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Analyzing the Impact of Trade in Services on the U.S. Labor Market: The Response of Service Sector Employment to Exchange Rate Changes[1]

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Revised version submitted
September 24, 2010

[1] This report was produced for the Department of Labor, Bureau of International Labor Affairs (ILAB). I thank Zhi George Yu for research assistance. This research was conducted at the Center for Economic Studies at the U.S. Census Bureau. Any opinions and conclusions expressed herein are those of the author and do not necessarily represent the views of the U.S. Census Bureau, the U.S. Department of Labor, or the U.S. Government. All results have been reviewed to ensure that no confidential information is disclosed.

1. Motivation

The service sector is large and growing. Table 1 shows U.S. employment in 2007. The service sector accounts for about 50 percent of employment. Business services (NAICS sectors 51, 52, 53, 54, 56) account for about 25 percent of employment and personal services (NAICS 61, 62, 71, 72, 81) account for another 25 percent of employment. Business services employment increased almost 30 percent between 1997 and 2007; personal services employment increased over 20 percent over the same period. In contrast, employment in the manufacturing sector decreased by over 20 percent and manufacturing accounted for only 10 percent of U.S. employment in 2007.

U.S. service imports and exports both more than doubled over the past 10 years. Over the period 1992 to 2007, service exports have increased from $177 billion to $497 billion to account for 30 percent of all U.S. exports; service imports have increased from $120 billion to $378 billion to account for 17 percent of all U.S. imports.

The size of the service sector and growing trade in services present the possibility that international trade in services could affect labor market outcomes in the U.S. Yet, very little is known about the impact of trade in services on employment or wages.[2] The objective of this report is to start to address this shortage of empirical evidence and investigate one possible channel – exchange rates – through which international trade in services might influence labor market outcomes.

We are accustomed to thinking of the impact of exchange rates on manufacturing activity. When the dollar appreciates, U.S. produced goods tend to become more expensive (to the extent that the exchange rate change is passed on to foreign customers) and demand from abroad for U.S.-produced goods decreases. The decrease in demand for U.S. goods tends to result in a decrease in employment in the manufacturing sector. Previous research (reviewed later in the report) has documented the impact of exchange

[2] The dearth of empirical research extends beyond examining the relationship between exchange rates and employment growth in the service sector. The focus of most of the empirical work on job creation and destruction has been the manufacturing sector (for example see the seminal work by Davis, Haltiwanger, and Schuh (1998)), though more recent research on gross employment flows has started to include the service sector. See, for example, Davis, Faberman, and Haltiwanger (2006).

rate changes on export shipments and employment in the manufacturing sector and generally finds these relationships hold.

If trade in services is important and if services trade is responsive to exchange rate changes, we would expect that changes in the exchange rate should impact economic activity, and thus labor demand, in the service sector. The intuition for this is analogous to the impact a change in the exchange rate has on the demand for manufactured goods. If the dollar appreciates, U.S. exports become more expensive (if there is significant pass-through of the exchange rate change) and demand for U.S. exports decreases. (Similarly, if the dollar appreciates, imports become relatively less expensive, also causing a decrease in demand for U.S. products.) We can imagine that the mechanism would be similar for tradable services. If the dollar appreciates, U.S. produced software, movies, or trips to visit U.S. resort destinations (e.g. Disney World, Broadway, Rocky Mountain ski resorts) become more expensive relative to other countries products. Foreign (and domestic) purchasers of these products might switch out of purchasing U.S. services and purchase the services elsewhere. Intuitively, exchange rate appreciations (depreciations) serve as a negative (positive) demand shock. Bernard and Jensen (2004) find that the depreciation of the dollar in the late 1980s and early 1990s was an important factor in increasing exports and increasing exports to sales ratios at U.S. manufacturers. While Bernard and Jensen did not examine the impact of exchange rates on plant survival or employment growth, it seems reasonable to expect that a positive demand shock which increases exports would increase employment and improve plant survival rates. An open question is whether the service sector behaves similarly to the manufacturing sector. This paper examines whether exchange rate changes influence establishment employment and survival in the service sector.

Over the past decade, the U.S. trade-weighted exchange rate experienced a 30 percent increase over the period 1997-2002 and subsequently experienced a 30 percent decline over the period 2002-2007, see Figure 1. The exchange rate fluctuations seem large enough to induce a labor market response within the service sector if trade in services is having an impact on the labor market.

The paper examines the employment and wage responses of service establishments and service sector establishment survival probabilities to changes in the

exchange rate using annual establishment level data from the U. S. Census Bureau's Longitudinal Business Database (LBD) for the period 1997-2005.[3]

The project examines the differential impacts of exchange rates on service industries that are tradable and those that are non-tradable. The paper uses an index of "tradability" to classify industries as tradable or non-tradable. The operating assumption is that exchange rate changes should only be a factor for tradable industries. The paper examines whether exchange rate changes are associated with service establishment survival, employment growth, or wage growth. In addition to difference across tradable and non-tradable industries, to explore whether industries that are more consistent with U.S. comparative advantage (high-wage, high-skill industries) respond differently than industries that do not seem aligned with U.S. comparative advantage, the paper investigates whether high-wage industries are more or less responsive than low-wage industries. Last, for select industries the paper examines whether exporters have a differential response than non-exporters.

The paper finds little evidence of exchange rates having an impact on service establishment survival, employment growth, or wage growth. To the extent that a correlation exists, the estimated coefficient is positive (opposite of the expected sign), but only marginally statistically significant and not robust.

In the next section, we review related literature. Section 3 describes the method used to identify tradable services. Section 4 provides information on the correlation between the tradability measure and measures of international trade in services. Section 5 describes the empirical approach and section 6 describes the data used in the analysis. Section 7 presents the results and section 8 concludes.

2. Related Literature

Previous research has examined the relationship between international trade, employment and wages, and firm performance in the manufacturing sector.

[3] In addition, as part of this project we examined service sector establishment responses to exchange rate changes using two panels of data from the Census of Services from 1997-2002 and 2002-2007. These results were no more satisfactory than the results with the annual LBD data and, as a result, are not discussed here.

Exchange Rates, Employment, and Firm Performance in Manufacturing

Revenga (1998) investigates the relationship between exchange rate changes and employment and wages in a subset of import competing manufacturing industries. She finds that for a subset of manufacturing industries facing significant import competition exchange rates have significant implications for employment and wages.

Gourinchas (1998) examines the impact of exchange rate fluctuations in net and gross job flows in U.S. manufacturing. He finds that exchange rates do have a significant effect on net and gross employment flows in the traded goods sector. Gourinchas finds that job creation and job destruction rates are positively correlated following an exchange rate shock.

Campa and Goldberg (2001) examine the employment and wage responses in the U.S. manufacturing sector to exchange rate changes. For the 1972-1995 period, they investigate the relationship between exchange rate changes and industry employment and wages in the manufacturing sector. They find that exchange rates have statistically significant effects on employment and wages, especially in low price-over-cost markup industries.

Klein, Schuh, and Triest (2003) examine the net and gross employment effects of a real exchange rate change in the U.S. manufacturing sector. They find that increases in the real exchange rate decrease net employment growth. They find that the decrease in net employment growth is due primarily to an increase in job destruction in affected industries (as opposed to decreases in job creation).

Cross-Country and International Studies

Burgess and Knetter (1998) examine the industry-level employment response in manufacturing industries in the G-8 countries to exchange rate changes. They find that employment changes are smaller in Germany, France, and Japan. They find the net employment response is more rapid in the U.S., Canada, and the U.K.

Galindo, Izquierdo, Montero (2006) examine the impact of exchange rate fluctuations on manufacturing employment in 9 Latin American countries. They find that

real exchange rate depreciations can impact net employment growth positively, but also find that the level of liabilities in dollars can overturn this effect.

International Trade and Producer Dynamics in Manufacturing

While there is very little empirical work covering establishment survival and growth in the service sector, there is a large literature on the role of plant characteristics in determining manufacturing plant survival. Dunne, Roberts, and Samuelson (1988, 1989) identified the positive correlation between industry exit and entry rates and the relationship between plant characteristics (e.g. plant age, size, and multi-unit status) and survival. Dunne, Roberts, and Samuelson find that larger manufacturing plants and plants owned by multi-unit firms are more likely to survive. Dunne, Roberts, and Samuelson also emphasize the importance of sunk entry costs in determining death rates.

Bernard and Jensen (2007) examine the role of firm structure on manufacturing plant closure and confirm the Dunne, Roberts, and Samuelson results that plants owned by multi-unit firms are more likely to survive. However, they find that plants owned by multi-unit firms have systematically different characteristics and that conditional on other plant characteristics associated with plant survival, plants owned by multi-unit firms are actually more likely to close.

Bernard and Jensen (2004) examine the response of U.S. manufacturers to exchange rate changes and foreign income growth. They find that the weakening dollar and rising foreign incomes induced a significant number of manufacturing plants to start exporting. They also found that changes in export shipments were largely concentrated at existing exporters who had already paid the sunk cost to enter the export market.

Bernard, Jensen, and Schott (2006a) use data on both tariff and transportation costs to examine the implications of falling trade costs on US manufacturers. They find when trade costs in an industry fall, plants are more likely to close. They find that low productivity plants are more likely to die.

In separate but related work, Bernard, Jensen, and Schott (2006b) examine the role of import-competition from low-wage countries on the reallocation of U.S. manufacturing within and across industries. They develop a measure of import competition that focuses on where imports originate (rather than their overall level),

motivated in part by the significant increases in import shares from low-wage countries like China. They focus on import penetration from very low-wage countries. They show that low-wage country import shares and overall penetration vary substantially across both industries and time. Both components tend to be higher and to increase more rapidly among labor-intensive industries. Capital- and skill-intensive sectors experience little or no increase in the share of imports from low-wage countries. They find that plant survival and growth are negatively associated with industry exposure to low-wage country imports.

3. Identifying Tradable Services

An important issue in examining the response of service sector establishments to exchange rate changes is whether service activities are actually “tradable” – i.e. can be provided at a distance – and, if so, which activities are tradable. Part of the difficulty in answering this question is there is a paucity of empirical work on the service sector in general and trade in services in particular. The lack of empirical work derives in part from the fact that the data infrastructure in services is less developed than that for goods. In this section we examine the geographic concentration of productive activity within the U.S. to identify which activities are traded within the U.S. and are thus at least potentially tradable internationally.

There is a long tradition among economists of using the geographic concentration of economic activity to identify a region's "export base" or "manufacturing base." The thinking was that if a region specialized in a manufacturing activity -- think Boeing and airplanes in Seattle -- it was likely to export the product in which it specializes. Seattle has a disproportionate share of U.S. aircraft manufacturing employment. This is not because people in Seattle consume more airplanes than other parts of the country; they export the planes in exchange for other goods and services.

This same type of logic applies to services. Economists have long thought of many services as "non-tradable" because services seem to require face-to-face interaction. The quintessential services are personal services like haircuts or divorce lawyers. These

service activities tend to be distributed in proportion to the population in a region (and thus we don't see big concentrations of these types of service activities in one place). But increasingly, there are services that don't seem to require face-to-face interaction and thus might be tradable. We can use this feature to distinguish between service activities that are tradable and those that require face-to-face interaction (and thus are far less likely to be traded).

This intuition is described in Krugman (1991), where he notes "In the late twentieth century the great bulk of our labor force makes services rather than goods. Many of these services are nontradable and simply follow the geographical distribution of the goods-producing population -- fast-food outlets, day-care providers, divorce lawyers surely have locational Ginis pretty close to zero. Some services, however, especially in the financial sector, can be traded. Hartford is an insurance city; Chicago the center of futures trading; Los Angeles the entertainment capital; and so on. …. The most spectacular examples of localization in today's world are, in fact, services rather than manufacturing. …. Transportation of goods has not gotten much cheaper in the past eighty years… But the ability to transmit information has grown spectacularly, with telecommunications, computers, fiber optics, etc." (p. 65)

Let's go back to Seattle. Figure 2 shows the location quotient for several industries in Seattle.[4] Indeed, Seattle has a disproportionate share of U.S. aircraft manufacturing employment (about 9 times Seattle's share of employment). We are accustomed to thinking of Seattle exporting aircraft. But, Seattle also has a disproportionate share of U.S. employment in software publishing (about 18 times Seattle's share of the population). Again, this is not because consumers in Seattle demand more software than other parts of the country, Microsoft and other software publishers based in Seattle produce software and then export it in exchange for other goods and services. Software is a service that is traded with other regions.

Jensen and Kletzer (2006) generalize this approach to make up for the lack of detailed data on trade in services and identify which activities are vulnerable to services offshoring by looking at services that are geographically concentrated and traded

[4] The location quotient is the share of an industry's employment in a region relative to its share of total employment. These calculations are made using the 2000 Decennial Public Use Micro Sample.

domestically. They use the geographic concentration of service employment across metropolitan areas within the U.S. to identify service activities that are tradable.[5]

They find that a significant number of service industries (and occupations) exhibit levels of geographic concentration consistent with the activity being traded within the U.S. Figure 3 shows a graph of Gini coefficients (the measure used to identify geographic concentration) by industry.[6]

While industries in the manufacturing sector tend to have higher levels of geographic concentration than the service sector, many service industries exhibit levels of geographic concentration consistent with them being traded within the U.S. In addition, the industries that do exhibit high levels of geographic concentration conform to our priors about what service activities might be tradable. For example, software publishing, sound recording, motion picture production, securities and commodities trading all exhibit high levels of geographic concentration. In addition, service industries identified as non-tradable also conform to our notions of industries that are likely to be non-tradable. For example, retail banking and video tape rental exhibit low levels of geographic concentration.

Implementation

Jensen and Kletzer (2006) implemented these measures using employment information from the 2000 Decennial Census of Population Public Use Micro Sample (PUMS) files.[7] In this project, we construct these measures for the initial year of the study using employment information from the U.S. Census Bureau's 1997 Business Register, the 1997 Census of Manufactures, and the 1997 Census of Services. We construct a Gini coefficient of employment in service industries using labor market areas defined by the Bureau of Economic Analysis as the unit of geography. The labor market

[5] If a service is non-tradable and demand for the service is concentrated (the industries that use the non-traded service are geographically concentrated), the service industry will be geographically concentrated and the analysis would incorrectly infer that the service is tradable. Jensen and Kletzer adjust their measure of geographic concentration to correct for this possibility and construct region specific measures of demand for each industry using the input-output use tables produced by the Bureau of Economic Analysis.
[6] This figure is taken from Jensen and Kletzer (2006).
[7] Jensen and Kletzer used the Consolidated Metropolitan Statistical Area or the Metropolitan Statistical Area where an individual reports working as the geographic entity.

areas are metropolitan areas and surrounding counties; there are 183 labor market areas in the U.S.

Figure 4 shows a plot of industry geographic concentration measures by 2-digit NAICS sector for 2002.[8] While Gini coefficients for industries in the manufacturing sector tend to be higher than for service sector industries, there are a number of service sector industries with relatively large Gini coefficients. The high Gini coefficients are evidence of significant geographic concentration of employment within the U.S., enough concentration to suggest that these service activities are traded within the U.S. In addition, the industries within both services and manufacturing that have high Ginis conform to our priors about what service activities are likely to be tradable and which manufacturing industries are less tradable (i.e., they have high trade costs to value ratios). For example, within manufacturing, the 5 industries with the lowest Ginis are Other Concrete Product Manufacturing, Fabricated Structural Metal Manufacturing, Concrete Block and Brick Manufacturing, Wood Container and Pallet Manufacturing, and Ready-Mix Concrete Manufacturing -- all characterized by low value to weight ratios and thus less likely to be traded.

Within the Information sector, the industries with the lowest Ginis are Newspaper Publishers, Motion Picture Theaters (except Drive-Ins), Television Broadcasting, Radio Stations, and Wired Telecommunications Carriers. These all tend to have a heavy reliance on local inputs or require a physical presence to provide the service. The Information industries with the highest Ginis are Record Production, Music Publishers, Cable and Other Subscription Programming, Integrated Record Production/Distribution, and Other Motion Picture and Video Industries. Within Professional, Scientific and Technical services some of the low Gini industries are Photography Studios, Portrait and Veterinary Services. High Gini Professional, Scientific, and Technical service industries are Payroll Services and Research and Development in the Social Sciences and Humanities.

[8] The analysis uses demand adjusted Gini measures constructed from 1997 data; please see Jensen and Kletzer (2006) for a description of the demand adjusted Gini construction. In an interest to limit disclosure requests, we include a graph of the Gini coefficients constructed from 2002 data (which had already been released). The graphs are qualitatively similar.

The share of employment within sectors that is classified as tradable varies considerably across sectors. In manufacturing, approximately 89 percent of employment is in industries classified as tradable, within business services the share is 64 percent. These results are consistent with priors about the ability to provide these services over distance. Industries within the Educational, Health Services, and Other Services (except Public Administration) sectors tend to have low Gini coefficients, suggesting low tradability. In contrast to business services, the share of employment in tradable industries in education and health services is 15 percent.

These results suggest that a number of business service industries are tradable within the U.S. Jensen and Kletzer (2006) report that the employment in tradable service activities is a significant share of total civilian employment – for example they find tradable business services employ more people than the manufacturing sector. For at least some service industries and for a significant share of the service workforce, international trade seems technologically feasible.[9]

4. Tradability and Trade

A number of business service industries exhibit levels of geographic concentration high enough to suggest that these activities are being traded within the U.S. and are thus in principle tradable internationally. While there may exist a number of impediments to international trade in services that do not apply to domestic trade in services (e.g. language, culture, regulation), we expect that service activities that are tradable within the U.S. are more likely to be traded internationally. In this section we examine the relationship between our measure of tradability and official U.S. statistics on trade in services.

The Gini coefficient measures the geographic concentration of employment in industries. It seems reasonable that once the Gini coefficient reaches a threshold, it represents an activity that is not produced everywhere (as non-tradables are) and is thus

[9] This abstracts from the issue of policy or regulatory impediments to trade in services (e.g. national or local licensing requirements).

tradable. We are interested in examining the producer survival and employment growth in tradable and non-tradable activities. An important issue in this empirical approach is to identify the level of geographic concentration that indicates that an industry or occupation is "tradable." Jensen and Kletzer (2006) explore where to impose the tradable/non-tradable threshold with industries because we have a much better sense of which industries are tradable – particularly for goods producing industries. They choose a Gini coefficient of 0.10 for the data used in that paper and report robustness checks on the threshold. In this paper, because the detail available in the industrial classification system is different and the level of geography is different, the Gini coefficient threshold for "tradability" must be adjusted. In this paper for the Gini coefficients constructed using the Census establishment data, industries with a Gini coefficient level greater than or equal to 0.12 are classified as tradable; those with a Gini coefficient below 0.12 are classified as non-tradable.[10]

To make this comparison of tradability and trade, we use publicly available information from the Census of Services collected by the Census Bureau. The Census of Service Industries contains information on principal industry, location, employment, payroll, and sales across all sectors in scope. There are also sector specific questions, one of which is whether the establishment exports. Establishments in the Information sector (51), Professional, Scientific, and Technical services (54), and Administrative and Support and Waste Management and Remediation services (56) are asked to report their export sales for services. The service sectors where the export question is asked provide direct evidence on the correlation between the classification of "tradability" and exports. Information from the Bureau of Economic Analysis provides information on the correlation between the "tradability" classification and imports.

[10] The threshold is calibrated to leave the same (or the closest analog) categories of manufacturing industries in the same tradable and non-tradable classifications as those used in Jensen and Kletzer (2006). In manufacturing, industries with Ginis below the threshold are Other Concrete Product Manufacturing, Fabricated Structural Metal Manufacturing, Concrete Block and Brick Manufacturing, Wood Container and Pallet Manufacturing, and Ready-Mix Concrete Manufacturing -- all characterized by low value to weight ratios and thus less likely to be traded.

Tradability and Exporting Across Industries

To examine the relationship between our tradable measure and exporting, we examine industry level export information from published aggregates of the 2002 Census of Service Industries.[11] Table 2 reports the share of establishments that export and exports to sales ratios in service industries classified as tradable and non-tradable. Industries classified as tradable have significantly higher shares of establishments that export (almost an order of magnitude larger, though it is a relatively small share) and significantly higher exports to sales ratios (again, an order of magnitude larger than non-tradable industries). These results indicate that the tradable classification is positively correlated with export participation, confirming that geographic concentration is concentrated with tradability in services. It is also interesting to note that industry average wages are much higher in tradable industries than non-tradable industries. Tradable service activities are high wage, high skill activities.

Tradability and Importing Across Industries

To examine the relationship between our tradable measure and importing, we draw on information for the Bureau of Economic Analysis's benchmark input-output tables.[12] We recognize and acknowledge that the BEA data on imports are imperfect due to the classification systems used on the collection instruments not corresponding directly to the NAICS classification system (they are collected at a much more aggregated level). Because the classification systems used are different, BEA must allocate imports across NAICS categories. While we acknowledge this shortcoming, we think it is useful to compare the data as a crude robustness check.

Table 2 also reports industry level imports and industry import penetration. Industries classified as tradable have higher levels of imports and higher import penetration levels. These results indicate that the tradable classification is positively correlated with imports, suggesting that geographic concentration is concentrated with

[11] See http://www.census.gov/econ/census02/.
[12] See http://www.bea.gov/industry/io_benchmark.htm#2002data.

tradability in services. The data presented in Table 2 on imports and exports suggest that the tradability index is a useful proxy for identifying industries that are more likely to be traded internationally.

5. Empirical Approach

As described above, the data available on the service sector are not as rich as the data available for the manufacturing sector. This presents significant challenges for the empirical analysis. To examine the relationship between exchange rate changes and employment and wages at U.S. service sector establishments, we pursue an empirical strategy that is similar in spirit to that described above (Revenga (1998), Campa and Goldberg (2001), and Bernard and Jensen (2004)), but with far less rich data. Because this paper examines employment changes at the plant level, it is more similar to the work by Bernard and Jensen.

Based on the results for the manufacturing sector from Revenga (1998), Campa and Goldberg (2001) and Bernard and Jensen (2004), we expect that exchange rate changes will have an impact on economic activity in industries where international trade is important. We do not expect that all service activities will be responsive to exchange rate changes. We expect that only tradable service activities will be affected by exchange rate changes. To investigate whether establishments in tradable service activities are more responsive to exchange rate changes, we will estimate the following specification:

$$\Delta Emp_{j,i,t} = + \Delta XR_t + \Delta GDP_t + \Delta World\ GDP_t + \Delta Interest\ Rate_t +$$
$$\Delta NASDAQ_t + Tradable_i + \Delta XR_t * Tradable_i + Urban_j + Region\ Fixed\ Effect_j$$

where

$\Delta Emp_{j,i,t}$ is the annual change in employment *t-1* to *t* at establishment *j* in industry *i*.

ΔXR_t is the change in the trade-weighted exchange rate *t-1* to *t*.

ΔGDP_t is the change in U.S. GDP *t-1* to *t*.

$\Delta World\ GDP_t$ is the change in World GDP *t-1* to *t*.

$\Delta Interest\ Rate_t$ is the change in the interest rate *t-1* to *t*.

$\Delta NASDAQ_t$ is the change in the NASDAQ stock market index *t-1* to *t*.

$Tradable_i$ is an indicator variable of whether industry *i* is classified as tradable using the methodology described above.

$Urban_j$ is an indicator of whether the establishment is located in an urban county.

$Region\ Fixed\ Effect_j$ is a fixed effect for the Bureau of Economic Analysis Labor Market Area in which the establishment is located.

This specification is similar in spirit to that used by Campa and Goldberg (2001).[13] One difference is the unit of observation. Campa and Goldberg use industry level data, while in the paper we examine establishment level responses. There are other differences in the independent variables, as well. Camp and Goldberg use the price of oil as a control in their analysis; this project will drop oil and include a measure of the NASDAQ stock market to capture the telecommunications and internet investment boom (and subsequent dot.com bust) in the late 1990s. This specification will investigate whether service establishments on average are responsive to exchange rate changes. Similar specifications will be estimated for changes in establishment level average wage and establishment survival.

[13] Campa and Goldberg (2001) also include import penetration. While it would be desirable to include import penetration in the regressions, lack of industry detail on services flows precludes including this in the analysis.

While the macro-economic variables are primarily included as controls, we have some general notions about how the should affect establishment employment, average wages, and survival. We expect that when aggregate demand is strong, this will increase demand for services and tend to increase establishment level employment, and survival probabilities. We have no strong priors regarding the impact of these variables on average wages. If establishments add new workers that have lower wages than the average of current workers, the average wage would tend to decrease.

Controls are also included for local demand conditions. An indicator variable is included to identify whether the county is classified as an urban county using the 1993 Rural-Urban Continuum Code produced by the U.S. Department of Agriculture.[14] Counties with a code of 0-3 were classified as Urban. We also include region fixed effects for the Bureau of Economic Analysis Labor Market Area in which the establishment is located.[15]

Following previous research, the project will also examine whether there are differential responses to exchange rates across tradable service industries with different characteristics. Campa and Goldberg (2001) find that industries with low price-cost margins are more responsive to exchange rate changes. This project will investigate whether industries with higher average wages (industries more consistent with U.S. comparative advantage) are more insulated from exchange rate changes. The project will separately estimate the empirical specifications for high-wage and low-wage industries.[16]

[14] See http://www.ers.usda.gov/Data/RuralUrbanContinuumCodes/ for additional information.
[15] Seehttp://www.bts.gov/programs/commodity_flow_survey/methods_and_limitations/national_transportation_analysis_regions/ for additional information.
[16] Jensen and Kletzer (2008) in preliminary work find that establishments in tradable industries are more likely to close over the 1997-2002 period than establishments in non-tradable industries, though high-wage industries have lower closure rates.

6. Data

Longitudinal Business Database (LBD)

The principal data source for examining the impact of exchange rate changes on service establishment survival, employment growth, and wage growth is the Longitudinal Business Database (LBD), developed and maintained by the Center for Economic Studies at the U.S. Census Bureau. The LBD contains the universe of all U.S. business establishments with paid employees that are in scope for the Economic Census (i.e., all manufacturing; mining; construction; retail; wholesale; service; transportation, communications and utilities (TCU) and finance, insurance, and real estate (FIRE) establishments). In constructing the LBD, great care was taken to provide researchers with the most complete and accurate set of longitudinal establishment linkages possible which substantially reduces the number spurious establishment births and deaths observed in the data. (See Jarmin and Miranda (2002) for more information on the contents and construction of the LBD.) The LBD contains basic information on establishment size, payroll, the industry in which it operates, its geographical location and ownership that permit researchers to analyze establishment demographics.

The LBD is a rich and highly reliable source of information on establishment survival and employment and wage changes at annual frequencies. One problem with the LBD is that industry coding information (like other variable son the LBD) is derived from the Standard Statistical Establishment List (SSEL). The SSEL is the basis for the Census Bureau's sampling frame and is derived from a variety of sources – both administrative data and survey data. One particular issue with the LBD/SSEL data is that industry classification information lags for newly formed establishments. Because new establishments are included in the SSEL before they have been surveyed (often coming from administrative data), the industry classification information is not always complete, i.e. establishments sometimes have an incomplete industry code (for example 540000 or 541200 instead of 541214).

To resolve this issue, we link establishments from the LBD to observations in the Economic Census (which occurs every five years) and use industrial classification

information from the Economic Census where possible. For some new establishments appearing in the LBD only after 2002, no Economic Census record is available. For these establishments, we leave the industry code as the partial code and classify the establishment as being in a non-tradable industry. We construct a sample of all service sector establishments in scope for the Economic Census for the period 1997 – 2005 (the most recent year the LBD is available).

The high wage industry indicator is constructed by taking (employment weighted) average wages within an industry and comparing that to the average across industries. Industries above the mean are classified as high wage industries.

Outside measures

Exchange rate: US trade weighted exchange rate (broad range of currencies). The data are downloaded from St. Louis Fed website: http://research.stlouisfed.org/fred2/categories/105.

As reported on the St. Louis Fed website: "Averages of daily figures. A weighted average of the foreign exchange value of the U.S. dollar against the currencies of a broad group of major U.S. trading partners. Broad currency index includes the Euro Area, Canada, Japan, Mexico, China, United Kingdom, Taiwan, Korea, Singapore, Hong Kong, Malaysia, Brazil, Switzerland, Thailand, Philippines, Australia, Indonesia, India, Israel, Saudi Arabia, Russia, Sweden, Argentina, Venezuela, Chile and Colombia."[17] The original data are monthly, and the annual rate is calculated as the simple average of the monthly rate.

NASDAQ: NASDAQ composite index for March 15 of each year. Source: "Daily Stock Price Record, NASDAQ" Standard & Poor's Corp.

Real interest rate: calculated from the nominal interest rate and inflation rate. (i) The nominal interest rate is the 5-year T-bill rate, which is downloaded from the Federal

[17] For more information about trade-weighted indexes see http://www.federalreserve.gov/pubs/bulletin/2005/winter05_index.pdf.

Reserve Board website: http://www.federalreserve.gov/releases/h15/data.htm. (ii) inflation rate is calculated from CPI index, which is downloaded from IMF International Financial Statistics. Both the original nominal interest rate and CPI data are monthly. The annual nominal interest rate is calculated as the simple average of the monthly nominal interest rate, and the annual CPI is the CPI for December in each year.

US GDP: downloaded from IMF International Financial Statistics. The original data are quarterly, and the annual GDP is calculated as the sum of the quarterly GDP in each year.

World GDP: Sum of GDP of all countries in the world. GDP data of each country are also downloaded from IMF International Financial Statistics. The original data are quarterly, and the annual GDP of each country is calculated as the sum of the quarterly GDP of the country.

7. Results

Establishment Employment Growth

Table 3 reports the regression results for the base specification. The first two columns report the regression coefficients and standard errors for the all industry sample. Changes in the exchange rate between t-1 and t have a positive and statistically significant impact on employment growth at the average service establishment. Changes in U.S. GDP have a negative and statistically significant impact on employment growth at service establishments. This is not intuitive. World GDP has a positive and statistically significant impact on service establishment employment growth. Changes in real interest rates have a negative and statistically significant affect on employment growth. Changes in the NASDAQ index have a positive and statistically significant affect on service establishment employment. Service establishments in tradable industries do not, on average, have employment growth different from the average service sector establishment. When we examine the interaction term between tradability and the change

in the exchange rate, the coefficient is positive and statistically significant. The expected sign for the exchange rate is negative (appreciation of the dollar should lead to a decrease in demand for tradable service activities), so this is unexpected.

The second set of columns in Table 3 presents results for establishment employment growth in high wage industries. Changes in the exchange rate between t-1 and t have a positive and statistically significant impact on employment growth at the average service establishment. Changes in US and world GDP also have a positive and statistically significant impact on service establishment employment growth and the coefficient estimates are larger than for the full sample (especially US GDP growth which is negative in the full sample). Changes in the NASDAQ index have a negative and statistically significant affect on service establishment employment. This is counter-intuitive and difficult to explain. Employment growth in service establishments in tradable industries is lower than the average high-wage service sector establishment. When we examine the interaction term between tradability and the change in the exchange rate, the coefficient is positive (and larger than the full sample estimate) and statistically significant. The expected sign for the exchange rate is negative (appreciation of the dollar should lead to a decrease in demand for tradable service activities), so this is unexpected.

The third set of columns in Table 3 presents results for establishment employment growth for low wage industries. The qualitative results for low wage industries are similar to the overall results with the exception of the Tradable indicator. In low wage industries, establishments in tradable industries have higher employment growth on average. The sign on the interaction between the exchange rate term and the tradability indicator is unexpected as in the full sample and the high wage industry sample.

Establishment Wage Growth

Table 4 reports regression results for average wage changes at establishments over the sample period. The first set of columns reports regression coefficients and standard errors for the full sample of establishments. Increases in the exchange rate are associated with increasing average wages at service establishments over the period. This

is contrary to previous results in the manufacturing sector, where an appreciation of the dollar was associated with negative labor market outcomes.

Increases in US GDP are associated with rising average wages at service establishments. Increases in world GDP are associated with negative average wage changes at service establishments. Increases in real interest rates are associated with increases in average wages.

Service establishments in tradable industries have, on average, lower average wage growth than establishments in non-tradable industries. The interaction between the exchange rate and the tradable industry indicator is negative and statistically significant, suggesting that an appreciation of the dollar is associated with lower average wage growth at the average service establishment in a tradable industry.

The results for the high wage industry sample are presented in the second set of columns in Table 4. Changes in World GDP are associated with positive changes in average wages in high wage service industries (in contrast to the effect in the full sample of establishments). The interaction between the exchange rate and the tradability indicator is positive and statistically significant (again, in contrast to the overall results). For the low wage industry sample, the results are qualitatively similar to the overall results with the exception of the exchange rate variable.

Establishment Survival

Table 5 reports regression results for annual service establishment survival over the sample period. An establishment is considered to have exited if it appears in year *t-1* and does not appear in year *t*. The first set of columns reports regression coefficients for establishment survival for the full sample. Exchange rate changes have negative and statistically significant impact on survival probabilities. Surprisingly, US GDP growth and World GDP growth are negatively (and statistically significantly) associated with service establishment survival probabilities. Increases in interest rates, contrary to expectations, are associated with higher survival probabilities. Increases in the NASDAQ index are positively and statistically associated with service establishment survival. Establishments in tradable industries are less likely to survive than the average

establishment. Increases in the exchange rate increase the likelihood of survival for establishments in tradable industries. This is the opposite of what was expected.

The results for high wage industries and low wage industries are qualitatively similar.

Different Lag Relationships

In this section, we explore alternative lag structures for the macro variables. Tables 6 and 7 report the employment change and survival probability results for specifications using the change from *t-2* to *t-1* for all the macro variables (i.e. exchange rates, US GDP, world GDP, real interest rates, NASDAQ index). The results for the employment change regression are sensitive to the choice of lag structure – the coefficient estimates of all the macroeconomic control variables (with the exception of the NASDAQ index) change sign and are statistically significant compared to the base specification for the full sample. The lagged changes in U.S. GDP are positive and statistically significant. The lagged changes in World GDP are negative and statistically significant. The coefficient on the real interest change is negative and significant; the coefficient on the change in the NASDAQ index is negative and statistically significant. The coefficient on the tradable indicator is negative and the coefficient on the interaction between the exchange rate change and the tradability indicator is positive. The results for the survival regression using the lagged changes are qualitatively similar to the base specification.

Including Initial Establishment Employment

Previous research examining establishment level employment growth and survival probabilities have included initial plant characteristics as controls.[18] To control for initial establishment characteristics, we include initial establishment employment in the base specifications. Tables 8, 9, and 10 report the results. The estimated coefficients are qualitatively similar to the base regression results. We see that initial employment is

[18] See Dunne, Roberts, and Samuelson (1988, 1989) and Bernard and Jensen (1999, 2007).

negatively associated with employment growth (some evidence of mean reversion), while larger establishments are more likely to have higher than average wage growth and have higher survival probabilities.

8. Discussion and Conclusions

While it seems intuitive that exchange rate changes should translate into demand shocks for tradable service producers, the results from this analysis do not support the hypothesis that exchange rates are associated with employment changes, average wage changes, or survival in the service sector over the period of study. There are a number of potential explanations for why the empirical results do not identify this effect:

1. The tradability classification is not accurate. If the tradability classification is not accurate, then it would be difficult to identify the effect of exchange rate changes on establishment level employment change, average wage chance, and survival. The correlations between the tradability classification and measures of international trade in services suggest that the classification is appropriately capturing some variation across industries.

2. Related to the above, if only a small share of service establishments within a tradable industry are exporters it is likely to be difficult to identify this effect. For the service industries where establishment level export information is available, it is true that a small share of establishments export (roughly 5 percent). If this is true across all tradable industries, it would be difficult to identify the affect of exchange rate changes using an industry-level identifier. [19]

3. The exchange rate change measure is poorly measured. We use a single trade weighted measure of exchange rates constructed by the Federal Reserve for all

[19] In this project, we did examine whether exporters' employment, wages, and survival are responsive to changes in the exchange rate for the select industries where exporting information is available. These results did not provide any clarification to the previous results, so we chose not to include these results.

industries.[20] The trade weights include merchandise trade (and, because services trade accounts for about 30 percent of trade, the weights are dominated by merchandise trade patterns). If the countries with which the US engages in services trade differ from the countries with which the US conducts merchandise trade, the exchange rate measure would not accurately reflect the demand shock.

4. There is relatively inelastic demand for US tradable services. If, because of the nature of services (e.g. they are small in terms of budget share, there is little possibility for inter-temporal substitution for services, services are fixed costs types of activities like payroll processing) they have relatively inelastic demand, gradual changes in the exchange rate will not be large enough to affect demand.

5. Exchange rates are a demand shock to revenue, but increased revenue does not translate directly (or rapidly) into increased employment or wages. It is possible for activities like motion pictures and software (and other services in the information sector) that revenues increase as a result of exchange rate changes but this does not translate into measurable increases in employment.

6. Secular trends swamp cyclical or transitory trends. It is possible that secular forces like comparative advantage and increasing specialization across countries is driving changes in employment and survival in service industries and that these effects are quantitatively more important than any effects from exchange rate changes.

7. We don't understand service producer employment dynamics well enough to tease out the exchange rate effect. The manufacturing sector studies built upon a large body of work regarding employment dynamics in the manufacturing sector. Currently little is known regarding employment dynamics in the service sector and it is possible that we are not adequately modeling other influences on service sector employment growth and survival to identify the exchange rate effect.

[20] In contrast, Bernard and Jensen (2004) construct 4-digit SIC level trade weighted exchange rates.

The results of the study do not support the hypothesis that exchange rates influence employment, wages, or survival in the service sector, but do point to directions for future research.

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Figure 1

Source: Board of Governors of the Federal Reserve System,
http://research.stlouisfed.org/fred2/series/TWEXBMTH/

Figure 2
Location Quotients for Seattle, Washington

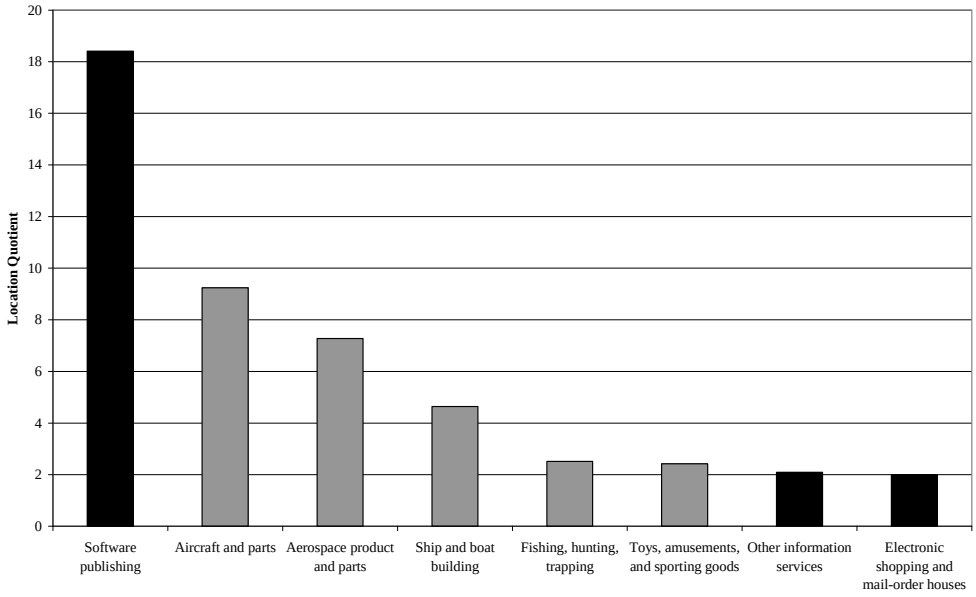
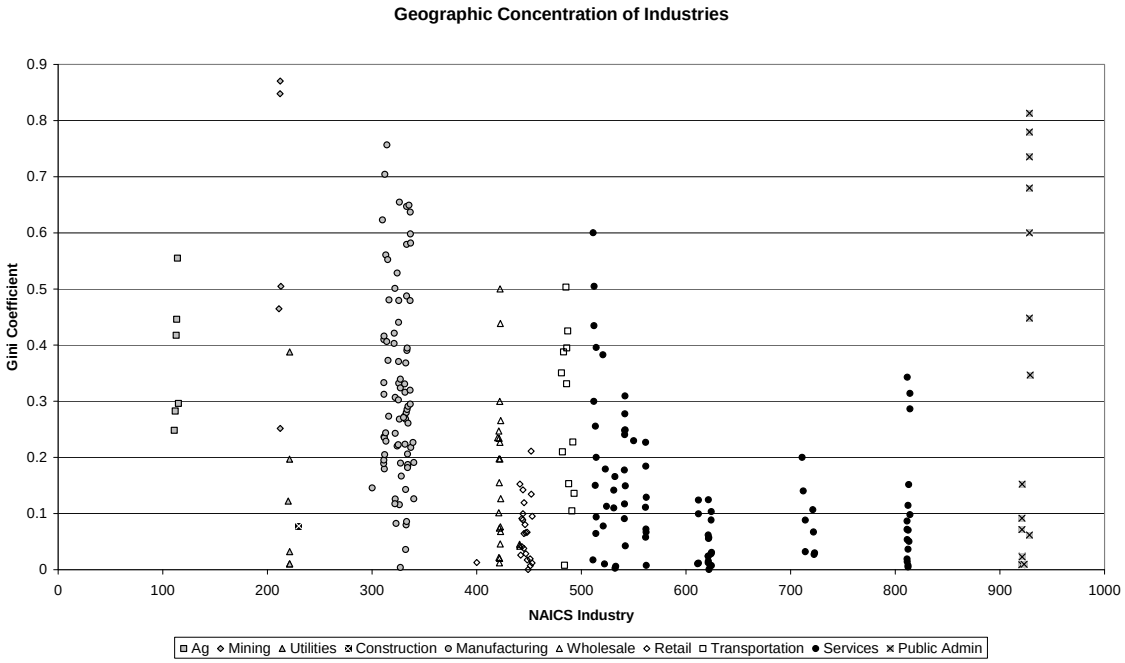


Figure 3[21]



[21] This figure is taken from Jensen and Kletzer (2006).

Figure 4
Gini Coefficients by NAICS Industry (from establishment data), 2002

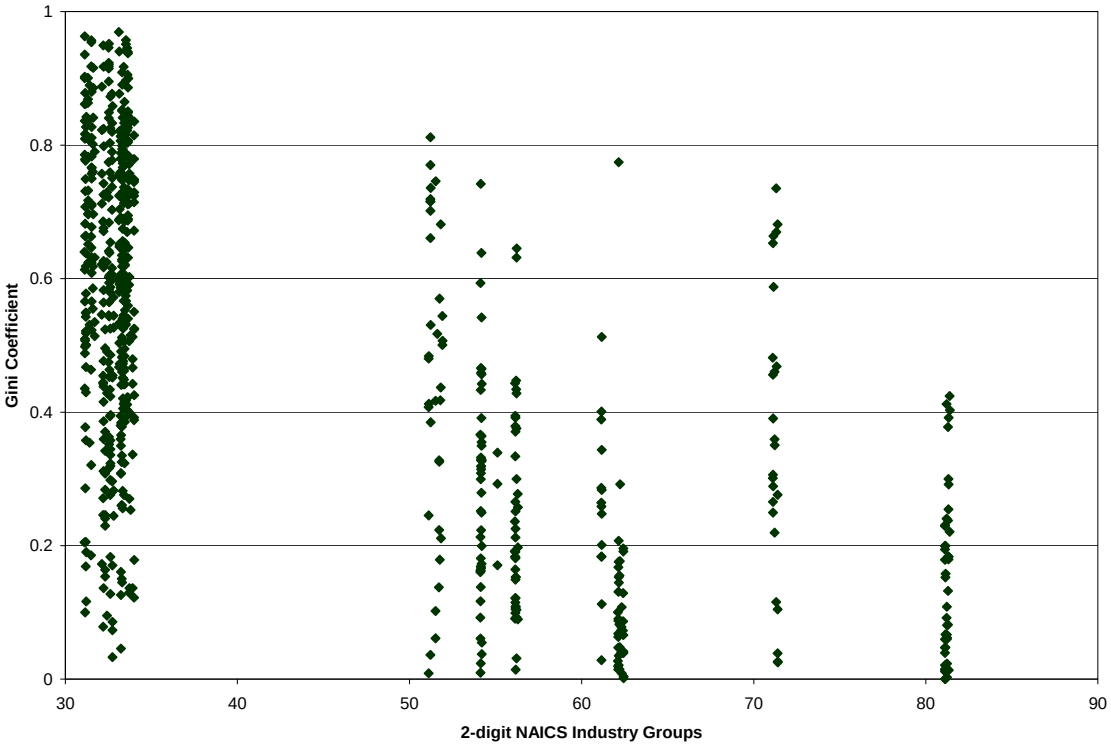


Table 1

NAICS Code		Sector	Employment 2007	Share of Total Employment 2007	Employment Growth 1997-2007
21		**Mining**	**703,129**	**0.5%**	**38%**
22		**Utilities**	**632,432**	**0.5%**	**-10%**
23		**Construction**	**7,399,047**	**5.5%**	**31%**
31-33		**Manufacturing**	**13,333,390**	**9.9%**	**-21%**
42		**Wholesale trade**	**6,295,109**	**4.7%**	**9%**
44-45		**Retail trade**	**15,610,710**	**11.5%**	**12%**
48-49		**Transportation and warehousing**	**4,435,760**	**3.3%**	**52%**
51-56		**Business Services**	**33,430,809**	**24.7%**	**29%**
	51	Information	3,428,262	2.5%	12%
	52	Finance and insurance	6,562,546	4.9%	12%
	53	Real estate and rental and leasing	2,249,353	1.7%	32%
	54	Professional, scientific, and technical services	8,121,171	6.0%	51%
	55	Management of companies and enterprises	2,915,644	2.2%	11%
	56	Administrative and support and waste remediation services	10,153,833	7.5%	38%
61-81		**Personal Services**	**34,595,857**	**25.6%**	**23%**
	61	Educational services	562,210	0.4%	75%
	62	Health care and social assistance	16,859,513	12.5%	24%
	71	Arts, entertainment, and recreation	2,070,524	1.5%	30%
	72	Accommodation and food services	11,587,814	8.6%	23%
	81	Other services (except public administration)	3,515,796	2.6%	8%
		Federal Government	**2,462,000**	**1.8%**	**--**
		State and Local Government	**16,400,000**	**12.1%**	**--**

Table 2

Business Service Sector (NAICS 51, 54, 56)

Industry Level Descriptive Statistics

	Variable	N	Mean	Std Dev
Non-Tradable	Exports/Sales	21	0.001291	0.001997
	Shr of Estabs that Export	21	0.008853	0.006773
	Import Penetration	15	0.003924	0.00605
	Imports ($ millions)	15	264.26	347.0536
	Average Wage	22	27849.35	11832.14
Tradable	Exports/Sales	99	0.024838	0.036448
	Shr of Estabs that Export	101	0.074616	0.091129
	Import Penetration	77	0.012065	0.016373
	Imports ($ millions)	77	592.0325	704.5372
	Average Wage	102	43853.9	16701.23

Table 3

Impact of Exchange Rate Change on Establishment Performance: Employment

Dependent Variable:	**Δ log(employment$_{f,t}$)**					
	ALL INDUSTRIES		HIGH WAGE INDUSTRIES		LOW WAGE INDUSTRIES	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Δ log(XR$_t$)	0.1544 ***	(0.0057)	0.0633 ***	(0.0091)	0.2138 ***	(0.0073)
Δ log(GDP$_t$)	-0.1359 ***	(0.0168)	0.2987 ***	(0.0260)	-0.4638 ***	(0.0219)
Δ log(World GDP$_t$)	0.0248 ***	(0.0070)	0.1129 ***	(0.0109)	0.2726 ***	(0.0092)
Δ (Real Interest Rate$_t$)	-0.0015 ***	(0.0002)	-0.0013 ***	(0.0003)	-0.0018 ***	(0.0002)
Δ log(NASDAQ$_t$)	0.0068 ***	(0.0005)	-0.0046 ***	(0.0008)	0.0153 ***	(0.0007)
Tradable Industry$_t$	-0.0003	(0.0002)	-0.0048 ***	(0.0003)	0.0017 ***	(0.0003)
Δ log(XR$_t$) * Tradable Industry$_t$	0.0964 ***	(0.0040)	0.1524 ***	(0.0059)	0.0262 ***	(0.0061)
Urban Area$_t$	0.0009	(0.0007)	0.0011	(0.0011)	0.0006	(0.0008)
Fixed Effect	Region		Region		Region	
N	23,317,590		10,139,003		13,178,587	
R^2	0.0004		0.0006		0.0005	

Note: Standard errors are robust and clustered on year.

Table 4

Impact of Exchange Rate Change on Establishment Performance: Average Wage

Dependent Variable:	**Δ log(wage$_{f,t}$)**					
	ALL INDUSTRIES		HIGH WAGE INDUSTRIES		LOW WAGE INDUSTRIES	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Δ log(XR$_t$)	0.1397 ***	(0.0064)	0.2693 ***	(0.0104)	-0.0022	(0.0080)
Δ log(GDP$_t$)	0.3887 ***	(0.0188)	0.2318 ***	(0.0297)	0.5049 ***	(0.0241)
Δ log(World GDP$_t$)	-0.0261 ***	(0.0079)	0.3192 ***	(0.0125)	-0.2925 ***	(0.0101)
Δ (Real Interest Rate$_t$)	0.0123 ***	(0.0002)	0.0200 ***	(0.0003)	0.0063 ***	(0.0003)
Δ log(NASDAQ$_t$)	-0.0105 ***	(0.0006)	-0.0081 ***	(0.0009)	-0.0122 ***	(0.0007)
Tradable Industry$_t$	-0.0095 ***	(0.0002)	-0.0214 ***	(0.0003)	-0.0018 ***	(0.0003)
Δ log(XR$_t$) * Tradable Industry$_t$	-0.0254 ***	(0.0044)	0.1086 ***	(0.0067)	-0.0895 ***	(0.0067)
Urban Area$_t$	-0.0033 ***	(0.0007)	-0.0077 ***	(0.0012)	-0.0008	(0.0009)
Fixed Effect	Region		Region		Region	
N	23,317,586		10,139,002		13,178,584	
R^2	0.0008		0.0015		0.0009	

Note: Standard errors are robust and clustered on year.

Table 5

Impact of Exchange Rate Change on Establishment Performance: Survival

Dependent Variable:	**Survival**					
	ALL INDUSTRIES		HIGH WAGE INDUSTRIES		LOW WAGE INDUSTRIES	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Δ log(XR_t)	-0.1433 ***	(0.0035)	-0.2167 ***	(0.0056)	-0.1014 ***	(0.0045)
Δ log(GDP_t)	-0.7328 ***	(0.0104)	-0.6715 ***	(0.0159)	-0.7754 ***	(0.0137)
Δ log(World GDP_t)	-0.2261 ***	(0.0043)	-0.2676 ***	(0.0067)	-0.1952 ***	(0.0057)
Δ (Real Interest $Rate_t$)	0.0014 ***	(0.0001)	0.0006 ***	(0.0002)	0.0019 ***	(0.0001)
Δ log($NASDAQ_t$)	0.0127 ***	(0.0003)	0.0113 ***	(0.0005)	0.0137 ***	(0.0004)
Tradable $Industry_t$	-0.0200 ***	(0.0001)	-0.0299 ***	(0.0002)	-0.0115 ***	(0.0002)
Δ log(XR_t) * Tradable $Industry_t$	0.1209 ***	(0.0024)	0.1848 ***	(0.0036)	0.0575 ***	(0.0038)
Urban $Area_t$	-0.0052 ***	(0.0004)	-0.0105 ***	(0.0007)	-0.0017 ***	(0.0005)
Fixed Effect	Region		Region		Region	
N	25,976,635		11,322,508		14,654,127	
R^2	0.0036		0.0060		0.0027	

Note: Standard errors are robust and clustered on year.

Table 6

Impact of Lagged Exchange Rate Change on Establishment Performance: Employment

Dependent Variable:	**Δ log(employment$_{f,t}$)**					
	ALL INDUSTRIES		HIGH WAGE INDUSTRIES		LOW WAGE INDUSTRIES	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Δ log(XR_{t-1})	-0.1882 ***	(0.0058)	-0.0775 ***	(0.0093)	-0.2725 ***	(0.0074)
Δ log(GDP_{t-1})	0.7354 ***	(0.0164)	0.5969 ***	(0.0254)	0.8418 ***	(0.0215)
Δ log(World GDP_{t-1})	-0.2707 ***	(0.0071)	-0.1137 ***	(0.0110)	-0.3912 ***	(0.0092)
Δ (Real Interest $Rate_{t-1}$)	-0.0029 ***	(0.0002)	-0.0014 ***	(0.0002)	-0.0041 ***	(0.0002)
Δ log($NASDAQ_{t-1}$)	-0.1850 ***	(0.0005)	-0.0110 ***	(0.0008)	-0.0243 ***	(0.0007)
Tradable $Industry_t$	-0.0004 **	(0.0002)	-0.0049 ***	(0.0003)	0.0018 ***	(0.0003)
Δ log(XR_{t-1}) * Tradable $Industry_t$	0.0202 ***	(0.0038)	0.0375 ***	(0.0056)	-0.0130 **	(0.0058)
Urban $Area_t$	-0.0017 ***	(0.0003)	-0.0013 ***	(0.0005)	-0.0022 ***	(0.0004)
Fixed Effect	Region		Region		Region	
N	23,317,590		10,139,003		13,178,587	
R^2	0.0002		0.0003		0.0003	

Note: Standard errors are robust and clustered on year.

Table 7

Impact of Lagged Exchange Rate Change on Establishment Performance: Survival

Dependent Variable:	**Survival**					
	ALL INDUSTRIES		HIGH WAGE INDUSTRIES		LOW WAGE INDUSTRIES	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Δ log(XR_{t-1})	-0.1955 ***	(0.0036)	-0.2261 ***	(0.0057)	-0.1896 ***	(0.0047)
Δ log(GDP_{t-1})	-0.2514 ***	(0.0102)	-0.2928 ***	(0.0157)	-0.2194 ***	(0.0135)
Δ log(World GDP_{t-1})	-0.2780 ***	(0.0044)	-0.2410 ***	(0.0067)	-0.3069 ***	(0.0058)
Δ (Real Interest $Rate_{t-1}$)	0.0011 ***	(0.0001)	0.0022 ***	(0.0001)	0.0002	(0.0001)
Δ log($NASDAQ_{t-1}$)	0.0154 ***	(0.0003)	0.0164 ***	(0.0005)	0.0146 ***	(0.0004)
Tradable $Industry_t$	-0.0212 ***	(0.0001)	-0.0325 ***	(0.0002)	-0.0114 ***	(0.0002)
Δ log(XR_{t-1}) * Tradable $Industry_t$	0.0977 ***	(0.0023)	0.1807 ***	(0.0034)	0.0132 ***	(0.0036)
Urban $Area_t$	-0.0047 ***	(0.0002)	-0.0111 ***	(0.0003)	-0.0007 ***	(0.0002)
Fixed Effect	Region		Region		Region	
N	25,976,635		11,322,508		14,654,127	
R^2	0.0025		0.0046		0.0016	

Note: Standard errors are robust and clustered on year.

Table 8

Impact of Exchange Rate Change on Establishment Performance: Employment

Dependent Variable:	**Δ log(employment$_{f,t}$)**					
	ALL INDUSTRIES		HIGH WAGE INDUSTRIES		LOW WAGE INDUSTRIES	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
log(Employment$_{f,t-1}$)	-0.0612 ***	(0.0001)	-0.0615 ***	(0.0001)	-0.0617 ***	(0.0001)
Δ log(XR$_t$)	0.1433 ***	(0.0056)	0.0503 ***	(0.0090)	0.2063 ***	(0.0072)
Δ log(GDP$_t$)	-0.2106 ***	(0.0165)	0.2338 ***	(0.0257)	-0.5527 ***	(0.0216)
Δ log(World GDP$_t$)	0.2100 ***	(0.0069)	0.1091 ***	(0.0108)	0.2864 ***	(0.0091)
Δ (Real Interest Rate$_t$)	-0.0010 ***	(0.0002)	-0.0010 ***	(0.0003)	-0.0011 ***	(0.0002)
Δ log(NASDAQ$_t$)	0.0080 ***	(0.0005)	-0.0034 ***	(0.0008)	0.0167 ***	(0.0006)
Tradable Industry$_t$	-0.0181 **	(0.0002)	-0.0166 ***	(0.0003)	-0.0125 ***	(0.0003)
Δ log(XR$_t$) * Tradable Industry$_t$	0.1165 ***	(0.0039)	0.1678 ***	(0.0058)	0.0464 ***	(0.0060)
Urban Area$_t$	0.0054 **	(0.0007)	0.0042 ***	(0.0011)	0.0073 ***	(0.0008)
Fixed Effect	Region		Region		Region	
N	23,317,590		10,139,003		13,178,587	
R^2	0.0291		0.0290		0.0296	

Note: Standard errors are robust and clustered on year.

Table 9

Impact of Exchange Rate Change on Establishment Performance: Average Wage

Dependent Variable:	**Δ log(wage$_{f,t}$)**					
	ALL INDUSTRIES		HIGH WAGE INDUSTRIES		LOW WAGE INDUSTRIES	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
log(Employment$_{f,t-1}$)	0.0494 ***	(0.0001)	0.0473 ***	(0.0001)	0.0525 ***	(0.0001)
Δ log(XR$_t$)	0.1487 ***	(0.0063)	0.2792 ***	(0.0104)	0.0042	(0.0080)
Δ log(GDP$_t$)	0.4490 ***	(0.0186)	0.2817 ***	(0.0295)	0.5805 ***	(0.0239)
Δ log(World GDP$_t$)	-0.0303 ***	(0.0078)	0.3221 ***	(0.0124)	-0.3042 ***	(0.0100)
Δ (Real Interest Rate$_t$)	0.0119 ***	(0.0002)	0.0198 ***	(0.0003)	0.0057 ***	(0.0003)
Δ log(NASDAQ$_t$)	-0.0115 ***	(0.0006)	-0.0090 ***	(0.0009)	-0.0134 ***	(0.0007)
Tradable Industry$_t$	-0.0048 ***	(0.0002)	-0.0123 ***	(0.0003)	0.0103 ***	(0.0003)
Δ log(XR$_t$) * Tradable Industry$_t$	-0.0417 ***	(0.0044)	0.0968 ***	(0.0067)	-0.1066 ***	(0.0066)
Urban Area$_t$	-0.0069 ***	(0.0007)	-0.0101 ***	(0.0012)	-0.0065 ***	(0.0009)
Fixed Effect	Region		Region		Region	
N	23,317,586		10,139,002		13,178,584	
R^2	0.0157		0.0143		0.0182	

Note: Standard errors are robust and clustered on year.

Table 10

Impact of Exchange Rate Change on Establishment Performance: Survival

Dependent Variable:	**Survival**					
	ALL INDUSTRIES		HIGH WAGE INDUSTRIES		LOW WAGE INDUSTRIES	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
$\log(\text{Employment}_{t,t-1})$	0.0299 ***	(0.0001)	0.0294 ***	(0.0001)	0.0310 ***	(0.0001)
$\Delta \log(XR_t)$	-0.1318 ***	(0.0035)	-0.2026 ***	(0.0055)	-0.0923 ***	(0.0045)
$\Delta \log(GDP_t)$	-0.6871 ***	(0.0103)	-0.6339 ***	(0.0158)	-0.7191 ***	(0.0135)
$\Delta \log(\text{World GDP}_t)$	-0.2179 ***	(0.0043)	-0.2545 ***	(0.0066)	-0.1914 ***	(0.0057)
Δ (Real Interest Rate$_t$)	0.0013 ***	(0.0001)	0.0007 ***	(0.0002)	0.0018 ***	(0.0001)
$\Delta \log(NASDAQ_t)$	0.0120 ***	(0.0003)	0.0106 ***	(0.0005)	0.0128 ***	(0.0004)
Tradable Industry$_t$	-0.0111 ***	(0.0001)	-0.0238 ***	(0.0002)	-0.0045 ***	(0.0002)
$\Delta \log(XR_t)$ * Tradable Industry$_t$	0.1094 ***	(0.0024)	0.1739 ***	(0.0036)	0.0476 ***	(0.0037)
Urban Area$_t$	-0.0072 ***	(0.0004)	-0.0118 ***	(0.0007)	-0.0049 ***	(0.0005)
Fixed Effect	Region		Region		Region	
N	25,976,635		11,322,508		14,654,127	
R^2	0.0197		0.0215		0.0198	

Note: Standard errors are robust and clustered on year.