.315*** (0.114)	0.260** (0.129)	0.278** (0.111)	0.268** (0.104)	0.263*** (0.099)	0.217* (0.114)
$R^2$	0.77	0.77	0.81	0.81	0.82	0.82
Dependent variable: Share of labour with Internet						
Chinese competition	0.340*** (0.101)	0.274** (0.113)	0.303*** (0.104)	0.274*** (0.091)	0.267*** (0.088)	0.148 (0.108)
$R^2$	0.71	0.71	0.75	0.76	0.76	0.77
Dependent variable: Share of labour with computer						
Chinese competition	0.222** (0.103)	0.195 (0.124)	0.232* (0.122)	0.196* (0.110)	0.193* (0.103)	0.183 (0.125)
$R^2$	0.73	0.73	0.76	0.77	0.77	0.77
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B3: OLS estimates of the effect of IT use on firm-level productivity

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable log(sales/worker)						
Computers-per-worker	0.898*** (0.228)	0.845*** (0.256)	0.977*** (0.222)	0.911*** (0.215)	0.858*** (0.212)	0.843*** (0.218)
$R^2$	0.848	0.849	0.852	0.856	0.858	0.858
Share of labour with Internet	0.786*** (0.255)	0.753*** (0.275)	0.814** (0.353)	0.685* (0.354)	0.650* (0.333)	0.624* (0.338)
$R^2$	0.846	0.847	0.850	0.853	0.856	0.856
Share of labour with computer	0.857*** (0.193)	0.805*** (0.195)	0.883*** (0.270)	0.776*** (0.276)	0.721*** (0.251)	0.710*** (0.249)
$R^2$	0.848	0.848	0.848	0.855	0.857	0.857
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B4: IV estimates of the effect of IT use on firm-level productivity

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable log(sales/worker)						
Computers-per-worker	2.017*** (0.656)	1.834** (0.744)	2.175** (0.889)	2.036** (0.881)	1.968** (0.895)	1.999* (1.080)
Share of labour with Internet	1.579*** (0.598)	1.755** (0.752)	1.985** (0.840)	2.047** (0.842)	2.091** (0.848)	2.610** (1.241)
Share of labour with computer	2.952*** (0.800)	2.748*** (0.860)	2.783*** (0.937)	2.444** (1.067)	2.358** (1.092)	2.150* (1.154)
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B5: First stage regressions from Table B4

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Computers-per-worker						
IV1	0.090*** (0.019)	0.111*** (0.023)	0.095*** (0.021)	0.099*** (0.021)	0.102*** (0.021)	0.102*** (0.024)
IV2	8.357*** (2.076)	7.867*** (2.118)	6.433*** (1.945)	5.877*** (1.956)	5.037** (1.958)	5.001** (2.106)
First stage F-value	26.3	20.5	17.2	17.1	17.1	11.4
Underid p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sargan p-value	0.107	0.106	0.171	0.323	0.365	0.359
Dependent variable: Share of labour with Internet						
IV3	0.413*** (0.059)	0.418*** (0.069)	0.377*** (0.065)	0.391*** (0.064)	0.380*** (0.064)	0.314*** (0.069)
IV4	0.663*** (0.207)	0.640*** (0.213)	0.566*** (0.199)	0.489** (0.198)	0.518*** (0.198)	0.369* (0.207)
First stage F-value	41.8	26.7	24.3	24.7	24.7	12.1
Underid p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sargan p-value	0.84	0.92	0.94	0.87	0.77	0.68
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

1 The hypothesis of weak instruments cannot be rejected for specification (6)

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B5 Continued: First stage regressions from Table B4

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Share of labour with computer						
IV1	0.113*** (0.022)	0.120*** (0.023)	0.103*** (0.022)	0.093*** (0.022)	0.085*** (0.022)	0.090*** (0.024)
IV5	0.126*** (0.031)	0.137*** (0.036)	0.136*** (0.034)	0.115*** (0.034)	0.120*** (0.034)	0.127*** (0.037)
First stage F-value	20.3	17.2	15.8	11.7	11.7	9.7
Underid p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Sargan p-value	0.88	0.93	0.62	0.63	0.69	0.69
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

IV1: IT intensity dummy based on name from (Bloom et al., 2012b) and Share of urban households with computers (2000 and 2010 Population and Housing Censuses)

IV2: IT intensity based on investment from (O'Mahony and Van Ark, 2003) and Share of households with Internet (MODUTIH)

IV3: IT intensity dummy based on name from (Bloom et al., 2012b) and Share of households with Internet (MODUTIH)

IV4: IT intensity based on investment from (O'Mahony and Van Ark, 2003) and Share of urban households with computers (2000 and 2010 Population and Housing Censuses)

IV5: IT intensity dummy based on name from (Bloom et al., 2012b) and Share of urban households with Internet (2000 and 2010 Population and Housing Censuses)

Table B6: Split OLS regression of the effects of IT use on firm-level productivity: Low competition with China

Dependent variable log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Computers-per-worker	0.308 (0.334)	0.337 (0.317)	0.400 (0.355)	0.352 (0.400)	0.372 (0.387)	0.366 (0.387)
$R^2$	0.876	0.876	0.876	0.877	0.879	0.879
Share of labour with Internet	0.209 (0.516)	0.260 (0.527)	0.315 (0.551)	0.225 (0.575)	0.297 (0.549)	0.268 (0.605)
$R^2$	0.876	0.876	0.876	0.877	0.879	0.879
Share of labour with computer	0.317 (0.346)	0.385 (0.345)	0.442 (0.331)	0.393 (0.330)	0.443 (0.316)	0.437 (0.319)
$R^2$	0.876	0.877	0.877	0.878	0.880	0.880
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	672	672	672	672	672	672

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B7: Split OLS regression of the effects of IT use on firm-level productivity: High competition with China

Dependent variable log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Computers-per-worker	1.168*** (0.285)	1.079*** (0.319)	1.353*** (0.286)	1.282*** (0.201)	1.220*** (0.164)	1.219*** (0.170)
$R^2$	0.810	0.814	0.822	0.830	0.834	0.834
Share of labour with Internet	1.107*** (0.255)	1.110*** (0.249)	1.260*** (0.476)	1.102** (0.449)	1.014*** (0.372)	0.999*** (0.381)
$R^2$	0.804	0.811	0.817	0.824	0.828	0.828
Share of labour with computer	1.234*** (0.211)	1.155*** (0.211)	1.319*** (0.423)	1.156*** (0.407)	1.038*** (0.332)	1.023*** (0.333)
$R^2$	0.809	0.814	0.821	0.826	0.830	0.830
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	730	730	730	730	730	730

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B8: Split IV regression of the effects of IT use on firm-level productivity: Low competition with China

Dependent variable: log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Computers-per-worker	0.995 (1.356)	1.613 (1.681)	1.639 (1.731)	1.454 (1.818)	1.642 (1.844)	1.391 (1.772)
F-first stage	8.5	5.7	6.1	5.5	5.5	5.7
Sargan p-value	0.90	0.98	0.72	0.67	0.75	0.90
Share of labour with Internet	1.075 (1.262)	0.954 (1.245)	1.019 (1.328)	1.046 (1.377)	1.327 (1.471)	0.806 (1.781)
F-first stage	11.3	12.0	12.0	11.0	11.0	6.7
Sargan p-value	0.92	0.83	0.66	0.47	0.39	0.29
Share of labour with computer	0.517 (1.472)	0.475 (1.422)	0.353 (1.144)	-0.238 (1.277)	-0.447 (1.281)	-0.391 (1.267)
F-first stage	5.4	6.0	10.3	8.3	8.3	8.6
Sargan p-value	0.71	0.76	0.98	0.93	0.98	0.78
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	672	672	672	672	672	672

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B9: Split IV regression of the effects of IT use on firm-level productivity: High competition with China

Dependent variable: log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Computers-per-worker	2.456*** (0.651)	2.289*** (0.704)	2.372*** (0.731)	2.097*** (0.727)	2.175*** (0.803)	2.692** (1.055)
F-first stage	22.5	19.2	22.7	21.6	21.6	11.03
Sargan p-value	0.14	0.14	0.36	0.59	0.53	0.58
Share of labour with Internet	1.594*** (0.579)	1.784** (0.718)	1.881** (0.780)	1.745** (0.778)	1.819** (0.840)	2.045* (1.070)
F-first stage	40.1	26.0	26.7	26.9	26.9	14.7
Sargan p-value	0.55	0.49	0.24	0.35	0.30	0.25
Share of labour with computer	3.072*** (0.885)	2.849*** (0.911)	3.331*** (1.063)	3.085*** (1.131)	3.338** (1.378)	3.493** (1.538)
F-first stage	14.9	13.6	12.1	10.6	10.6	6.4
Sargan p-value	0.29	0.28	0.78	0.96	0.84	0.87
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	730	730	730	730	730	730

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B10: IV regression IT use on firm-level productivity considering China's competition

Dependent variable: log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Computers-per-worker	0.736 (0.926)	0.672 (0.991)	0.460 (1.043)	0.449 (1.039)	-0.091 (1.106)	-0.423 (1.384)
Chinese competition*IT	8.722** (4.030)	8.448** (4.104)	8.186** (4.086)	7.974* (4.075)	8.095** (4.057)	9.492* (5.397)
Chinese competition	-2.605* (1.578)	-2.591 (1.681)	-2.451 (1.648)	-2.463 (1.635)	-2.334 (1.620)	-3.027 (2.316)
F-first stage IT	9.0	9.7	11.8	11.7	10.1	9.8
F-first stage IT*competition	10.6	12.9	15.2	15.1	14.7	9.8
Sargan p-value	0.62	0.60	0.84	0.93	0.93	0.91
Share of labour with internet	-1.657* (0.967)	-1.814 (1.121)	-1.302 (1.232)	-0.902 (1.158)	-0.922 (1.146)	-1.453 (1.914)
Chinese competition*IT	18.483*** (6.543)	18.647*** (6.520)	17.006*** (6.428)	15.374** (6.286)	14.151** (6.179)	15.598* (9.011)
Chinese competition	-2.966* (1.529)	-3.153** (1.566)	-2.915* (1.538)	-2.658* (1.486)	-2.292 (1.465)	-2.793 (2.277)
F-first stage IT	15.2	13.5	12.5	14.0	13.1	10.2
F-first stage IT*competition	8.7	10.6	11.3	11.6	11.0	11.3
Sargan p-value	0.62	0.60	0.84	0.93	0.93	0.91
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B10 Continued: IV regression IT use on firm-level productivity considering China's competition

Dependent variable: log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Share of labour with computer	-0.713 (1.351)	-0.557 (1.237)	-0.197 (1.458)	-0.417 (1.503)	-0.784 (1.568)	-1.186 (1.819)
Chinese competition*IT	14.489** (5.719)	13.979*** (5.248)	12.014** (5.282)	11.947** (5.210)	10.963** (5.036)	12.013** (6.001)
Chinese competition	-3.216* (1.642)	-3.179** (1.589)	-2.697* (1.572)	-2.711* (1.544)	-2.275 (1.485)	-2.700 (1.895)
F-first stage IT	6.5	7.9	6.6	6.3	5.2	5.3
F-first stage IT*competition	10.3	12.5	13.4	14.0	13.6	13.3
Sargan p-value	0.62	0.60	0.84	0.93	0.93	0.91
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B11: IV regression IT use on firm-level productivity considering China's competition in the U.S.

Dependent variable: log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Computers-per-worker	0.079 (1.129)	0.389 (1.124)	0.384 (1.045)	0.345 (1.035)	-0.134 (1.076)	-0.447 (1.359)
Competition in U.S.*Computers-per-worker	7.097* (3.738)	5.742* (3.307)	5.731* (3.268)	5.772* (3.213)	6.083* (3.144)	6.864* (3.772)
Competition in U.S.	-1.863 (1.222)	-1.393 (1.161)	-1.326 (1.157)	-1.412 (1.134)	-1.438 (1.111)	-1.843 (1.575)
F-first stage IT	11.1	11.3	12.0	11.9	10.3	9.1
F-first stage IT*competition	9.5	12.9	12.3	12.6	12.3	12.0
Sargan p-value	0.90	0.72	0.58	0.68	0.60	0.64
Share of labour with Internet	-2.391* (1.296)	-2.043* (1.197)	-1.858 (1.270)	-1.678 (1.261)	-1.779 (1.237)	-3.191 (2.266)
Competition in U.S.*Share of labour with Internet	11.271** (5.648)	10.056** (4.625)	9.693** (4.582)	9.422** (4.577)	8.748* (4.514)	12.062* (6.614)
Competition in U.S.	-1.180 (1.045)	-1.075 (0.920)	-1.018 (0.903)	-1.021 (0.871)	-0.826 (0.870)	-1.902 (1.604)
F-first stage IT	18.1	16.1	15.7	17.7	15.9	10.1
F-first stage IT*competition	9.6	11.3	12.7	14.3	12.8	12.7
Sargan p-value	0.91	0.86	0.90	0.98	0.88	0.99
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations using data from ENTIC, INEGI

Table B11 Continued: IV regression IT use on firm-level productivity considering China's competition in the U.S.

Dependent variable: log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Share of labour with computer	-2.481 (2.057)	-1.998 (1.761)	-1.952 (1.782)	-2.311 (1.830)	-2.625 (1.880)	-3.286 (2.463)
Competition in U.S.*Share of labour with computer	10.177** (4.947)	8.824** (4.007)	8.523** (4.333)	8.702** (4.360)	8.327* (4.340)	9.796* (5.545)
Competition in U.S.	-1.646 (1.124)	-1.398 (1.000)	-1.322 (1.083)	-1.432 (1.098)	-1.269 (1.091)	-1.929 (1.653)
F-first stage IT	6.9	7.0	10.9	10.0	8.5	8.1
F-first stage IT*competition	14.9	17.2	23.2	22.1	20.2	20.1
Sargan p-value	0.91	0.98	0.99	0.98	0.95	0.90
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B12: IV regression IT use on firm-level productivity considering China's competition and initial IT

Dependent variable: log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Computers-per-worker	-0.963 (1.584)	-0.603 (1.460)	-0.180 (1.567)	0.256 (1.514)	0.077 (1.508)	-0.368 (1.980)
Competition*Computers-per-worker	14.468*** (5.545)	12.841** (5.473)	11.535** (5.316)	10.810** (5.224)	10.615** (5.175)	12.318* (7.102)
Competition	-0.946 (1.204)	-0.943 (1.168)	-0.581 (1.061)	-0.818 (1.030)	-0.615 (1.012)	-0.880 (1.272)
Initial IT*Competition	-10.888** (4.923)	-9.408** (4.627)	-9.278** (4.536)	-8.312* (4.430)	-8.412* (4.395)	-9.777* (5.884)
F-first stage IT	7.0	9.7	9.1	9.9	10.0	9.9
F-first stage IT*competition	12.5	14.9	16.8	17.8	17.8	16.2
Sargan p-value	0.90	0.72	0.58	0.68	0.60	0.64
Share of labour with Internet	-2.135* (1.174)	-2.296* (1.378)	-1.494 (1.420)	-1.132 (1.321)	-1.051 (1.316)	-2.470 (3.044)
Competition*Share of labour with Internet	22.785*** (6.056)	22.959*** (6.542)	19.460*** (6.169)	17.441*** (5.925)	15.514*** (5.780)	20.178* (11.821)
Competition	-1.742 (1.115)	-1.862 (1.134)	-1.521 (1.029)	-1.359 (0.989)	-1.008 (0.964)	-1.471 (1.352)
Initial IT*Competition	-13.430*** (4.971)	-13.859** (5.663)	-12.133** (5.408)	-10.802** (5.118)	-9.779* (5.054)	-14.529 (10.937)
F-first stage IT	14.5	12.9	11.9	12.7	12.2	9.4
F-first stage IT*competition	13.1	14.0	15.4	15.3	15.3	15.1
Sargan p-value	0.28	0.32	0.40	0.44	0.45	0.30
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B12 Continued: IV regression IT use on firm-level productivity considering China's competition and initial IT

Dependent variable: log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
Share of labour with computer	-2.306 (2.678)	-1.565 (2.579)	-1.024 (2.794)	-1.743 (3.031)	-1.544 (3.035)	-1.769 (2.455)
Competition*Share of labour with computer	20.832* (10.788)	19.805* (10.157)	18.794* (10.294)	20.457* (10.886)	18.549* (10.559)	20.300** (9.063)
Competition	-1.017 (1.182)	-1.436 (1.219)	-1.445 (1.223)	-1.411 (1.200)	-1.146 (1.193)	-1.647 (1.408)
Initial IT*Competition	-15.397* (9.325)	-13.215 (8.860)	-12.697 (8.929)	-14.633 (9.591)	-13.256 (9.441)	-14.190* (7.679)
F-first stage IT	7.5	7.1	5.9	5.9	5.0	5.1
F-first stage IT*competition	12.1	12.1	11.1	11.8	10.6	9.7
Sargan p-value	0.17	0.13	0.15	0.15	0.15	0.17
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B13: IV regression IT use on firm-level productivity considering China's competition and initial IT interactions

Dependent variable: log(sales/worker)	(1)	(2)	(3)	(4)	(5)	(6)
IT (Computers-per-worker)	-1.095 (1.236)	-0.932 (1.381)	-1.248 (1.357)	-1.315 (1.352)	-1.962 (1.413)	-2.075 (1.762)
Competition*IT	16.144*** (5.752)	15.181*** (5.280)	14.396*** (4.968)	14.337*** (4.922)	14.147*** (4.906)	14.050** (5.750)
Competition	-3.216* (1.950)	-3.137* (1.898)	-2.188 (1.657)	-2.343 (1.625)	-1.794 (1.628)	-3.164 (2.287)
Initial IT*Competition	3.181 (7.073)	3.193 (6.828)	-0.296 (6.529)	-0.124 (6.521)	-2.141 (6.653)	4.212 (6.689)
IT*initial IT	1.984 (1.491)	1.869 (1.725)	1.780 (1.650)	1.975 (1.677)	2.176 (1.670)	3.594 (2.295)
IT*initial IT*Competition	-17.030* (8.983)	-16.074* (8.806)	-12.698 (8.026)	-12.553 (7.943)	-10.196 (8.025)	-15.739* (9.096)
F-first stage IT	13.4	14.4	14.2	14.8	13.6	14.7
F-first stage IT*competition	11.0	12.3	13.6	14.2	13.9	13.3
F-first stage IT*initial IT	14.8	13.7	13.8	13.5	13.3	13.1
F-first stage triple interaction	26.0	27.1	26.1	26.2	26.1	26.2
Sargan p-value	0.59	0.47	0.45	0.44	0.61	0.35
Controls						
Age	No	Yes	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes	Yes
Capital/worker	No	No	No	Yes	Yes	Yes
Exports/sales	No	No	No	No	Yes	Yes
FDI share	No	No	No	No	Yes	Yes
Time effects	No	No	No	No	No	Yes
Observations	1402	1402	1402	1402	1402	1402

Robust standard errors in parentheses

\* Significant at the 10% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

All specifications include firm's fixed effects.

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B14: IV estimates of the effect of IT use on firm-level productivity using IVs based on state elevation

	(1)	(2)	(3)	(4)	(5)
Dependent variable $\Delta\log(\text{sales}/\text{worker})$					
$\Delta\text{Computers-per-worker}$	1.348**	1.589*	1.608*	1.617*	1.707**
	(0.564)	(0.847)	(0.864)	(0.836)	(0.855)
F-first stage	11.78	13.60	12.06	12.64	12.46
Sargan p-value	0.76	0.95	0.95	0.99	0.96
$\Delta\text{Share of labour with Internet}$	1.312**	1.787*	1.789*	1.699*	1.859*
	(0.612)	(0.952)	(0.952)	(1.006)	(1.064)
F-first stage	14.94	11.08	13.07	13.43	12.77
Sargan p-value	0.55	0.43	0.39	0.27	0.27
Controls					
Age	No	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes
Capital/worker	No	No	No	Yes	Yes
Exports/sales	No	No	No	No	Yes
FDI share	No	No	No	No	Yes
Observations	701	701	701	701	701

Robust standard errors in parentheses

\* Significant at the 1% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B15: IV estimates of the effect of IT use on firm-level productivity considering China's competition and using IVs based on state elevation

	(1)	(2)	(3)	(4)	(5)
Dependent variable $\Delta\log(\text{sales}/\text{worker})$					
$\Delta\text{Computers-per-worker}$	-0.116 (1.204)	-0.964 (1.362)	-1.155 (1.765)	0.383 (1.750)	0.192 (1.680)
$\Delta\text{Chinese competition}*\Delta\text{IT}$	11.373** (5.297)	13.780** (6.950)	10.766* (6.249)	11.632* (6.555)	10.995* (6.291)
$\Delta\text{Chinese competition}$	-3.416 (2.118)	-4.471 (2.871)	-3.125 (2.471)	-4.025 (2.658)	-3.658 (2.607)
F-first stage IT	22.68	21.39	13.17	13.56	13.98
F-first stage IT*Competition	26.70	18.31	18.18	18.49	19.59
Sargan p-value	0.11	0.22	0.17	0.41	0.49
$\Delta\text{Share of labour with Internet}$	-0.742 (1.183)	-2.362* (1.415)	-1.294 (1.501)	-0.891 (1.404)	-1.112 (1.403)
$\Delta\text{Chinese competition}*\Delta\text{IT}$	10.285** (4.837)	14.437** (5.755)	10.283* (5.466)	9.493* (5.428)	9.280* (5.362)
$\Delta\text{Chinese competition}$	-1.190 (1.050)	-1.900 (1.299)	-1.118 (1.230)	-1.129 (1.219)	-0.978 (1.215)
F-first stage IT	9.77	9.68	7.85	8.72	8.19
F-first stage IT*Competition	16.48	16.45	12.21	12.54	14.35
Sargan p-value	0.10	0.18	0.10	0.10	0.25
Controls					
Age	No	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes
Capital/worker	No	No	No	Yes	Yes
Exports/sales	No	No	No	No	Yes
FDI share	No	No	No	No	Yes
Observations	701	701	701	701	701

Robust standard errors in parentheses

\* Significant at the 1% level, \*\*Significant at the 5% level, \*\*\* Significant at the 1% level

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B16: Linear probability model Innovation on IT use and competition changes

Dependent variable: =1 if had innovation	(1)	(2)	(3)	(4)	(5)
Innovation in product and processes					
$\Delta$ Computers-per-worker	-0.236** (0.102)	-0.238** (0.101)	-0.159 (0.108)	-0.164 (0.106)	-0.167 (0.107)
$\Delta$ Chinese competition	-0.002 (0.175)	0.023 (0.176)	0.053 (0.174)	0.064 (0.174)	0.054 (0.174)
$\Delta$ Computers-per-worker* $\Delta$ Chinese competition	1.185** (0.477)	1.197** (0.470)	1.098** (0.482)	1.107** (0.478)	1.114** (0.477)
Innovation in marketing and organisation					
$\Delta$ Computers-per-worker	-0.191* (0.103)	-0.195* (0.102)	-0.106 (0.109)	-0.109 (0.107)	-0.112 (0.108)
$\Delta$ Chinese competition	-0.116 (0.175)	-0.099 (0.176)	-0.067 (0.174)	-0.052 (0.174)	-0.062 (0.174)
$\Delta$ Computers-per-worker* $\Delta$ Chinese competition	1.121** (0.475)	1.144** (0.472)	1.034** (0.484)	1.039** (0.480)	1.046** (0.480)
Controls					
Age	No	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes
Capital/worker	No	No	No	Yes	Yes
Exports/sales	No	No	No	No	Yes
FDI share	No	No	No	No	Yes
Observations	701	701	701	701	701

Robust standard errors in parentheses

\* Significant at the 1% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

*Source:* Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI

Table B17: IV split regression innovation score over IT use

Dependent variable: Innovation score	(1)	(2)	(3)	(4)	(5)
<b>Low competition with China</b>					
Products and processes					
Δ Computers-per-worker	-6.954*	-6.372*	-6.715	-5.958	-6.228
	(4.012)	(3.854)	(4.534)	(4.518)	(4.631)
F-first stage	9.7	10.2	7.1	6.5	6.6
Sargan p-value	0.92	0.72	0.75	0.96	0.95
Marketing and Organisation					
Δ Computers-per-worker	-4.461	-3.678	-2.779	-2.353	-2.328
	(3.069)	(2.925)	(3.375)	(3.404)	(3.474)
F-first stage	9.7	10.3	7.0	6.5	6.6
Sargan p-value	0.56	0.73	0.85	0.72	0.71
Observations	336	336	336	336	336
<b>High competition with China</b>					
Products and processes					
Δ Computers-per-worker	9.295**	9.020**	7.823**	7.846**	8.599**
	(3.870)	(3.841)	(3.445)	(3.524)	(3.779)
F-first stage	13.1	13.1	13.5	13.0	12.0
Sargan p-value	0.64	0.64	0.48	0.48	0.54
Marketing and Organisation					
Δ Computers-per-worker	5.971**	5.882**	5.254**	5.404**	5.824**
	(2.773)	(2.772)	(2.559)	(2.629)	(2.817)
F-first stage	13.1	13.1	13.5	12.9	9.2
Sargan p-value	0.31	0.31	0.23	0.24	0.27
Observations	365	365	365	365	365
Controls					
Age	No	Yes	Yes	Yes	Yes
Firm size	No	No	Yes	Yes	Yes
Share of white-collar workers	No	No	No	Yes	Yes
Capital/worker	No	No	No	Yes	Yes
Exports/sales	No	No	No	No	Yes
FDI share	No	No	No	No	Yes
Time effects	No	No	No	No	No

Robust standard errors in parentheses

\* Significant at the 1% level, \*\* Significant at the 5% level, \*\*\* Significant at the 1% level

Source: Authors' calculations with data from ENTIC 2009 and 2013, INEGI